Title: Is Automatic Linguistic Profiling Feasible in an ESL Context?

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Abstract

The objective of this thesis is to test if it is possible to design a program (Automatic Profiling) that can automatically generate a linguistic profile of a written interlanguage sample. The basic approach we take is illustrated in Figure 1, and detailed below.

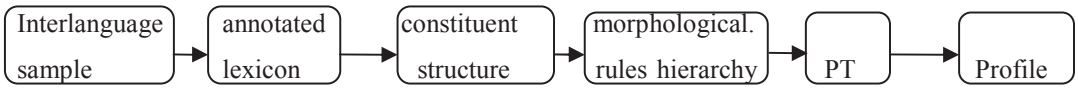


Figure 1: The basic architecture of Automatic Profiling

As can be seen in Figure 1, AP is designed to create an accurate profile of a given sample without any intervention by the user of the system. In other words, AP details the key grammatical (and lexical) aspects of the sample, and it evaluates its status in terms of second language development. It is also designed to tackle the irregular interlanguage data produced by a second language learner. Specifically, in traditional computational linguistics the automatic analysis of learner data is considered to be very difficult, if not impossible, because learner data are seen to be too irregular. The approach taken in this thesis is based on extensive research on the acquisition of English as a second language. The regularities found in ESL acquisition serve as the basic point of reference for the interlanguage parser that has been constructed for this thesis. The basic steps of the procedure are quite straight-forward. The machine will simply take the written interlanguage sample and automatically annotate its lexicon. On this basis, it will generate constituent structures, and it will use morphological and syntactic developmental regularities and compare the regularities found in the data with the PT hierarchy. Once the position of the learner grammar within the PT hierarchy has been determined, a complete linguistic profile will be generated in real time.

The work that is presented in this thesis derives in part from the tasks that follow from this rough outline of my approach to automatic linguistic profiling (AP). Further parts of the work presented here derive from the need to contextualise AP in the context of language testing, syllabus construction and the ESL classroom. In addition, AP has also been designed to be used as a research tool in corpus-based studies, and this capacity will also be presented.

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Chapter 1: Introduction

The objective of this thesis is to test if it is possible to design a program (Automatic Profiling) that can automatically generate a linguistic profile of a written interlanguage sample. The basic approach we take is illustrated in Figure 1, and detailed below.

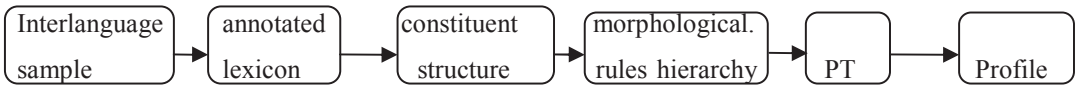


Figure 1: The basic architecture of Automatic Profiling

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The work that is presented in this thesis derives in part from the tasks that follow from this rough outline of my approach to automatic linguistic profiling (AP). Further parts of the work presented here derive from the need to contextualise AP in the context of language testing, syllabus construction and the ESL classroom. In addition, AP has also been designed to be used as a research tool in corpus-based studies, and this capacity will

also be presented.

The thesis is structured as follows.

Chapter 1 introduces the objective, which is to ascertain whether it is possible to design a program that can automatically generate a linguistic profile of a written interlanguage sample, and this part will explain what AP is. After that, the outline of each chapter is briefly introduced. Finally the research questions of this thesis are listed, as follows:

- Is AP as reliable and accurate as the analyst in the Rapid Profile procedure in determining learners' developmental stages of English?
- Can AP use an online method to elicit data from informants?
- Can AP describe the learners' developmental stages of online written English in real time?
- Can AP correctly describe what learners have acquired in terms of interlanguage distribution?

Chapter 2 introduces the rationale of this work. In this chapter, I will list the benefits of Auto Profiling and the background of the system. First, I will state that AP is a profiling tool which can be used in teaching, syllabus construction, and measurement of acquisition as well as do automatic profiling. Specifically, it uses online writing elicitation techniques, distributional analysis and the emergence acquisition criterion to find out the language profile of a learner in real time. I will then explain profiling in general terms, including the scope of profiling, and the differences between profiling and proficiency rating. Specifically, many authors of empirical studies have noted that second language acquisition is highly regular and follows stages of acquisition. In addition, interlanguage variation is also regular, and classroom language acquisition is subject to the same constraints as natural SLA (Pienemann, 1998; Ellis, 1994, p.631). Furthermore, it has been shown that learners cannot skip stages through the influence of teaching (Pienemann, 1998). Moreover, it follows from this that teaching needs to focus on developmental readiness (Doughty cited by Pienemann 1998, p.192; Keßler 2009). Finally, focusing on developmental readiness can be carried out successfully in the context of task-based language teaching (Keßler 2008b; Biane 2002 ; and Doughty & Long 2003) (See 3.1). As language profiling is so regular and most of the current testing systems do not provide enough information about this for teaching, Auto Profiling is

designed to meet this need. Specifically, it uses communicative tasks to elicit informants' data because they are very suitable for obtaining interlanguage data and data density. In fact, online writing elicitation is used to complement of the use of speaking elicitation conducted by Rapid Profile (see Appendix A). Consequently, with the information provided by Auto Profiling, teachers are better able to conduct their classes, because they know their learners' language profiles, meaning they know whether or not they are ready for specific types of instruction. Finally, in this chapter, I will introduce the research questions.

Chapter 3 introduces Processability Theory (PT) within a broader context of other theories of second language acquisition. It first introduces SLA as a basis for profiling and then compares three other main theories related to language acquisition to show that Processability Theory is the appropriate linguistic theory for designing Auto Profiling. In fact, some mechanisms of PT are also introduced. Specifically, in this chapter, I will first describe ESL acquisition and its variations. From empirical studies, it is known the language development of ESL acquisition follows a specific sequence, and that the language variation will be constrained by the hypothesis space (Pienemann, 1998). In other words, language development will start out from the categorisation of lexical items to phrasal ones, and then to inter-phrasal ones, and so on, and this phenomenon has been described by Ellis (1985, 1996), Long (1993), Pienemann (1998, 2005) and others. I will then describe why Processability Theory is an adequate linguistic theory for Auto Profiling. Specifically, SLA research as a basis for profiling offers many approaches in describing the language acquisition of a second language learner, the most prominent of which are three competing approaches: Parameterisation, Functionalism and Constructivism. After comparing these approaches, Pienemann (1998) concludes that PT is the best theory for use in explaining language development, as it is based on empirical observations of ESL acquisition and other typologically different forms of language acquisition. This is the reason why Auto Profiling uses PT as the linguistic theory in designing its linguistic processor (see 6.1) for profiling a learner's language development.

Chapter 4 introduces linguistic profiling and the analysis of learner language. In this chapter, I will introduce and explain some of the major processors in language profiling such as Rapid Profile, CHILDES, and COALA. Specifically, I will explain what each

language processor is, what it aims to achieve and how it works in real situations, including its strengths and weakness.

Chapter 5 introduces Automatic Profiling. After having described some of the major processors in previous chapter, in this chapter I will describe the overall structure of AP, including what it can do and how it is laid out along with some more detailed explanations. To start with, I will introduce the functions designed in Auto Profiling to meet the needs of current language processors, such as fully automatically analysing second English language data though elicitation techniques, emergence acquisition criterion and distributional analysis, and displaying the language profile of a learner, including their developmental stages of English and especially the annotated C-structure, as well as the instant corrective feedback. I will then introduce the interface of Auto Profiling, which has many effective functions to help teaching and language experts, by providing screen shots of these functions along with some explanations of what they are and how they can be used.

Chapter 6 introduces the computational aspect of Auto Profiling. In this chapter, I will first explain that a proper linguistic theory is needed to design a language processor, and that in Auto Profiling, this need is met by PT. Then I will explain how I use the theory in Auto Profiling with a series of algorithms that consist of modules which can be easily modified to meet the varied needs of the ESL context. In the second section, I will explain how Auto Profiling is equipped these algorithms can automatically display the language profile of a learner in real time and under time constraints, including the developmental stages of English, annotations of written texts, C-structures and so on. The detailed explanations of these modules will be explained step by step according to a floating chart in Tables 6.1and 6.2.

Chapter 7 introduces the feasibility study of Auto Profiling. In the very beginning, I will prove that AP can elicit and analyse all the produced ‘sentences’ by the informants in AP. After explaining how Auto Profiling can achieve what it sets out to, I will validate it in this chapter, including the machine analysis and my own analysis of written production, and a comparison of the transcripts of written texts using RP analysis, AP analysis and manual analysis. Specifically, in the first section, the analysis of AP and my own manual analysis are compared to show that it is appropriate to use AP to analyse second language

data. In the second section, the RP, AP and manual analysis are shown in different tables to demonstrate the reliability of AP. Specifically, Auto Profiling can analyse and profile the empirical data as well as RP does.

Finally, I will show that AP is reliable in analysing second language data, and thus it is feasible to use this system to profile the language development of a second language learner.

Chapter 8 discusses the evolution of Auto Profiling, including some of the major problems and how they have been tackled.

Chapter 9 introduces the benefits of Auto Profiling, which can be used as a platform for communication among learners, teachers and researchers.

Chapter 10 introduces the directions for further research of Auto Profiling, such as using AP as a research tool in SLA research, and examining the effects of time constraints on writing, the design of a language syllabus, and comparing AP and other language tests with regard to their effects on teaching and learning.

Chapter 2: Rationale

Auto Profiling has been designed to respond to a number of current issues in language learning, teaching and research. It creates a profile of the grammatical and lexical features of a given second language sample without any intervention by the user (or teacher), and evaluates this profile in relation to the overall patterns of second language acquisition. This system can be used in real classroom situations, such as in placement tests, as well as provide feedback in real time to improve teaching and thus accelerate language acquisition. In addition, researchers can also benefit from this system, as it has no inter- or intra-variances in assessing learners' interlanguage distributions.

In this chapter I will specify the rationale for this work, which is to develop a programming system based on Processability Theory (Pienemann, 1998, 2005) that can automatically profile the language knowledge of learners for use by researchers, teachers, educational authorities and the learners themselves. In short, this chapter will explain the need for the automatic linguistic profiling system presented in this work, called: Auto Profiling (AP).

2.1 AP is a profiling tool

In this section, I will introduce Auto Profiling to show that it is very useful in second language acquisition, as it can help teaching, syllabus construction, and measurement of acquisition, as well undertake automatic profiling. Specifically, it uses online writing elicitation techniques, distributional analysis and the emergence acquisition criterion to find out the language profile of a learner in real time, so that teachers can know whether learners are ready for the materials the wish to present (for more details, see Chapters 3 and 4).

When it comes to teaching and learning, especially when and what to teach a second language learner, Pienemann (1998, p250) proposed the teachability hypothesis, which is constrained by processability, like a subset of Processability Theory. Pienemann and Keßler (2009) noted that the teachability hypothesis (Pienemann 1984, 1989) is based on the Multidimensional Model (MM) and the Strategies Approach, predicting not only that stages of SLA cannot be skipped through teaching intervention, because of the cumulative nature of the processing strategies, but also predicting that variational features

are not subject to the same constraints on teachability. This means that although the teachability hypothesis defines constraints on teachability, it does not predict the necessary conditions for teaching to be successful. Therefore, it was later (Pienemann 1998) integrated into PT because of the lack of falsifiability in the MM. After this integration, PT is able to address the teachability hypothesis, which proves the developmental stages cannot be skipped, and thus provides sufficient conditions for teaching. In order to prove teachability hypothesis, Pienemann presented a number of studies, which are briefly reviewed as follows. First, Pavesi (Pienemann, p255 citing Pavesi 1984, 1986) found identical sequences in the acquisition of English in an Italian high school context, as well as in naturalistic acquisition by adults in Scotland. Like Pavesi, Daniel (Pienemann 1998 citing Daniel 1983), Westmoreland (Pienemann 1998 citing Westmoreland 1983) and Jansen (Pienemann 1998 citing Jasen 1991) also found the same sequence of acquisition in German as a second language in cross-sectional studies which had been carried out in completely formal contexts. In addition to these studies, back in 1987, Pienemann (1987) carried out a longitudinal study of German L2 in a formal context in Australia. In fact, Pienemann (1988) further demonstrated how robust the teachability hypothesis is by conducting a study in a formal context in Australia, and found that the sequence of acquisition to be substantially different from both the structures contained in the linguistic input and from the intended learning progression. Pienemann (citing Long 1988) stated that it is logical to hypothesise that a ‘stage cannot be skipped’ through formal intervention, because each stage requires its previous stage as the prerequisite for successful learning. In fact, Pienemann (1998, p13) claimed that instruction will be most beneficial if it focuses on structures from ‘the next stage.’ This has been proved by Doughty and Williams, who also related this idea to the developmental problem. In short, the results of all these studies are just as the teachability hypothesis predicts: that the same learning sequence existence in formal and natural contexts regardless of the structure of the teaching intervention.

Unfortunately, most teachers do not know what developmental stages their students are in. In fact, Larsen-Freeman (2000) stated that the most fundamental problem that teachers face is how to detect when learners are ready to learn something. However, the developmental stages of English are not easy to acquire in real time, especially when

dealing with many students at the same time. As teachers cannot obtain the developmental stages of their students, they do not know that what each individual can learn in terms of grammatical and/or morphological structures. This makes designing an appropriate syllabus for learners almost impossible.

owever, with the integration of the teachability hypothesis into Processability Theory, there is now an adequate construct theory for Auto Profiling (see Chapter 3.2).

In summary, AP uses automatic linguistic profiling to expedite the speed and reliability of acquiring the language profiling of English in real time, especially showing what processing procedures the learners have acquired. The results of this analysis can then be used by teachers to tailor their instruction to best suit the needs and abilities of their students.

2.2 AP and language profiling

In this section, I will first introduce language profiling is, its scope and its characteristics. Then, I will discuss why psychometric methods are not suitable for language profiling. In other words, I will discuss the problems related to most of the current testing systems and approaches, which rely on norm- and criterion-referenced methods.

Language profiling is the profile of language, which is based on the syntax, morphemes, lexicon, text cohesion and semantics that a learner produces. In this thesis, I only focus on the language profiling of lexicon, syntax and morphemes.

One approach to help learners acquire language more efficiently is by using Rapid Profile (RP): a speaking elicitation language profiling tool that simplifies and refines the theoretical concepts of the original Profile Analysis method (see 4.2). This system condenses the whole data collection procedure into some 15-20 minutes per respondent, and this is achieved not only with the use of new technologies, but also with a number of new theoretical concepts (see 4.3).

However, as RP still needs two language elicitors to conduct the elicitation, and also cannot currently elicit written data, it still has a number of weaknesses, which Auto Profiling is designed to address. Specifically, AP uses online writing elicitation techniques, distributional analysis and the emergence acquisition criterion to find out the language profile of a learner in real time. In other words, it can show the regularities of

the language development mentioned in previous section, such as the developmental stage, constituent structure (along with annotation of a 'sentence,' which may be a broken one), the frequencies of lexical tokens, and the distributions of syntactic and morphological structures. The online writing elicitation in AP is used to complement of the use of spoken elicitation in RP (see section 4.3). In addition, the emergence criterion and distribution analysis are also used to make sure the information provided by AP can truly reflect language development of a learner (see sections 3.1, 4.3 and 5, 6).

Besides linguistic profiling, AP is also designed to tackle common problems that arise in measurement and acquisition, which are related to the use of different types of instruments to measure learners' language acquisition, such as multiple choice questions, norm-referenced tests, criterion-referenced tests and corpora approaches. In fact, there is currently no fast and reliable method to find out learners' language knowledge. To make matters worse, when it comes to current testing systems, like those using rating scales and descriptors, there are also numerous problems, such as they are not operationalized with solid construct validity (Brindley and Slatyer 2002). These issues also make it difficult to design a computer program to aid in the assessment process, as they prevent the development of the solid algorithm that is needed for such a system. Researchers and/or teachers may use different types of instruments to measure learners' 'language acquisition,' but these may not actually measure what they are not intended to. For example, Hughes (2005, p76) stated that multiple choice questions used to be regarded as the only fair way to conduct tests. However, although many laymen have always been sceptical of what could be achieved through such tests, it is only quite recently that their limitations have been more generally recognised by professionals. Specifically, although multiple choice questions can solve the problems of inter- and intra-rater variances, Hughes listed the following issues. To start with, the technique only tests recognition knowledge, and a multiple choice grammar test score, for example, may be a poor indicator of someone's actual ability to use grammatical structures. Next, guessing may have a considerable but unknowable effect on test scores. Moreover, the technique severely restricts what can be tested, and it is very difficult to write successful items. Finally, the related backwash may be harmful, and cheating can become easier (Hughes, 2005, p76). Worst of all, teachers often use norm-referenced tests to help their learners to

pass high stakes examinations, because they are commonly used during these exams. In fact, quite a lot of testing systems try to use norm-referenced tests, which are inadequate for formative evaluation. This problem also has been raised by Johnson (1994, p249), who pointed out that the purpose of formative evaluation is to gather information about learner outcomes that is detailed enough to guide program revision, not to measure what a learner has acquired. He also reported that a number of evaluation researchers (for example, Weiss, 1972; Millman, 1974; Baker, 1974; Popham, 1978) have agreed that standardized tests are unsuitable for this purpose, because they are usually descriptively inadequate. First, the abilities measured by most standardized tests of language proficiency are defined in very general terms, and thus they can not be directly interpreted with reference to specific instructional objectives. Second, there is often a mismatch between instructional objectives and the content of a standardized test. This is not surprising, because of the wide variety of contexts in which language is taught around the world and the resulting diversity of instructional objectives. Therefore, it is thus unreasonable to expect a single standardized test to meet the objectives of any given program, with regard to providing suitable measurements that can be used for formative evaluation. A third weakness is that scores on standardized tests do not provide information about the degree of mastery of content or skills, and this is due to the problem of not having a valid construct theory, as mentioned earlier. Finally, there is the problem of content validity. This is mainly caused by the use of statistical criteria in selecting items for standardized tests. To maximize individual differences, these kinds of tests will mostly include those items that are of medium difficulty and that discriminate well between high and low groups of test takers. As a result, in the process of developing a standardized test, ‘easy’ items get weeded out. Unfortunately, these easy items are what a formative test should have, because they include the instructional objectives, and thus can test whether students have mastered the relevant content. In short, for various different reasons norm-referenced test development procedures tend to eliminate the very items which are of the greatest interest for formative evaluation, not to mention the language profiling of a learner.

As norm-reference test development procedures are not suitable, other test procedures had attracted more attention For example, Johnson (1994, p250) stated that proponents of

the criterion-referenced approach to test development and use claim that it will provide a means of solving the problems which are associated with norm-referenced tests (for example, Hively et al., 1973; Popham, 1978). To start with, these authors have claimed that since the approach is based on the domain of instructional objectives, it can provide direct and detailed information about students' achievement of these. Thus, the mismatch between teaching and test content that is often found with standardized tests can be avoided. Second, the test scores of this approach are reported in terms of how much the learners have mastered the instructional objectives, most frequently as a percentage. Therefore, this approach provides useful information for diagnosing both strengths and deficiencies in learning. Finally, since there is no need to maximise inter-individual differences, test items that are too easy or which do not discriminate will not be eliminated.

However, even if norm-referenced approaches are not used, most criterion-referenced approaches still cannot correctly pin-point learners' developmental stages, an important piece of data for profiling a person's language knowledge. Though criterion-referenced approaches may provide useful information about the accuracy rates of sentences, they cannot be used as assessment methods to determine test-takers developmental stages, nor to provide information on their interlanguage distribution in real time. In fact, Pienemann (1998) clearly showed that the main problem with this procedure is that it is based on the unfounded assumption that accuracy rates can uniformly describe progress in acquisition. Also, it has been proved that there is no guarantee that the accuracy of morpheme insertion will increase steadily in relation to any two morphemes or in relation to any two learners. To the surprise of those who insist on utilizing accuracy rates or percentages, Pienemann noted that 'it is quite likely and well attested in empirical studies (Meisel et al., 1981; Pienemann, 1998) that accuracy rates develop with highly variable gradients in relation to grammatical items and individual learners.' As a result, accuracy rates cannot be used to determine learners' developmental stages.

As current norm- and criterion-referenced approaches have a number of problems, corpora approaches have also been proposed. Currently there are quite a few good corpora systems such as the Corpus of Contemporary American English (COCA) and British National Corpus (BNC) available for researchers, teachers and learners, which

provide users with access to authentic materials produced by either NSs or NNSs. As a result, they can carry out a wide variety of research, teaching, or/and learning practices. However, some researchers have expressed reservations about these systems. For example, Ellis and Barkhuizen (2005, p347) pointed out that in traditional corpus-based studies the development of the verb by individual learners is not tracked, and hence it is not possible to assess the variability in the developmental sequences followed by individuals. They also argued that traditional corpus-based studies do not trace a learner's interlanguage over time (p349), and that the merged learner corpora are mostly composed of the writings of fairly advanced language learners (p357). Consequently, they do not provide researchers with enough data to fully understand how learners acquire a second language, and thus Ellis and Barkhuizen argued that a wider range of learner corpora is needed. Last, but not least, researchers have found that it is difficult, if not impossible, to find the average developmental stage of a large group of students. This is first because, as mentioned above, there are no very suitable methods to find an individual student's developmental stage, and second because even a poor average measure for a large group of students is difficult to obtain within a short period of time.

To date, no fast and reliable method to assess learners' language knowledge has been developed, and this is obviously something that would benefit all parties concerned in this field. However, as PT is good at describing language profiling and its development (see Chapter 3), it is not surprising that Pienemann uses this theory as the basis for the Rapid Profile speaking elicitation profiling tool (see. 4.3). One key difference between speaking and writing is that the former happens almost automatically and offers no possibility for erasing or editing an utterance once it is spoken, and thus mistakes such as slips of the tongue are quite common. In contrast, when it comes to writing, learners can generally make changes to their language production right up until they finish the task. As learners are not constrained by time, their written production does not really reflect the automisation of their procedural skills, and thus cannot be used to profile a learner's language development. In fact, Huang (2008) pointed out the similar problem in assessing one's own writing, and that the Reading and Writing Self-Assessment (RWSA) results need to be treated with caution, because RWSA is more a reliable measurement of the learners' self-confidence than a representation of their actual reading and writing

abilities.

To solve this problem, Pienemann suggested that I use communicative tasks to elicit informants' data and that when eliciting written production, researchers should limit the time available for learners and forbid them from making changes to their work. Specifically, in order to make sure that AP can elicit informants' interlanguage data, especially with data density, I will use communicative tasks in AP. As there are so many definitions of the word 'task', I will first discuss some of these, and then focus on why communicative tasks are suitable for use with AP to elicit informants' data.

The word 'task' has been defined in various ways in second language acquisition,, as noted by Nunan (1989, p.5), who classified the term in three different ways. The first is a piece of work undertaken for oneself or for others, freely or for some reward, such as painting a fence, making an airline reservation, and so on. The second definition, adopting a pedagogical perspective, is from a dictionary of applied linguistics. It is 'an activity or action which is carried out as the result of processing or understanding language (i.e. as a response)', including drawing a map while listening to a tape, and performing a command. The final definition is a structured language learning endeavour with a particular objective, appropriate content, a specified working procedure, and a range of outcomes for those who undertake the task.

Tasks can also be explained by functions through the assessment perspective and/or language development. For example, Brown et al. (2002, p.7) pointed out that performance assessment seems to be a necessary and desirable activity in many contemporary language education contexts. They further argued that 'in order to meet the interpretive and decision-making needs of teachers and others, some sort of evaluation of learner performances on meaningful communicative activities is often required.' In other words, meeting the intended interpretations, a test developer can select appropriate test tasks, then initiate consistent testing procedures, and finally develop adequate rating/scoring criteria and practices. Specifically, they (p.9) explained that task-based language assessment provides a specific approach to interpret students' abilities by using a particular set of methods for the elicitation and evaluation of second language performance. In fact, using communicative tasks in performance assessment is quite common in educational contexts, especially to find out the language development of a

second language learner. For example, Brown et al. (2002, p.9) explained that task-based language assessment provides a specific approach to interpreting students' abilities by using a particular set of methods for the elicitation and evaluation of second language performance.

Nobuyoshi and Ellis (1993 citing Nunan 1989, p.10) also stated that communication tasks have been defined as tasks involving the learner in comprehending, manipulating, producing, or interacting in the target language, with their attention principally focused on meaning rather than form. They contrast this with other, more traditional language tasks requiring learners to pay attention to specific linguistic properties, such as phonological, lexical or grammatical items, so as to learn or practice using them more accurately. They further stated that the pedagogic rationale for the use of communication tasks is partly that they will help to develop learners' communicative skills, and partly that they will contribute to their linguistic development. In fact, they stated that 'focused communication tasks provide a means of encouraging learners to produce output that is comprehensible and, at the same time, grammatically correct.' Therefore, with a careful description of a task, we can bring about a substantial degree of focus in learner performance, which is what AP aims to do.

The functions of communicative tasks are also explained by Pienemann and Kessler (2011), who stated that different types of such tasks can elicit certain types of grammatical structures more frequently than other types of structures. For example, habitual tasks, such as daily activities, can elicit third person singular verbs and picture differences information questions. They (p.87) pointed out that certain ethical issues, as well as unproductive data collection sessions, can be avoided by using communicative tasks for the elicitation of interlanguage data. One example they introduced is using a visual or other type of cue to delineate a communicative task. Specifically, the instructions during the elicitation can provide a chance for informants to describe certain types of tasks, such as 'habitual actions' and 'picture differences'. In other words, it is through these types of communicative tasks that different types of syntactical and morphological structures can be elicited and the ethical problems can be avoided.

They further pointed out that using communicative tasks is not a test, but a way to confirm whether a learner has acquired certain types of structures. They said that it is

important to remember that such a communicative task is not a test. Specifically, they (p.89) pointed out that the objective of doing communicative tasks is not to find out if the informant can describe the scene adequately or produce answers without making mistakes, but instead to provide communicative contexts to elicit specific productions, such as of third-person-s and information questions. If the informants cannot produce these structures where they are required in the context of the tasks, the researcher can then infer that the informant has not acquired them. Specifically, they (p.90) demonstrated that the habitual action-task produces much more contexts for third-person-s, while the picture-differences task has more contexts for questions. In fact, Pienemann (1998, p.280) utilized specific communicative tasks to target the elicitation of specific ESL structures, including the frequency of structures in different types of communicative tasks.

Therefore, in order to elicit the structures we are interested in as well as avoid ethical problems, we designed the communicative tasks in this system.

Besides using communicative tasks in AP, Pienemann also suggested that I should limit the time available for informants. This means that a writing profiling tool should be able to check whether learners are using their automisation procedures or not, because this is a process which can lead to language acquisition. Therefore, the tool proposed in this work, Auto Profiling, uses time constraints and does not allow the learners to make changes to their work, to ensure that the written data are produced through automised procedures, and are more similar to spoken data. Consequently, AP can more accurately profile learners' developmental stages of English, from lexical to phrasal to inter-phrasal procedures.

2.3 Research questions

As I have proposed the Auto Profiling system to address a number of fundamental problems in assessing learners' language knowledge, in this section I will describe the main research question as well as four related sub-questions, and then explain how they will be tested and answered.

The main research question is 'Is automatic profiling of written IL texts possible?' To answer this question, I will ask twenty informants to test the AP system, and the results

will be included in Chapter 7. The four related sub-questions are as follows:
The first one is ‘Can AP be as reliable and accurate as the analyst in Rapid Profile (RP) in determining learners’ English developmental stages in writing?’. In order to answer this question, I will first modify the transcribed texts from Pienemann and Keßler, as these texts are the ones that were used to prove the feasibility of RP. I will also use various tables to aggregate the results from both AP and RP to analyse the differences and similarities between these two systems. Finally, I will use this comparison to check whether AP can be as reliable and accurate as the analyst in RP with regard to determining learners’ English developmental stages in writing. The second sub-question is ‘Can AP use an online task method to elicit data from informants?’ To test this, I will set up a server and then ask informants to log on to it using a computer, and they can then start testing the system to see if AP can use the online task method to elicit data. I will show the results of the online assessment system, including the data collected from the online method, in Chapter 7. The third sub-question is ‘Can AP correctly describe what learners have acquired in terms of interlanguage distributions?’ To investigate this, I will again show the results of this system, especially with regard to the frequency of different structures, lexicon, words, the temporary level, and the constituent structure of each elicited sentence as well as of all of the whole elicited sentences. The last sub-question is ‘Can AP describe the learners’ developmental stages of online written English in real time?’ This item examines the most important function of the system in practice, as without it, teachers will not be able to provide suitable teaching and researchers will not be able to know whether their subjects are compatible or not. AP can provide this information in real time once informants have completed their online assessments, and it is shown on the computer screen directly without any further processing being required. As above, I will show the results from this system to demonstrate that it can correctly describe what learners have acquired in terms of their developmental stages of English.

Chapter 3: SLA as a basis for profiling

In this chapter, I will introduce Processability Theory within a broader context of other theories of second language acquisition. I will describe ESL acquisition and language variations constrained by the mechanisms and hypotheses space in PT. The different levels of developmental stages of English, including syntactical and morphological structures, are then also described according to PT. After that, I will explain how PT can adequately describe ESL acquisition after comparing three major approaches in language acquisition, further demonstrating how PT can be used in describing language development. This comparison is to place this theory within a broader context of other theories of second language acquisition. In other words, the first section is a description of ESL acquisition which is also the descriptive basis of the AP and the whole thesis. Specifically, it describes in detail how ESL acquisition develops with regard to syntax and morphology, explains the database on which AP is based, including the ESL corpora used by Pienemann et al. (e.g. Pienemann 1984 and 1998, Johnston 1997, DiBiase 2002, Mansouri and Duffy 2005, Keatinge 2005, Keßler 2006a and 2006b), as well as specifies the elicitation techniques, distributional analysis, emergence criterion, and implicational scaling in the data analysis used in AP, to show how it can correctly profile learners' language development. In the second part of this chapter, I first describe three competing approaches in describing language acquisition and will then explain why PT is an appropriate theory in describing and explaining language acquisition, including how it evolves. In fact, PT can also apply to bilingualism, and creole studies done by Plag (Pienemann & Kessler, 2011, p.106), another example of how Processability Theory fits into the broader context of theories of second language acquisition

At this stage it should be noted that PT is based on some key assumptions, as highlighted by Pienemann and Kessler (2009). First, second language development follows universal stages, which are constrained by the processability hierarchy. Second, interlanguage variation is limited and regular, and this is also caused by the constraints inherent in the processability hierarchy. Thirdly, L1 transfer is constrained by processability, implying that L1 forms can be transferred to the L2 only when they can be processed in the developing L2 system, an operationalised "partial transfer" position (cf. Pienemann, Di Biase, Kawaguchi and Håkansson 2005). Fourthly, task variation is also constrained by the processability hierarchy, a claim that results in the "steadiness hypothesis," which predicts

that a specific interlanguage will be placed at one and the same stage of development in different tasks as long as they refer to the same skill type (Pienemann, 1998). Fifthly, although first and second language acquisition are constrained by the processability hierarchy, they may both be associated with fundamentally different developmental trajectories because of the different accuracy rates of the acquired processing procedures, or because of the use of different strategies in producing language. It should be noted that although there are differences in producing language in L2 and L, their developmental stages of language are the same because of the same processing procedures. Finally, the bilingual language development of a learner or native speaker can be compared across different languages on a universal scale using the processability hierarchy inherent in PT. In other words, with the scale of the processability hierarchy, the development of the language processing procedures of each language can be known, and thus the development of these two languages can be compared (Pienemann, Keßler and Itani-Adams in press).

3.1 Description of the ESL acquisition process

In this section, I will further explain the profiling discussed in section 2.2: English language acquisition and the profiling systems. In other words, the developmental stages of English are introduced and the profiling systems are further discussed to meet needs of the ESL acquisition process.

The ESL acquisition process, including language development and variations, does not change all of a sudden and it does not 'scout', which is a process of changing developmental levels within a very short time without obtaining further processing skills. It is actually constrained by the mechanisms and hypothesis space in PT. In fact, Ellis (1994, p110) also pointed out that language development occurs in a sequence. To support this, he listed some important conclusions in language acquisition, one of which stated that Pienemann's work on ZISA has provided some impressive evidence showing that learners acquire German word order rules in a clear sequence, and this can be extended to other languages, such as English. Specifically, the lexically driven grammar, Lexical Mapping Theory and hypotheses space can explain the variations of language development. More specifically, Pienemann and Keßler (2009) pointed out that each stage corresponds to a set of grammatical rules sharing certain processing routines, and each interlanguage variation represents a specific variant of the grammatical rules.

Pienemann & Keßler (2009) demonstrated how the hypotheses space and the sequence of developmental stages of English constrain the development and variation of an English learner. For example, they showed that when English learners try to produce aux-second before level 5 (i.e. before they are ready for inter-phrasal structure), those who have not yet acquired the processing procedures to produce such a structure come up with the following interlanguage variants:

A. What she seen?
B. What has seen?
C. What she has seen?
D. She seen this?

These variants are produced to get around placing the auxiliary before the subject, meaning that they constitute different solutions to the same learning problem because of the learners' relatively low current developmental stage of English. Learners will then further accumulate grammatical rules and their variants in the course of L2 development according to each of the different solutions they choose, and this allows them to develop an individual developmental trajectory while adhering to the overall developmental schedule. In short, in this way, Pienemann and Keßler (2009) concluded that PT defines a two-dimensional space (i.e. the hypotheses space) which is constrained by the processability hierarchy for the formation of processable hypotheses, and which occurs in the context of developmental trajectories. That is to say, the structures that are processable at any given stage are constrained by the available processing resources. When learners' developmental stage is at the phrasal procedure level, they can only exchange grammatical information only within phrases, not beyond the phrasal boundary. For example, these learners will not be able to do subject-verb agreement which requires grammatical information to be exchanged beyond the phrasal boundary. Learners' processing resources thus define and constrain the grammatical information they can produce.

While the exchange of grammatical information is constrained by the learners' processing resources, these constraints do leave sufficient leeway for learners to find different solutions to structural learning problems. As noted above, Pienemann and Keßler (2009) showed that the position of auxiliaries in English wh-questions requires processing procedures at the sentence level in the hierarchy. Although the L2 learners in their example have not yet acquired the processing procedures at the sentence level in the hierarchy, they

can still produce “pre-wh-questions” with the help of their current processing procedures. Specifically, when not being able to place the auxiliary before the subject (i.e. in second position), a level 5 inter-phrasal procedure, learners will still have four structural options (variants A-D above), which can be used as variants based on the processing procedures available at the previous stage. Moreover, the number of options is limited because of the limited resources that are available for learners: a phenomenon caused by the need to circumnavigate a structural problem (here the aux-second) which is caused by the constraints inherent in the hierarchy. This is how and why possible and predictable developmental trajectories are constrained by the processability hierarchy.

As these trajectories can be fairly explained through the inherent mechanisms in PT, and language learning is a cognitive process, learners’ linguistic systems cannot change all of a sudden, regardless of the inputs given, including social parameters and/or formal learning environment. Pienemann clearly stated this view, as follows:

> one can no longer assume that the fundamental nature of the learner’s linguistic system can suddenly change under the influence of non-cognitive variables such as interactional parameters or formal learning environments. At the same time it is quite consistent with this cognitivist position to assume that social parameters may cause a sequence of changes in the learner’s processing of the language which leads to the gradual attainment of a high-level skill. However, these changes of cognitive processes would always occur within the overall architecture of the cognitive system.
>
> Pienemann (1998, p132)

Since linguistic systems cannot suddenly, it is both meaningful and useful to describe the sequence of the developmental stages of a language (see section 2.1). Therefore, this section will next describe the developmental stages of English as constrained by the mechanisms of PT and the hypotheses space, as well as their perceptual salience and other factors. First, the sequence of developmental stages of a language results not only from grammatical information exchange, but also from perceptual salience: primacy and recency. According to Pienemann,

> The first principle for establishing an accessibility hierarchy of processing procedures was that of grammatical information exchange. This can be complemented by a second principle, namely perceptual salience. Murlock (1962) (cf. also Sridhar 1988, Kintsch 1974) established this principle through a number of studies which found persistent primacy and recency effects on the memorisation of any sequence of stimuli.
>
> Pienemann (1998, p78)

we can thus understand why the sequence of developmental stages of a language is the way

it is. Specifically, Pienemann stated that grammatical information exchange and perceptual salience complement each other. Language develops from simple structures that do not need information exchange to more complex ones that do. In order to express question statements, learners at lower developmental stages will use perceptual salience, such as do-fronting or wh-fronting. This is again because of their lower developmental stages, which are unable to deal with higher processing procedures. Therefore, Pienemann stated that when a learner starts to learn English, they will begin with very simple terms, such as *book* and *home*, and not use complete sentences. Later, more simple items will be used in a string. However, while such structures are normally in a canonical order of sentences, at this particular point there will be no grammatical exchange between items. Later, with perceptual salience, do-fronting or wh-fronting will be used. Subsequently, some grammatical information exchange between items can be achieved, and the learner can start to use structures like be-second and so on.

In addition to perceptual salience, there is another constraint that will be able to describe the developmental stages of English: TOPIC hypothesis, a mechanism in PT. When learners start to use topics at the focus position, they are also in the process of upgrading their developmental stages. For instance, Pienemann (2005, p239) explained that in the TOPIC hypothesis it is the use of non-subjects at the adjunct in the focus position which causes the collapse of a learner's canonical sentences, a phenomenon that causes learners to have problems with using canonical sentences again, because the canonical order is not there for them to use. This process not only leads to the dynamics of the developmental process, but also upgrades this learner's developmental stage (see Chapter 3.2 for more details about mechanisms in PT).

Having talked so much about language development, I would like to explain the developmental stages of English, as outlined by Pienemann. This is also related to the system that I am using for this thesis. The developmental stages of PT are actually the algorithms of the Correct_ranking function (see section 6.2). It is through this function that AP can find each informant's developmental stage of English and interlanguage distribution, especially the formula sentences.

According to PT, the different levels of developmental stages are as follows:

Lexicon (Level 1)

Canonical order (Level 2)

Auto Profiling

Adverb fronting (ADV) (Level 3)

Do-fronting (Level 3)

Wh-fronting (Level 3)

Yes/no inversion (Level 4)

Do/Aux 2nd (Level 5)

Cancel inversion (Level 6)

Pienemann (1998, p170) pointed out that canonical word order (SVO), level 2, can be found in most affirmative sentences in English. In addition, ADV, level 3, refers to the occurrence of adverbs and adverbials in the initial position of sentences. Do-fronting and wh-fronting are similar types of structures related to level 3. Next, yes/no-inversion is the structure in level 4, while do/aux 2nd refers to inversion in wh-questions, which are the structures in level 5. Finally, cancel inversion, level 6, describes the fact that the word order phenomena observed in direct questions do not apply in the context of indirect questions. Specifically, Pienemann (1998, p170) further explained that do-fronting, level 3, is merely the appearance of 'do' at the start of sentences for the purpose of marking a direct question. Do-fronting thus covers (25) as well as (26) and (27):

(25) Do you like it?

(26) Do he like it?

(27) Do he have lunch yesterday?

Pienemann (1998, p170)

Pienemann also stated that wh-fronting, level 3, refers to the positioning of question words at the beginning of sentences. This basically provides beginners with a way to express information questions, although it is an incorrect structure, which is essentially a wh- word followed by canonical word order, as in (28):

(28) Where you have been?

Pienemann (1998, p170)

Next, Pienemann noted that yes/no-inversion, level 4, refers to the syntactic pattern which is found in a direct yes/no-question. In order to produce this pattern, learners have to invert the subject and the auxiliary as in (29):

(29) Has he seen you?

Pienemann (1998, p170)

Furthermore, Pienemann explained that do/aux 2nd, level 5, refer to inversion in wh-questions, as in (30) to (32):

(30) Why did he sell that car?

(31) Where has he gone?

(32) What is she eating?

Pienemann (1998, p170)

Finally, as for the current highest developmental stage of English, Pienemann observed that cancel inversion puzzles learners who have only acquired level 4, and this is mainly because the word order observed in direct questions does not apply in the context of indirect ones. This phenomenon is illustrated by adding a matrix clause to examples (28)-(32). The resulting sentences are given in (33)-(37).

(33) I wonder whether he had lunch yesterday.

(34) I wonder whether he has seen you.

(35) I wonder where he has gone.

(36) I wonder what she is eating.

Pienemann (1998, p170)

Besides syntactical structures in the developmental stages of English, Pienemann also mentioned the morphological structures such as category procedure, phrasal procedure and sentence procedure. First, a category procedure, a level 2 in the PT hierarchy, can be seen in endings like '*ed*' at the end of a root verb to describe the past tense of a sentence. For example, the word 'worked' is a typical category procedure which does not have any information exchange but instead uses an ending '*ed*' to express someone did the work. The developmental stage is lower because it does not need information exchange. However, the next level, level 3, is a phrasal procedure which can be seen in many situations, such as 'three books' or 'five dogs'. This procedure is used to exchange information within a phrase, and learners have to acquire the procedure in order to notice that these two words are interrelated. When they notice that these phrases start with a number that is more than one, they have to add '*s*' or '*es*' at the end of a countable noun. This is called a 'phrasal procedure' because the information is exchanged within a phrase and is achieved by feature unification. Finally, an even higher level in PT is the SV-agreement level of morphological structure, which is achieved by utilizing many procedural skills. Pienemann (1998) stated that one of the important developmental stages in English is the acquisition of SV-agreement in equational sentences. A typical example is: John designs an airplane. In order to produce this sentence, learners have to use an inter-phrasal procedure, namely a sentence procedure that is also called inter-phrasal affixation. With the sentence procedure, they can notice that 's' has to be added to the verb 'design', a procedure that is achieved through feature unification at the level 5. In order to achieve this level, learners have to acquire

quite a lot of phrasal procedural skills. When these are not properly acquired, learners will either miss the SV-agreement in equational sentences, or simply memorise it without knowing the procedural skills, and this will then cause problems (see Table 3.1). For example, the learner will not be able to produce similar types of sentences, as they only know what they have memorised. Pienemann explained this phenomenon, as follows:

> I believe the seeming mastery of SV-agreement in equational sentences can be accounted for by the learning of lexically invariant material.
>
> Pienemann (1998, p128)

This is related to formula sentences. Even when learners seem to be able to vary their language lexically and/or morphologically, this does not mean that they have already acquired this process. In fact, it may be the case that learners simply learn phrases as one block. In fact, Pienemann further specified some similar phenomena with regard to the major differences between formula and non-formula sentences.

> the major difference between the copula and lexical verbs is that the latter vary lexically while the former do not. Similarly, pronominal subjects do not vary lexically (except for gender marking in the third person), while non-pronominal subjects do.
>
> Pienemann (1998, p128)

Processing procedure	**L2 process**	**Morphology**	**Syntax**
5 • subord. cl. procedure	main and sub cl	Cancel INV	
4 • S-procedure	inter-phrasal info	SV agreement (= 3sg-s)	Do2nd, INVERSION
3 • phrasal procedure	phrasal info.	*NP agreement*	ADV, Do-Front, Topi Neg+V
2 • category procedure	lexical morph	*plural, past –ed* possessive pro	canonical order
1 • word/ lemma	'words'	invariant forms	single constituent

Table 3.1: Processing procedures applied to English

Unfortunately, most of the research on learners' language development does not really look

for the lexically and morphologically varied items, because of practical issues such as a lack of time or the inadequate capabilities of the methods and technologies used. Fortunately, Rapid Profile (RP) is one of the few processors that take into account the lexically and morphologically varied items. In fact, it also uses the emergent criterion to tally the varied items in order to find out whether learners have achieved a certain developmental stages of English or not. Keßler and Keating (2008, p.165) stated that the current version of RP utilizes this developmental schedule for English as a second language and compares the structures found in speech samples collected from English L2 learners. To make this work, the analyst has to locate the patterns found in the sample within the overall regularities of the standard developmental schedule. As this is done partly by human beings, RP limits itself to the analysis of a number of well-established morpho-syntactic features that can be found in EFL learners' interlanguage, as mentioned above. They further pointed out that while the linguistic features focused on may not on the surface immediately resemble the full picture of human language, they do in fact reflect much more of what we know of learner language development as a whole than is immediately known. Specifically, this developmental path of learner language has not only been substantiated by many empirical findings (e.g. Pienemann 1984 and 1998, Johnston 1997, DiBiase 2002, Mansouri and Duffy 2005, Keatinge 2005, Keßler 2006a and 2006b). In fact, Keßler (2006 and in press) carried out a further study to test whether an online-speech sample of approximately 15 minutes can really elicit sufficient data that can be used to screen the current state of interlanguage of an EFL learner, as well as whether these collected speech samples can then be used to conduct RP online screenings to assess the current state of learner language development. Specifically, Keßler collected speech samples from four EFL learners from four different EFL classrooms in three different schools. Two of the learners who had started learning English in formal classroom settings at the age of eight were about to finish an early start EFL programme at primary school. The total EFL input was 145 lessons with two lessons per week. The other two learners who started learning English at the age of ten and did not have any EFL instruction in primary school attended different secondary schools, both of which followed a more traditional EFL programme. The total EFL input was also 145 lessons, but in a more intensive programme of five lessons per week. These four learners were taught English by different teachers. The L1 of all four learners was German. Interestingly, two undergraduate students who had only

undergone the assessor training successfully collected the speech samples from these four learners. This proved that analysts do not necessarily need to be experts in psycholinguistics to be able to conduct the online screening procedure using RP.

In order to make sure that RP can really elicit linguistic indicators of the current EFL interlanguage of the learners, Keßler (2008a, citing Keßler and Kohli 2006) stated that one of the two undergraduate students administered a range of communicative tasks. Specifically, each of the students took turns to elicit two speech samples, while the other undergraduate conducted the RP online-screening. The interviews for data elicitation took an average of 12.5 minutes, ranging between seven and 17 minutes. All interviews were video- and audio-recorded, each of which was fully transcribed from the recordings and then checked according to the underlying structures needed for the online assessment using RP (cf. chapter 3, especially figure 3.2). In fact, Keßler (2008a citing Pienemann 1998) further stated that

> the data density in all the interviews proved to be sufficiently high as each interview contained a large variety of underlying structures for each of the stages reached by the individual learners.
> Keßler (2008a, p182)

With a full transcript for each of the four learners, the traditional linguistic profiling also confirmed the current profile of L2-development for all the learners involved. Specifically, the elicited stages of acquisition attained by the learners ranged between stages 1 and 2 for primary school learners, and stage 4 and early stage 5 by the learners having started learning English at secondary school.

However, as RP still needs humans to conduct its elicitation, AP is developed to remove this requirement. AP is also based on Processability Theory (PT), and can thus explain developmental and variational phenomena in interlanguage (IL) dynamics. In order to achieve this goal, AP uses the Interlanguage Profile in the feedback to provide each learner's developmental and variational phenomena. Moreover, this feedback will also automatically change in real time when the learners' developmental and variational phenomena change as more advanced processing procedures are acquired. What is more, since SV-agreement marking can be learned through lexically invariant material, AP will use the IL distribution to check whether learners actually acquire the level or not (see the algorithms in section 6.2). As Pienemann stated (1998, p128):

> Typically, SV-agreement marking is based on (1) the recognition of the grammatical subject of the sentence, (2) the recognition of the values of its diacritic features for 'number' and 'person', (3) the

> recognition of the verbal element which carries the agreement marking and (4) affixation of the correct morpheme to the verb—on the basis of accessibility of (2) in the S-procedure. Pienemann (1998, p128)

Specifically, to be able to differentiate whether learners have acquired the SV-agreement marking, AP, using the Distribution Rule algorithm, will make sure that the subject of a sentence produced by a learner will be recognized, and then the values of its diacritic features for 'number' and 'person' will also be recognized at the same time. In the meantime, AP will also make sure that the verbal element has agreement marking, as well as the correct morpheme to the verb.

In addition to checking the diacritic features of the samples produced by learners, with the aid of some of the fundamental concepts used in RP, AP is able to clarify some of the doubts about the language profiling produced in this system, such as the definition of the Emergence Criteria, the hierarchical nature of stages (instead of a uniform set of levels in different domains) and the implicational analysis. To start with, the Emergence Criteria are important in AP because they can clearly define whether a developmental stage is acquired or not. Pallotti (2007) pointed out that the term 'first systematic use' is the fundamental concept that differentiates the Emergence Criteria (EC) from other criteria, which focus on the later stages of the acquisition process. He also pointed out another seemingly paradoxical concept associated with EC—the association of 'first' with 'systematic'. Specifically, he elaborated that under normal circumstances the word 'first' refers to an incipient phenomenon, to a process that is just beginning, and thus we expect very few observable cases. On the other hand, we would expect at least a certain number of observations for the word 'systematic' to be used. Since EC is defined as the 'first systematic use', it seems that with this definition there is almost no way of getting this phenomenon within a datum, because it is not obtained chronologically, and thus it is difficult to get evidence of systematic and productive use. Pallotti concluded that 'emergence' means 'presence'—the structure has emerged (at some time) and is now being used systematically and productively. In fact, he also stated that the greater the number of observations, the more reliable the conclusion of systematicity. He also noted that there is a question as to whether the analysis should be based on types or tokens. For example, if a learner repeats the term *books* twice in a data sample, this would count as one type and two tokens. In fact, Pallotti (2007, citing Pica 1984) has proved that type or token counts lead to different criterion levels or ranks for the same learner at a particular time. As well as

different counting methods causing different results, Pallotti highlighted another problem—establishing the necessary structures the acquisition criterion should be applied to. He suggested that specifying interlanguage rules is one a way to tackle this problem, especially by following Pienemann's proposal of factorizing diacritic features. Finally, Pallotti concluded that in order to increase reliability and replicability, many distributional tables are needed to achieve this goal.

> it is desirable that not only the transcripts but also the distributional tables used for analysis be available to other researchers, showing what items were excluded, how data were aggregated, and how types/tokens were scored
>
> Pallotti (2007, citing Polio and Gass, 1997)

As Pienemann's method is a good approach in EC, this project will follow this and add more tables to be able in line with Processablity Theory, such as implicational analysis and the frequency of structures, to deal with the doubts raised by Larsen-Freeman and Long (Pienemann 1998, p153) such as 'scouting' (see the algorithm of the final developmental stage and the algorithm of the frequency of syntactical and morphological structures in section 6.2). Specifically, Pienemann (ibid, p 133 citing Hyltenstam 1978)) pointed out that implicational scaling has been recognised as highly productive in representing dynamic aspects of the interlanguage, with the notion that cumulative learning processes can be represented by successive additions of linguistic rules to the interlanguage system such as rule 1 + rule 2 + rule 3 and so on. For example, for any set rules learnt in a cumulative fashion the following is true: if sample A contains rules 3, then it should contain rule 2 and rule 1 otherwise rule 3 is not cumulated from rule 2 and/or rule 1. Specifically, the rules of the interlanguage system are listed on one axis, while the samples are listed on the other. With this two dimensional presentation, the systematic account of a linguistic system (grammar axis) in relation to developmental time can be listed, describing a non-static grammar through many aspects of the learning process. In fact, Pienemann further explained the advantage of using implicational scaling, in that it limits the analysis to cumulative learning processes, and thus interlanguage samples from different speakers can be represented on what is the time axis in Table 3.2. In addition, if such an exercise produces a valid implicational relationship of individual interlanguage rules, we can hypothesize that the chronological development of these rules follows the implicational pattern.

	time 1	time 2	time 3	time 4
rule 1	-	+	+	+
rule 2	-	-	+	+
rule 3	-	-	-	+

Table 3.2 Implicational scale

Another doubt about language profiling is the uniformity of levels in different domains. Pienemann (1998, p 151) stated that Larsen-Freeman and Long seem to suggest 'there ought to be some degree of uniformity of level across the different structural domains, and if that is not be found the concept of stages is falsified.' However, Pienemann pointed out that such a procedure would mean not focusing on the key features of an implicational hierarchy of stages of acquisition. Therefore, he stated that what ought to be tested is not the uniformity of levels but the hierarchical nature of stages. Specifically, in order to get the hierarchical nature of stages, a test should be based on several interlanguage samples to capture the concept of implicational or hierarchical levels. This means that, ideally, these samples should be taken in a longitudinal manner to avoid confusion between variational and developmental features. In practice, one should at least be sure that the samples are sufficiently linguistically varied to contain all the linguistic contexts needed to produce the rules to be tested.

To validate and falsify implicational relationships, Pienemann (ibid, p 152) presented two tables (Tables 3.3 and 3.4). Specifically, if 'a' is the context for rule 'A' and 'b' the context for rule 'B', and so on, the pattern shown in Table 3.2 is to be expected for a valid implicational relationship, because the environments for rules A, B, and C are present in both samples and rule A, which is the easier rule, is also present in samples 1 and 2, but rules B and C, which are more difficult, are only present in sample 2 and absent in sample 1. In other words, these samples would provide evidence for the implicational relationship: A before B and C. On the other hand, if the rule (structure) positioned at the lower end of the implicational hierarchy is absent in the presence of the required environment and in the presence of a 'higher' rule, as illustrated in Table 3.3, where rule A is absent from sample 2 in the presence of rules of B and C, then this falsifies the hierarchy of rules.

In short, finding out the developmental stage does not rely on the uniformity of levels but on the hierarchical nature of stages. This also means that AP will use the hierarchical nature

of stages in its analysis, instead of the uniformity of levels (see the algorithm of the final developmental stages of English in section 6.2)

Like the validation of the hierarchy of rules, Pienemann (ibid, p 153) stated again that Larsen-Freeman and Long assumed the overall level of development in this type of analysis, such as implicational analysis, is determined by identifying the highest level for which the 'majority' of domains have a plus for 'acquired'. However, the truth, Pienemann stated, is that the EC is used to describe the beginning of an acquisition and the principle is also used in the emergence of evidence for the learner's capacity to process linguistic material at a higher level. This is important in determining whether a learner has acquired the development in different structural domains, solving the problem of 'scouting'. Therefore, in my project, I will also use the emergence of evidence to determine a learner's development level (see frequency of syntactical and morphological structures in section 6.2)

	Sample 1	**Sample 2**
a	+	+
A	+	+
b	+	+
B	-	+
c	+	+
C	-	+

Table 3.3 Identifying hierarchy of rules in linguistic samples

	Sample 1	**Sample 2**
a	+	+
A	+	-
b	+	+
B	-	+
c	+	+
C	-	+

Table 3.4 Falsifying hierarchy of rules in linguistic samples

In fact, to be able to achieve linguistic profiling in a short time, AP, similar to Rapid Profile, also uses task elicitation to elicit learners' data because of the steadiness hypothesis in PT, so that it can provide a learner's language profile in about ten minutes.

In short, the whole process of language development and variation can be clearly explained in PT and profiled in RP and AP with the help of mechanisms in PT, hypotheses space, emergent criterion and steadiness hypothesis. As Pienemann and Keßler (2009) noted, the core of PT is formed by a universal processability hierarchy based on Levelt's (1989) approach to language production and modelled using Lexical Functional Grammar (Bresnan 2001). With this universal basis, PT can predict developmental trajectories, each implying a developmental dimension known as "staged development" along with a variational dimension which accounts for individual differences between developmental trajectories for any second language. They further pointed out that in the course of L2 development, learners accumulate grammatical rules and their variants, which eventually allow them to develop an individual developmental trajectory within the overall developmental schedule.

3.2 Auto Profiling and different theories related to SLA

In this part of the paper, we will explain why Processability Theory (PT) is an adequate theory in describing the development of language, and thus can also be used as the construct theory for Auto Profiling (see section 6.1). Finally, as AP is based on PT to profile a language produced by a learner, it can therefore be used to upgrade learners' language development.

There are three main competing approaches in explaining the learnability theories: parametrisation, functionalism and constructivism. The first is rationalist, the second empiricist and the third neither of the two. Pienemann (1998) explained why PT is a suitable theory when compared with these three competing approaches.

To start with, Pienemann (1998, p15) pointed out that *parametrisation* is the most widely used explanatory approach to SLA, and it has a rationalist philosophical orientation. He further stated that "the strength of the argument in favour of this school derives from the solution it has to offer to the 'logical problem'" (Pienemann, 1998 citing Wexler &

Culicover 1980), i.e. how learners develop linguistic knowledge. One of the strongest cases claimed is White and Genesee's (Pienemann, 1998 citing White and Genesee 1996), which is based on identifying groups of adult learners whose ultimate attainment is indistinguishable from that of native speakers, and thus the argued that the former must have access to the same epistemological principles as the latter. Moreover, as these principles cannot be inferred from observation, they must be innate. With this in mind, the parameterisation approach is based on the 'government and binding theory' (GB) (Pienemann, 1998, citing Chomsky 1981a), that spells out a set of universal principles and parameters of language, as well as the ways in which these can be set for specific languages. In other words, Pienemann stated that every parameter of a language has a limited number of settings (two or more), and it is the particular setting of all the parameters which will then apply to a given language that determines its structure, such as headedness and pro-drop parameters. This formal theory therefore makes it possible to apply the parametrisation approach to any human language, producing a formal account of the target grammar, the initial stage through the concept of a Universal Grammar (UG). Therefore, Pienemann concluded that the question of the origin of linguistic knowledge at the heart of epistemology is addressed with great care, following the rationalist tradition. In fact, those who accept the idea that UG plays a role in SLA attribute different roles to it, varying according to the degree to which L2 learners are thought to have access to UG and to which L1 knowledge is transferred to the L2. Pienemann pointed out that the most radical position is of Schwartz and Sprouse (Pienemann 1998, p 17 citing Schwartz & Sprouse 1994; 1996), who proposed the "full transfer/full access model", assuming the initial state of L2 acquisition is the final state of L1 acquisition. This means that the parameters of L2 are already set in the L1, and L2 acquisition is thus seen as the process of restructuring the existing system of grammatical knowledge. In other words, the processing skills of L1can be transferred to L2. However, based on empirical data from German and Japanese speakers, the full transfer position has been questioned. For example, Pienemann argued:

> Word order rules are language-specific, even though genetically related language (such as the Germanic languages) share certain characteristics…Despite such relationships there is no a priori way of knowing for the language learner how closely related L1 and L2 are. Learners therefore have to be equipped to bridge maximal typological gaps in their L2 acquisition, for instance form English to Walpiri… which is non-configurational and agglutinative.

Pienemann (1998, p74)

In fact, the lexical category of lemmata may also vary from language to language. Pienemann further noted that both the words ‘house’ in English and ‘haus’ in Germany can either be nouns or verbs. However, the Finnish equivalent word, ‘talo’, can only act as a noun. This means that the language learners can not transfer their L1 lexical category to L2 unless they test the lexical category for every new lexical item.

Some scholars pursuing this line of research in the SLA context, such as Platzack, a ‘minimalist’, have applied the revised notion of parameters to first and second language acquisition, language attrition and impairment. Pienemann (Pienemann, 1998, p21 citing Platzack 1994, p65) pointed out that Platzack assumes that if the default value of functional heads is ‘weak’, then a universal default word order ‘Subject-Verb-Complement’ will be generated. It is only when a functional head is strong that the position of grammatical functions can change. Therefore, Platzack states that to master the word order of a particular language, learners must know where the strong features are (Platazack 1994, p62).

Unfortunately, this idea of weak functional heads is at odds with findings from German child language and the acquisition of typologically different second languages, such as Walpiri. Specifically, Pienemann (Pienemann 1998, p22 citing Clahsen 1982) found that the first discernible word order constellation in German child language is SOV and not SVO, as predicted by Platzack. In fact, Huter also found English learners of Japanese, an SOV language, start with SOV as the initial word order even though English is an SVO language (Pienemann 1998, p22 citing Huter 1996).

Nevertheless, Pienemann concluded that the implausibility and the empirical counter evidence of Platzack’s hypothesis do not demonstrate that the ‘minimalist program’ as such is unproductive for SLA research. Specifically, he said that it may be possible that these learners do not have access to the full range of functional categories or that the weak features are not the only lexical categories or that the default word order is not SVO in UG. In short, much work needs to be done before the new framework can to applied to SLA, which is like that of the GB framework.

Still some other researchers may be classified as working from the rationalist basis of the generative schools of grammatical theory, although this does not mean that they are committed to the same architecture of UG as the theory of Government and Binding or later

the ’minimalist program’ (Pienemann 1998, p23). In fact, Pienemann pointed out that other architectures, such as LFG, can be used to describe L2 developmental grammars. Specifically, while Chomsky’s principles and parameters are mainly based on constituent structure configurations, Pienemann (Pienemann 1998 citing Bresnan 1988, 1993) stated that Bresnan’s conceptualisation of UG is part of Lexical-Functional Grammar, which is concerned with the relationship between semantic predicate argument structure and constituent structure, meaning it does not contain ‘formal parameters’ but instead a hierarchy of semantic roles.

The second approach is functionalism, which is not a homogeneous theory but the label for a general approach to linguistics, one that aims at the description and explanation of language use through an understanding of the communicative conditions which eventually will lead to the use of one form over another. This approach does not talk about the parameters, which are used in GB, but instead seeks to explain the use of alternative forms through their functions. Like parametrisation, functionalism has a lot of variations, and Pienemann has written that

> in the context of language acquisition, form-function relationships can be seen as a heuristic basis for learning and also as it motivational basis. However, there is a great deal of variation in the way in which this general tenet is translated into functionalist approaches to language acquisition (Pienemann 1998, p24).

For example, with regard to nativism, Wilmsatt (Pienemann 1998 citing Wilmsatt 1992) uses mostly biological examples to explain how environment affects the development of the fruit fly. Specifically, the development in the larvae the organism needs to identify the relative position of its segments so that the appropriate organs can grow in the right place. In fact, the process of development of the organism depends on the level of acidity in its immediate environment, meaning that the genetic code is necessary to pre-set the position in the developing organism. This also leads to the different attitudes of studies based on Functionalism and Parametrisation in terms of the logical problem. Most of the former think that the degree of grammar complexity depends on the theory of grammar used to represent the final state of the learning process,while the latter think that the target language grammar is extremely complex and can only be acquired in the environment. Therefore, Bates and Elman (Pienemann 1998 citing Bates and Elman 1992) presented a general framework for the representation of language learning processes, which makes the final state appear much less complex and thus easier to acquire from a functionalist perspective.

In fact, functionalists also argue that many formal categories have correlates in the environment of the learner, such as the early nouns in child language being mainly related to objects, while grammatical subjects relate to agents (Pienemann 1998 citing MacWhinney 1982). However, this idea has been questioned by Pienemann (Pienemann, 1998, p27), who pointed out that a formal category constructed based on this tentative relationship without recourse to innate linguistic knowledge will soon be falsified once exposed to adult linguistic data. As Bates and Elman argued that the connectionist network describing the learner's use of linguistic categories is sufficient enough to model their linguistic behaviour, Pinker and Prince (Pienemann 1998 citing Pinker and Prince, 1988) also falsifies connectionist claim. Specifically, they said that simply by using the strengthening and weakening neural connections in response to statistical frequency patterns in the input, learners cannot produce all linguistic forms in the specific domain of the target language. In fact, they may produce non-forms on top of other learning problems. Other functionalists, such as Charles Ferguson and Catherine Snow, think that by adjustment of the linguistic input, such as using 'care giver' or 'motherese', learners can improve language acquisition. However, this has been challenged by Newport, Gleitman and Gleitmen (Pienemann 1998 citing Newport and Gleitman, 1977), who found little evidence for adjustments with morphosyntatic precision. In fact, Pica, Doughty and Young (Pienemann 1998 citing Pica, Doughty and Young) demonstrated that interactionally modified input resulted in better L2 comprehension than any other type of input.

In short, Pienemann (1998, p30) concluded that the only way to maintain the comprehensible input position, a typical functionalist approach, would be to assume that although comprehensible input is a necessary condition for language acquisition, it is not sufficient for learning success on its own. As a result, he pointed out that there are other explanatory components that need to interact with the input to achieveL2 acquisition.

The last competing approach is constructivism, which is based on genetic epistemology, an approach which is neither rationalist nor empiricist. Pienemann (1998, p30) stated that the work of Spencer (1864-7), who saw the growth of knowledge as a cumulative process of habit formation transmitted through generations, caused Piaget's anti-empiricism. Consequently, Piaget developed a brand of philosophy referred to as 'constructivism', which was originally derived from Kantian ideas, but with by reservations, especially about Kant's introspective method and his concept of a fixed instead of developing mental

structure (Pienemann 1998 citing Rotman 1978). Specifically, Piaget claimed that the human mind actively constructs its knowledge of the world, instead of passively recording data, as the empiricist saw it. Although this is very similar to Chomsky's idea, Piaget focuses more on the learning theory, rather than just the linguistic perspective. To develop mental structures, he assumes a very small set of innate ideas which equip the individual to acquire concepts in all cognitive domains. These innate ideas consist of two core functions: assimilation and accommodation. When compatible, a new concept is actively assimilated into existing schemata. When not compatible with the existing schemata, new concept will first disturb it and then a brand new one will evolved through accommodation, a process which is a dynamic equilibrium of knowledge. However, Boden (Pienemann 1998 citing Boden, 1979) criticised Piaget a lack of explicitness about the details of this mechanism, a common problem for most of the approaches mentioned earlier in this work.

As none of these competing approaches alone can explain the full picture of language acquisition, especially how learners develop and construct their language, Pienemann proposed Processability Theory (PT), a modular approach toward a theory of SLA. The aim of PT is combine all the good parts of these earlier methods within an explainable and communicable system that can describe how much a learner can process according to the types of procedural skills they have. It uses parametrisation to explain the origin of linguistic knowledge, because of the universal nature of PT, which is not language-specific and in principle which applies to the transfer of grammatical information in any language through Lexical Functional Grammar. It also uses functionalism to explain the needs in context, such as by applying lexical mapping theory and contructivism to explain the development of language, and a transition module, such as lexically driven grammar and feature unification. In short, PT proposes that learners have to be actively constructing knowledge in a contextualized environment according to their current situations.

Specifically, PT formalises a set of constraints into a processability hierarchy, which serves as an explanation of developmental trajectories. Pienemann (Pienemann, 1998) explained that PT does not contain learning mechanisms, but does interact with lexical functional grammar (LFG), a theory that can model linguistic knowledge, and thus PT can be extended to also address logical and developmental problems. Pienemann (2005, p2) further stated that the architecture of human language processing forms the basis of PT. At the same time, he (citing Kaplan and Bresnan, 1982) argued that ‘the language processor is

seen with Kaplan and Bresnan as the computational routines that operate on (but are separate from) the native speaker's linguistic knowledge'. In other words, PT primarily deals with the nature of those computational routines and the sequence in which they become available to the learner. In addition, Pienemann (1998, p132 citing Bethtel, 1988) pointed out that, based on cognitive science, which views language acquisition through the learner's interacting mental states, it is assumed that the architecture of each individual is the same. Thus, the acquisition of skills and knowledge can be understood through the discovery of their constituent cognitive processes. In fact, with the thousands of pieces of data analyzed so far, this approach, using PT, has been proved to be effective with regard to spoken languages as diverse as Arabic, German, Japanese, and Chinese. Specifically, research has found that to date no learner analysed in those languages can skip any level of the developmental stages. From this it can be concluded that the mental processes of any one individual acquiring a language can be treated as roughly identical to those of others. Since PT has this fundamental quality, it is therefore based on a cognitive science perspective of language acquisition, a characteristic which places PT within a broader context of other theories of second language acquisition.

To be able to achieve this level of explanation of second language acquisition was not been easy, and it was a long process of development that saw outdated concepts substituted by ideas with more solid foundations and based on thousands of data points.

One special feature in PT is its ability to be able to address the two key issues of a theory of language acquisition: the developmental problem as why learners follow universal stages of acquisition, and the logical problem as how learners develop linguistic knowledge. Specifically, Pienemann and Keßler (2009) pointed out that their 1998 work on PT focused on the first issue, while the one in 2005 also addressed the logical problem. In fact, with the modular approach, PT is able to explain SLA because it includes a grammatical theory, Lexical Functional Grammar (LFG), which has a high degree of psychological and typological plausibility and allows the modelling of several key aspects of language generation using feature unification. In addition, with the modular approach, PT allows a clear and falsifiable differentiation between the two dimensions, development and variation, of SLA, which could not be achieved by the MM, because PT has a hypotheses space to constrain these two dimensions.

Creoles are another example that shows PT can be placed within a broader context of other

theories of second language acquisition. Plag (Pienemann & Kessler 2011, p.111) pointed out the preference of using one of the two types of inflection, inherent and contextual inflection. Specifically, he noted that these two types of inflection are actually two types of morphology. The former is a kind of inflection which is not strictly required by syntax, but has some semantic content, while the latter is triggered by syntactic rules, such as subject-verb agreement. As contextual inflection does not provide more semantic content, users of creoles tend to use inherent inflection because of processing skills.

One of the key psycholinguistic mechanisms in PT is *feature unification*, a morphological process to unify the features such as PERS(ON) and NUM(BER) and their values PERS=3 and NUM=SG in the sentence: *He eats*. In other words, it is the need to store grammatical information on PERS and NUM during sentence generation that proves the non-linearity of a morphological process. In fact, Pienemann and Keßler further pointed out that the point of unification is related to the hierarchy of processability, which reflects the time course of real time processing, as detailed in Levelt (Pienemann & Keßler citing Levelt 1989). It is in this way that a range of morphological and syntactic processes can be aligned with a universal hierarchy of processability which yields developmental trajectories for the given target languages shown in several chapters of Pienemann (2005). Specifically, by comparing the points of feature unification, the hierarchy can be shown and ordered, indicating, for example, whether there is any grammatical information exchange or not, and the order from no exchange of such information to an exchange within a phrase, into the exchange of grammatical information within a sentence. Therefore, when one applies this hierarchy to ESL morphology, the following developmental trajectory can be predicted: from past –ed to plural –s (det + N) into third person –s.

Another special feature is that the universal nature of PT is not language specific, and in principle ,applies to the transfer of grammatical information in any language. In order to apply to a specific target language, more details from LFG are needed. In fact, Pienemann and Keßler pointed out that PT does not predict that morphology and syntax will develop in tandem, but instead outlines the “developmental trailers” in L2 acquisition (Pienemann 1998) which can be brought in line through formal intervention.

Another mechanism of PT that Pienemann and Keßler noted is a *lexically driven grammar* which stores grammatical information in the lexicon. This is required in the assembly of a sentence, which is an integral part of Levelt’s approach. For example, the lexical entry for

"talked" is marked for the past tense, listing the core argument of the verb as "agent". As LFG encodes syntactic properties primarily in the lexicon and affords a formal account of the linguistic dynamics present in developing learner grammars (Pienemann & Keßler 2009 citing Schwarze 2002, 148-9), Pienemann and Keßler stated that it is particularly suitable for the study of dynamic linguistic systems, such as developing learner grammars. In fact, they (citing Levelt 1989) further claimed that this lexically driven nature of sentence generation is supported by a wide range of psycholinguistic empirical evidence, such as the studies on slips of the tongue and on-line experiments. In addition, this lexically driven nature was demonstrated again recently in experimental work on sentence production (citing Pickering, Branigan, and McLean 2002), showing that "constituent structure is formulated in one stage". Finally, Pienemann (1998 citing Kempen and Hoenkamp1987)) used Kempen and Hoenkamp's study on the procedural account of language generation to show that every level of the PT hierarchy processing procedures can be captured through feature unification in LFG, with each of them sharing key characteristics. In short, these studies support the architecture of lexically driven grammar.

The third PT mechanism*, lexical mapping,* is based on Lexical Mapping Theory (LMT): a component of Lexical Functional Grammar (LFG) (Pienemann & Keßler 2009 citing Bresnan 2001). LFG has three independent and parallel levels of representation: a(rgument) structure, f(unctional) structure and c(onstituent) structure, and three levels of are universal. However, although the component parts of the f-structure and c-structure are universal, the specific form of the latter two are language-specific. Specifically, lexical mapping refers to the mapping of the argument structure onto functional structure. Pienemann and Keßler further explained that in PT the default mapping principle is "unmarked alignment": a one-to-one mapping base of semantic roles onto grammatical functions. In other words, Unmarked Alignment is the initial state of L2 development because there is no exchange of grammatical information during language processing, which is based on the one-to-one mapping of the three parallel levels of representation onto each other. For English as a second language learner, the Unmarked Alignment is in canonical word order, SVO. With this order, the learner can simplify language processing and, at this stage, will analyse the first noun phrase as the agent. Therefore, in the initial state of language development, learners will use canonical word order to avoid any kind of exchange of grammatical information during language processing. This phenomenon is called the Unmarked

Alignment hypothesis, which states that L2 learners will not have access L2-specific a-structures for predicates, implying that when L1 and L2 predicates have different a-structures, one can predict that L2 learners will initially have to map arguments canonically onto the LMT hierarchy of core grammatical functions because the required additional processing resources are not available yet. This hypothesis also implies that a developmental prediction for L2 structures will affect the relationship between a- and f-structures.

Pienemann and Keßler (2009) further pointed out that Unmarked Alignment can also specify the relationship between f- and c-structures. For example, one set of such predictions is "packaged" in the *TOPIC hypothesis,* the fourth PT mechanism. They (citing Pienemann, Di Biase and Kawaguchi 2005) explained developmental dynamics in the relationship between the f-structure and c-structure in the TOPIC hypothesis. Specifically, they pointed out that at first second language learners will not differentiate between SUBJ and other discourse functions (e.g. TOP). However, in the course of language acquisition, the addition of an XP to a canonical string will trigger a differentiation of TOP and SUBJ, which in the beginning will extend to non-arguments and then successively to core arguments, in the sequence of *c- to f- mapping* from SUBJ = default TOP to TOP=ADJ into TOP= OBJ, and this will have further structural consequences. In other words, the use of non-subjects at the adjunct in the focal position will cause the collapse of a learner's canonical sentences, leading to the dynamics of the developmental process, and upgrading the learner's developmental stage.

In short, in this chapter, we demonstrate that PT can be placed within a broader context of other theories of second language acquisition, such as creole language. We also use the proven concepts of PT, especially the ideas related to explaining language development, as the basic algorithms in the proposed Auto Profiling (AP) system. Furthermore, it is through AP that certain problems which cannot be explained by using only one of the three competing approaches in explaining language learnability can be partially and practically solved (see Chapters 4 and 5). This includes detecting when learners are ready to learn something by providing their developmental stages of English, processing procedures and feedback (see Chapter 2). Therefore, AP based on Processability Theory can effectively profile a learner's current language development to further aid its future progress.

Chapter 4: Linguistic profiling and the analysis of learner language

In this chapter, I will introduce different profiling systems and explain how they are related to the development of language acquisition, their possible theoretical backgrounds, and especially their strengths and weaknesses. It starts out with the linguistic profiling, LARSP (Crystal), then examines the system used by Pienemann, Johnson and Brindley (1988), Rapid Profile, as well as automatic grammatical analysis and its educational applications presented by Geoffrey Leech, the automatic profiling of learner texts by Sylviane Granger and Paul Rayson, CHILDES, COALA (1990), COMOLA and finally Auto Profiling (AP), the proposed system which will be explained in more detail in Chapter 5.

At the beginning of this chapter, I will explain the why a program designer needs to have a state sequence in a finite-state of automation for a parser to run. Here, I use a parser as a starting point, because it is the most frequently used method in processing a language. Specifically, most of the current parsers rely on probabilities which can be used for native speakers, but when it comes to a second language learner, the probabilities frequently cannot be acquired. Therefore, their performance cannot be predicted through probabilities, but only by profiling, a linguistic approach. This will be further explained in a later part of this section, and also in Chapter five.

As usual, before I go into more detail about probabilities, I need to define what a parser is and what it does. Sagae et al. (2004) stated that parsers use a computational model of natural language to analyse a sentence, producing a syntactic structure of the sentence as output. Specifically, this output may be represented as a constituent tree (C-structure or parse tree), a syntactic feature structure (or F-structure), or a dependency structure. These differences may make these outputs appear unrelated, but Sagae et al. (2004) pointed out that in reality these various representations of a sentence all describe how words are combined together to form a sentence. For example, they may contain parts-of-speech, case, syntactic function labels, and so on. Consequently, they further noted that the choice of a particular representational format depends mainly on the purpose the syntactic analyses will serve.

Unfortunately, these differences in representation may cause some fundamental problems regarding parsing, especially with regard to annotation. The first is that the processed form does not meet researcher's needs. For example, Sagae et al. (2004) pointed out that although there are now several hundred studies that have used the CHILDES database to

study the development of morphosyntax, most of these have been forced to use the database in an almost unprocessed raw lexical form – without tags for parts-of-speech and without syntactic parses.

Even if parsers can annotate texts, they are not designed for researchers. Sagae et al. (2004) again pointed out that over the past decade a number of annotation efforts have resulted in large amounts of text being annotated with the use of syntactic parse trees, known as "treebanks" (Marcus et al. 1993). Therefore, this kind of annotation style is used to facilitate the training of statistical language analysis tools, rather than the study of language acquisition.

The second fundamental problem mentioned above regarding parsing is that current methods cannot parse the texts of a second language learner. Specifically, one typical purpose of using statistical language analysis is using probability as a way to find out the syntactical structure or morphological structure in an ambiguous situation. For example, Sagae et al. (2004) stated that LCFlex uses the most probable succession of rules as a way to solve the statistical syntactic disambiguation in each analysis of a particular utterance obtained through an ordered succession of grammar rule applications. The probability of each competing analysis is determined based on a statistical model of bigrams of rule applications obtained from a training corpus (Sagae et al. 2004, citing Rose and Lavie, 2001). Consequently, the approach will encounter some difficulties in disambiguating the parsing problem, and thus another approach, such as a smoothing method, also needs to be applied.

Like probabilities, other approaches, such as using stack methods, will solve some local problems, but not whole sentences. Specifically, these stack methods are also based on native speakers' corpora, and thus will encounter similar problems when dealing with the production of second language learners. Therefore, like probability approaches, stack methods have to be changed significantly before they can really be used with second language learners.

The following sections will discuss some major profiling systems, especially those which can profile a second language learner's text.

4.1 LARSP

The Language Assessment, Remediation and Screening Procedure (LARSP) (Crystal et al., 1976) was designed to address the problems outlined. LARSP is systematically utilized in language therapy, and it is also through this method that the results of the language profile can be seen and used, which does not occur with a standard language test. Tommerdahl and Drew (2007 citing Ball, 1999) explained that LARSP is a linguistic profile that has the capability of providing comprehensive and consistent linguistic analysis to describe a child's grammatical strengths and weaknesses. They used LARSP in their experiment because it is able to analyse spontaneous language, in contrast to tests which attempt to elicit particular language structures. Specifically, it focuses on grammar and morphology, which had particular relevance due to their subjects' marked difficulties in these areas, which are commonly associated with specific language impairment (SLI). In fact, Kearns and Simmons (1983) also explained how LARSP can be used in children with language disorders. Specifically, this system was developed from within structural linguistics, and it has thus proven useful in language therapy for the diagnosis and treatment of language disorders in children (Crystal, Fletcher and Garman, 1976; Crystal, 1979, 1982). The analysis LARSP uses is based on a descriptive Grammar of Contemporary English (GCE) (Quirk, Greenbaum, Leech, Svartvik, 1972), and looks into the clause, phrase and word structure levels of each utterance, the examination of which is undertaken by an examiner who tallies these structures in one of seven stages of syntactic complexity. In addition, based on the developmental order of acquisition, the seven stages range from one-word, holophrastic utterances (Stage I), to sentences of four or more elements (Stage IV) into analysis of discourse structure (the final stage). To be able to achieve this, Kearns and Simmons (1983 citing Crystal et al., 1979) explained that the analysis procedure involves consecutive scans of a spontaneous speech sample, which aims at categorizing grammatical structures at one of the seven stages with a specific goal in mind, and the results of each scan are tabulated on the LARSP profile chart. During the first scan of the spontaneous speech sample, the examiner will manually tally unanalysable or problematic utterances, which will be coded under Section A of the LARSP. The second scan of the data will then focus on determining the general types of responses produced by the patient and the results of this analysis will be categorized under Section B on the profile chart. The number of questions, repetitions, elliptical, and abnormal responses produced will also be determined

during this review of the data. In addition, the number of spontaneous responses produced will at the same time be tallied under Section C of the profile chart during the second scan. Finally, the remaining scans are used to examine sentence, clause, phrase and word structure patterns.

Kearns and Simmons further pointed out that we should be aware of the elements of a single utterance which may be classified at different stages at each level of analysis. Specifically, take the sentence 'The woman washed the dirty dishes' as an example. First, it would be categorized as a stage IV sentence ("XY + C/O:NP") with subject, verb and direct object clause elements. Then, the sentence also contains a Stage II Determiner-Noun Phrase ("The woman") as well as a Stage III Determiner-Adjective-Noun Phrase ("the dirty dishes"). Similarly, at the word level, more Stage II credit would be given for marking the past tense in "washed" and Stage III credit for designating plurality in "dishes."

However, like other analysis systems, Kearns and Simmons concluded that LARSP has several limitations which should be considered before wholly embracing its results. One of these is that the analysis is time consuming—requiring up to several hours for even a practiced clinician to complete the analysis, who also needs considerable time to learn the system. Another is that LARSP has been used primarily with children, and thus its application with aphasic patients is not fully understood. However, despite these limitations, they concluded that LARSP has a relatively comprehensive descriptive taxonomy that makes few assumptions about underlying linguistic forms, the results of which can be directly applicable to treatment planning, such as treating a subject by expanding the variety of verb forms used and developing phrase and clause level verb strategies, if they did not have a variety of verb forms, and so on.

4.2 Profile Analysis

Profile Analysis is the forerunner of the Rapid Profile technique. Pienemann (1992) stated that in the original version of Profile Analysis and the one developed by Clahsen (1985) for second language acquisition, the analyst basically acts as a language acquisition researcher. As a result, he noted that the analyst has to collect a speech sample, usually of about 60 minutes, and then transcribe and analyse that according to certain criteria set out in the Profile Analysis guidelines. However, this is quite impractical in the context of second language classrooms, especially when the standard profile analysis usually requires speech

pathologists to spend 20 - 40 hours on the assessment of one individual (Pienemann, 1992). In addition, Pienemann stated that profile analysis also requires a very high degree of specialised training in areas in which language teachers do not normally have expertise, and this will cause the problems of intra- and inter-interviewer variability.

4.3 Rapid Profile

Rapid Profile (RP) is the forerunner of Auto Profiling, and it simplifies and refines the theoretical concepts of the original Profile Analysis. In RP, Pienemann and Thornton (1992) came up with an ingenious procedure to simplify traditional data collection methods. Their system condenses the whole procedure into some 15-20 minutes per respondent, and this was achieved by designing a new approach to profile analysis that involves not merely a technological process of refining the data elicitation and analysis procedure, but also implies the use and the creation of a number of theoretical concepts. Specifically, Pienemann and Keßler have written that Rapid Profile (RP) is a computer assisted procedure which is used to assess language learners' level of development. To achieve this goal, speech samples are collected from the learners and compared to standard patterns in the target language by using a task elicitation method. This is to ensure that RP can collect a rich set of data in a short period of time. Specifically, the elicitation tasks are all comprehensively tested in real situations, and these tasks have proven to be able to collect different features of syntactical and morphological structures (Pienemann 1998). Using this data, an analyst can operate the Rapid Profile system, and eventually the results of a learner’s interlanguage profile will be given, including their final developmental stage of English or German, lexical frequency, morphological variations, and so on.

The English version of Rapid Profile has been used in the development of English for several years, and has been shown to work well in many countries. In particular, this profiling system has been very popular in German schools. In fact, recently a German version of Rapid Profile was developed, and, since both English and German are Germanic languages, this version should work just as well as the earlier English one.

The procedure of interlanguage profiling is on the surface quite simple, but it actually requires a solid knowledge of language development. First, several different types of tasks will be presented for an informant to work on, and this is a form of data elicitation to ensure that RP can collect enough data within a short time. Then, an analyst will provide as little

information as possible about the tasks to the informant, while at the same time making sure that the data elicitation can continue as planned. This is to make sure that informants do not copy the sentences produced by the analyst. After that, the informant will try to finish the tasks within the time provided. Meanwhile, the informant can also ask questions related to the task. This ensures the flow of the data elicitation is uninterrupted, as well as that the informant knows what they are supposed to be doing. When data elicitation is achieved, the speech sample will at the same time be coded in the Rapid Profile software, including some lexical information, the structure of developmental stages, and so on. Finally, the information with regard to the final developmental stage of English or German, lexical frequency, and morphological variations will be displayed on the screen in real time. The whole process takes about 10 minutes for RP to collect and analyse the sample, and with its solid theoretical construct validity, the system produces reliable conclusions about the learner's level of acquisition, as well as assessing specific aspects of the lexicon and of variational features.

Some of the particular strengths and weaknesses in RP are stated by Pienemann and Keßler (2007), who noted that RP can produce developmental profiles for bilingual children, which makes it possible to compare the levels of development across languages. In fact, they further pointed out that this is relevant in assessing developmental disorders. Specifically, they explained that because developmental schedules can be related to one universal hierarchy of processability, they can therefore be related to each other. In other words, Processability Theory constitutes a universal metric for the comparison of linguistic development in bilingual individuals. Since RP is based on Processability Theory, it can thus also be used to compare the levels of development across languages. In addition, RP is empirically tested and psychologically plausible. Specifically, the new version of this theory contains a formal framework embedded in Lexical Functional Grammar (Pienemann, 1992). There are six levels of processing complexity specified in the morphology, syntax and lexis in an abstract, non-language-specific way. Furthermore, RP employs concepts which are in agreement with a wide range of empirical research into on-line language processing. In fact, it is important to note, as Pienemann and Keßler have pointed out, that several studies have examined both the reliability and feasibility of this system. For example, one study asked 10 analysts to code five samples each, and the results showed that 70 % of the samples were analyzed correctly, with four out of 10 analysts

analysing all of their samples accurately. It should be noted that in real situations only these four analysts can be certified for the RP procedure, so that the reliability of the system can be maintained. Also, as mentioned earlier, RP can collect, analyse and process a sample in about 10 minutes. In addition, RP analysts are trained to achieve reliability with regard to having the same results in terms of final developmental stages. Therefore, it is both appropriate and feasible to use RP to profile an informant's speaking input. Last, but not least, it utilises a well-documented and psychologically plausible theory of grammar—Processability Theory (Pienemann, 1998).

However, in order to achieve consistent and reliable results with regard to each learner's level of acquisition, as well as different aspects of the lexicon and of variational features, it is essential to train the analyst. For this reason, an interactive training environment has been created, with positive and negative feedback. With the rapid feedback that is offered on correct and incorrect analyses during training, analysts will know how to improve their performance, and thus quickly become certified to operate the system. Still, when there are too many informants that need to be analysed at the same time, there will not be enough professional analysts to carry out such a task. Therefore, the ideal situation would be to automate the analysis, which is one of the aims of the Auto Profiling system. Furthermore, RP still needs at least one interviewer and analyst for each respondent. Although so far the problems of intra- and inter-interviewer variability have not affected the results of its analysis when it is operated by language experts looking at a small group of subjects, when it needs to analyse a large group of people at the same time, these problems will arise simply because of the number of interviewers required to assess the respondents' developmental stages of English and their IL distributions.

In short, as mentioned earlier, when it comes to a lot of informants, RP will have problems due to the lack of qualified analysts. In addition, the assessment has to be done at a place where all the people involved can be present at the same time. This makes it difficult to organize for the informants, analysts and interviewers. Furthermore, a large number of people also require a large amount of space, as well as access to the related computer hardware. Therefore, there are a number of practical problems with RP that AP is designed to address (see Appendix A).

4.4 Automatic profiling of learner texts

This is an example of researchers using corpora to understand how learners acquire a language. Indeed, Granger (1998) pointed out that without a corpus it would be difficult for researchers to understand how people use a language. However, he argued that just using a categorization method to profile a language is not enough, because it might conceal more complex phenomena. For example, he claimed that although categorization can in general show that both native and non-native speakers seldom use conjunctions, this finding conceals a more complicated situation. Therefore, he used the Automatic Profiling of Learner Texts method to profile learners' language. Specifically, with this approach researchers can understand how learners use lexicon in terms of frequency, such as the definite and indefinite articles used by English learners of French as well as the underused subordinators by non-native speakers. Unfortunately, he went on to state that the reasons for this are difficult to explain, and thus it is beyond the scope of the method he proposed in the Automatic Profiling of Learner Texts.

4.5 CHILDES

The Child Language Data Exchange System (CHILDES) is an electronic corpora of transcribed speech between parents and their children, which contains corpora in several genres, such as informal speech and narrative, from a wide range of situations, such as structured experiments, lunch room conversations, and bath times, from 26 languages, across a range of ages, and from a variety of special populations, including bilinguals, second-language learners, clinical populations. Laakso (2005) noted that though there are a few phonetically transcribed corpora in CHILDES, most of them are transcribed orthographically.

Woodman (2001 citing MacWhinney, 1995) observed that CHILDES is an attempt to establish a system for sharing child language transcript data starting from mimeographed copies of Roger Brown's original Adam, Eve, and Sarah transcripts. He further noted that studies of child language acquisition, especially diary studies of individual children recorded by their parent(s), have an even longer history. Part of the reason for this is because how children learn a language has intrigued people throughout the ages. Consequently, many researchers have worked and continue to work on this phenomenon. Unfortunately, before the use of computers, most such studies were carried out in small

groups. Thus, Woodman also concluded that one of the limitations of diary and small group studies is the extent to which one can generalize the findings to larger populations—and thus there is a problem of theory generalization. Specifically, he said that conducting an analysis on a small and unrepresentative sample may lead to incorrect conclusions. One example he reviewed was MacWhinney (2000) in (vol. 1, p. 3), who noted that when using only one or two sentences, because more data is too time-consuming to collect and process, researchers may not consider the extent to which their predictions are applicable, or not, for the whole of the child's language.

One particular function recently released for English CHILDES is a complete set of morphosyntactic tags which can identify the lexical category (part of speech) and lemma (stem) of every word uttered by using the MOR program, and then use the POST program to disambiguate tagging problems (Parisse and Le Normand, 2000).

One advantage of using CHILDES is that it currently provides researchers with a means to further generalize their research, especially on small group studies, by providing access to approximately 300 million characters (300 megabytes) of child language data, collected and merged by researchers around the world. In more detail, with CHILDES, researchers can first manually code and store transcript data in a standardized format. They can then merge the data in CHILDES to be analyzed and shared with others, and the resulting abundant data enables researchers to test theoretical concepts and identify general or specific tendencies in language acquisition.

However, this system presents an aggregated set of data, which makes it hard for researchers to trace how a single learner develops his/her language. Moreover, researchers still have to transcribe and code their data in order for it to be used in CHILDES. Finally, Laakso (2005) concluded that most of the analyses conducted with CHILDES have only focused on lexical and morphological phenomena. Therefore, to understand language acquisition, another system is needed.

4.6 COALA

Pienemann and Jansen (1992) stated that COALA consists of two database components, interlanguage (IL) and target language (TL) ones. The former stores information on the data and the latter stores a lexico-grammar of the target language. One special feature of COALA is the Morpheme-Boundary Marker, which makes possible the automatic handling

of the insertion of morpheme boundaries into the data. Specifically, derivational and inflectional morpheme boundaries need to be marked manually only once per lexical item. This is done with the lexicon also serving as input for the morpheme boundary maker, which automatically inserts the morpheme boundaries into the data.

Pienemann's COALA is a semi-automatic method of parsing a second language to find key structures related to a learner's language acquisition. Unlike most of the other parsers, with the exception of COMOLA, it focuses on discovering a learner's language acquisition in terms of structural and functional development. This system has encouraged researchers to try to parse second language learner's data, because it tackles a number of formerly 'impossible' tasks. Pennington and Stevens (1992, p5) noted that COALA is a semi-automatic method of parsing second language input, beginning by manually coding the data to the point where the computer can continue the job automatically. They further specified that in the manual marking stages, COALA is designed so that marking becomes simply a matter of sorting words by a mouse-driven interface into the various possible categories. The system then uses relational databases and an ATN parser to complete the analysis. A database language is also used to query the system for information pertinent to the research. Pienemann explained why he designed this system (Pennington and Stevens 1992, p201), stating that it is very time-consuming for researchers working with large sets of data in linguistic analysis, particularly if the data are analysed by hand. This is because they need to repeatedly analyse a large set of data to test one particular hypothesis after another, each one slightly different. Therefore, he and his colleagues developed an approach to computer-aided linguistic analysis which used a machine to count many defined linguistic structures and functions. In fact, the COALA system was designed particularly for the analysis of language acquisition data—varieties of a developing language which have different degrees of language levels from the structure of the target language. This system was a significant advance when it was first developed, because it utilized a parser for non-native speakers which could discover the rule system expressing the form-function relationships in a given set of data, rather than recognise specific instances of a given rule system.

However, Pienemann and Jansen (1992) pointed out that one drawback of this approach is that it still requires the manual preparation of data before the automatic analysis can take place, such as the insertion of a limited amount of structural and functional information so that the automatic components of the system can utilise the coded information for a wide

range of structural/functional analyses. Another constraint they pointed out is that the parser will not accept some structures that are possible in the TL. To solve this problem, these items will be written in a separate file for further manual analysis, which makes this system even harder to use with large sets of data.

4.7 COMOLA

Like COALA, COMOLA (COmputer MOdel for Language Acquisition) was another pioneering system in parsing a second language data. It was specially designed for the syntactic analysis of L2 production data, and has been successfully applied to the analysis of L2 Dutch data.

Currently, the only version that is available is what Hakkenberg et al. (1995) labelled the one-stage model, with the aim of developing a two-stage one. Although this two-stage model has not yet been released, the problems involved in such a task are quite clear.

As such, COMOLA remains a tool for the description of interlanguage, and it emerged out of the need to gain insights into overall grammatical development within the L2 acquisition process over time. It was developed as a computational tool to facilitate otherwise time-consuming analyses and hypotheses testing in L2 corpora, and was designed to provide a formal and integrated description of the interlanguages of L2 learners. This system has been shown to be particularly useful for the analysis and reanalysis of large datasets, as well as for the testing of hypotheses on syntactic developments within these datasets. To achieve this, COMOLA grammar describes interlanguage data elicited in a series of data collection sessions with several L2 learners. Hakkenberg et al. pointed out that by providing information about each grammar rule, L2 learner and session, an overall picture can be created of an informant's grammar at a single point of time and of its development over time.

The COMOLA system basically consists of three components: EDIT, ANALYSIS and LAYOUT. The first component, EDIT, contains the linguistic information on the lexicon and grammar of various learners used by the lexical and the syntactical modules of the ANALYSIS component. The first module of the ANALYSIS component is the lexical module, which provides a lexical analysis of an utterance. The output of this module forms the input to the syntactical module, the second module of the ANALYSIS component. This module then provides a constituent and function assignment analysis and determines the

structure of the utterance. After that, the output, which consists of a labelled racketing analysis of the utterance, can be inspected in the LAYOUT component. In fact, this output can also be used as the input for a statistical analysis of the data.

In short, most of the parsers and/or profiling systems outlined above are aimed at discovering a learner's language profile, rather than other characteristics, such as accuracy related to testing. They use a variety of functions or modules to show the results of their analysis, but their most important contribution is to reduce the workload of researchers by using semi-automatic methodologies. However, none of these systems can fully automatically elicit, analyse and display a second language learner's language profiling, and this was the motivation for developing the Auto Profiling system.

Chapter 5: Auto Profiling

Chapter 5 explains how Auto Profiling works and how it was developed. This includes the various different functions and the user interface. For example, the Lexical Frequency function lists the frequency of each lexicon, as well as whether it is used correctly or not. In addition, users can also see the results of the interlanguage distributions for different functions, such as the C-structure function, which lists the C-structure of all the sentences produced by an informant and also evaluates how each lexicon is used. In addition, the Error Tracer function not only evaluates the mistakes produced by the informant, but also provides corrected sentences for the users to use in real time. In fact, the functions of elicitation techniques, distributional analysis, and the emergence acquisition criterion are also explained.

Moreover, the content and methods of assessing an informant through AP are also discussed in this chapter.

5.1 The functions of Auto Profiling

In this section of the chapter, I will explain the functions of Auto Profiling (AP),while the related algorithms will be described in Chapter 6.

AP is an automatic processing system that can analyse informant’s written data in real time (see Chapter 2). One of the most important functions is the Do the Task function, which elicits the informant's written data, so that the system can then produce their language profile. Another important function is the Practice one, which enables the informants to practice their typing and give feedback without worrying about time constraints. These constraints are a third important element in the system is, as they enable the informants' written production to imitate speaking in AP. When informants cannot finish a word within 3 seconds, the unfinished item will be deleted. A similar thing happens with an unfinished sentence, which must be completed within 30 seconds. In addition, in AP the informants cannot edit what they have written, as this allows written language production similar to what happens in spoken slips of the tongue

Feedback is another useful function, and this is offered in real time so that the informants can be alerted to any gaps in their language development. In contrast, the annotation function is especially useful for researchers, because other current parsers normally take a long time to annotate sentences and encounter a number of problems.

AP also has a number of frequency functions, many of which are embedded in different functions. For example, the Word Frequency function, produces both the frequencies of both correct and incorrect words.
Finally, there is also the Task Result function, which can tell the informants their developmental stages of English. This is the function where teachers can learn whether or not informants are ready for certain teaching materials.
These functions can be further explained from different perspectives, such as interfaces in section 5.2 and algorithms in Chapter 6.

5.2 The user interface

Auto Profiling (AP) is currently a rough system with much words needed before it is completed, such as deciding how much time is required for a learner to do each of the tasks built in the system. However, although it is still in its preliminary stages, it can already tackle a lot of problems, especially finding the developmental stages of English, C-structure, interlanguage profile, and so on. In this section, I will introduce the interfaces related to these features.
AP is used on the Internet, and informants only need to log onto the website to access it, where the system will first be introduced and then they can try a practice session to become familiar with the interfaces. Once learners feel that they are ready for the assessment, they can start by finishing four different tasks, each of which must be completed within a specific time. Moreover each word and each sentence must be entered within time constraints. If their input is to qualify as valid data, informants have to type in the words and sentences within 3 and 30 seconds, respectively. Words and sentences that do not meet this time condition will be deleted automatically, and will not be analysed. Therefore, AP will only analyse input which meets the time-constrained conditions, a function to imitate speaking.
For first time users, these time constraints are likely to be challenging, and some individuals will probably ignore the time element. Consequently, in early trials or tests much of their input is likely to be deleted because it is invalid. To address this situation, the AP interface will allow informants to redo the tasks until they are comfortable with the system. This mechanism shows that informants' developmental stages of English will not 'scout'. In fact, before taking the tasks, they are also informed not to panic because AP is a

profiling assessment, not an accuracy test. Therefore, any mistyping or mistakes in their input will not affect their language profile. In addition, when they want to finish a sentence, they can type '.', '!' or '?' after any word without a space to start a new one.

To let readers have a better picture of how Auto Profiling works from the perspective of a user, I will introduce the system with the aid of screenshots.

Informants can find the website at http://autoprofiling.no-ip.biz:8888/service.UserInterface/UserInterface.html and then simply click on the *Login* icon in the upper right hand corner (Figure 5.1) (see Demo for further information).

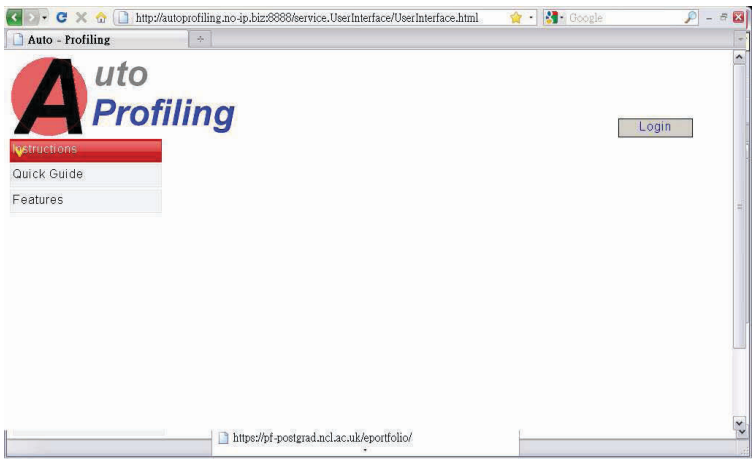


Figure 5.1: the login screenshot

After clicking on *Login*, users can type in their Account and Password details (Figure 5.2). In this example, users can type in '1' for the account number and '1' for password. Next, users can click on *Login* next *Reset* in the middle of the screen. A screen shot of this interface can be seen in Figure 5.3.

After this, users are ready for to undertake the online writing language profiling. They can click on the *Do Tasks* on the left of the screen (Figure 5.4), and this leads them to the screen shown in Figure 5.5.

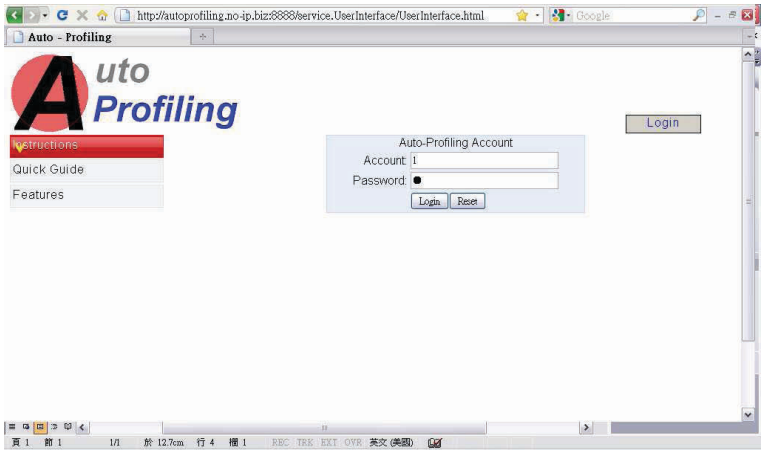


Figure 5.2: the account and password screenshot

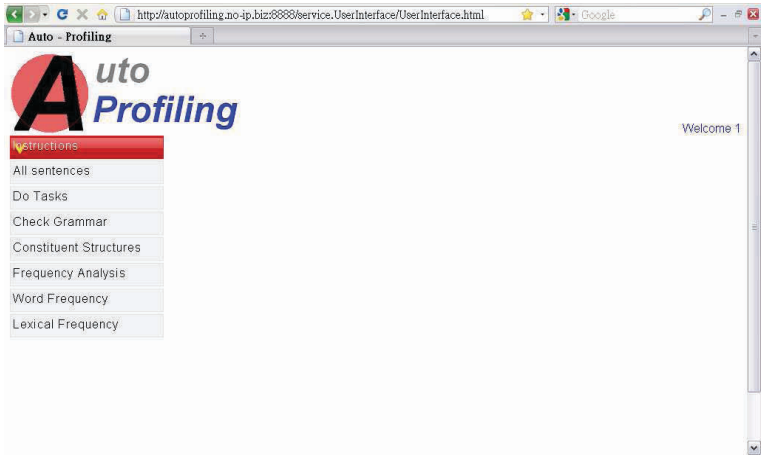


Figure 5.3: the layout of Auto Profiling



Figure 5.4: the box for ‘Do Tasks’



Figure 5.5: the box for 'New Task'

After clicking on *Do Tasks*, two options are revealed. First time users click on *New Task*, because they do not have any information recorded in the system yet. In contrast, a returning user can click on *Task Result* to review their progress. The screen after clicking on *New Task* can be seen in Figure 5.6. In fact, as this system wants to make sure that users really want to go on a new task, which will erase all their previous results, a pop up window will be shown first to confirm their decision (Figure 5.6).

If a user decides to continue, the first task will be shown on the screen (Figure 5.7). Users will have four minutes to complete the task, which they can start by clicking on the 'x' icon in the upper right hand corner of the picture, which will close this window. When it is done, they can type in their language production in the Input Field box (Figure 5.8).



Figure 5.6: the popup window for new tasks

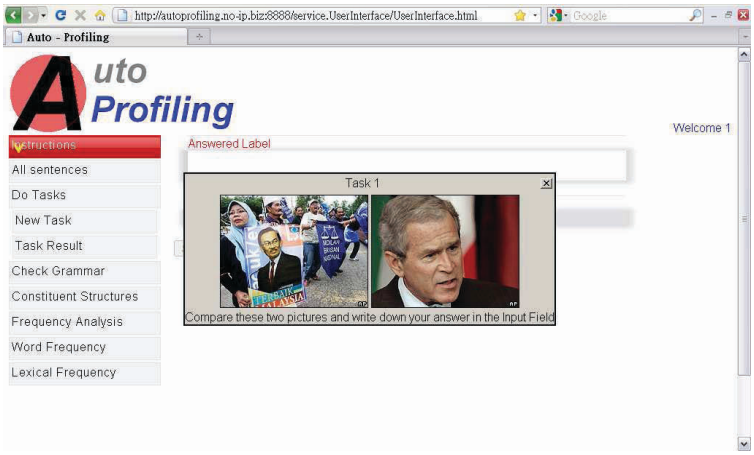


Figure 5.7: the first task of Auto Profiling

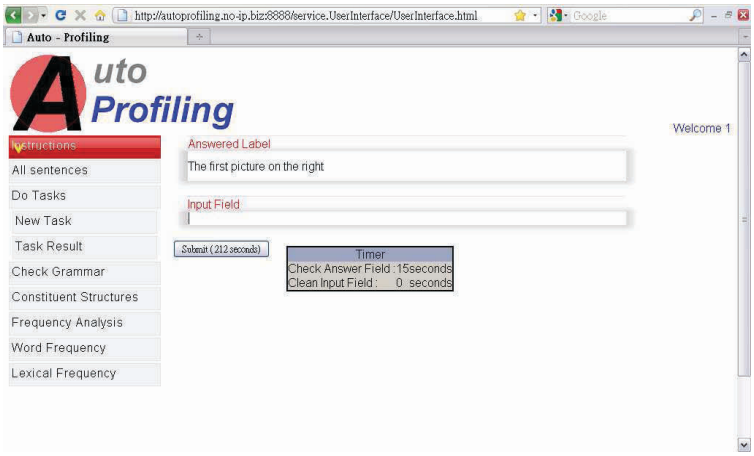


Figure 5.8

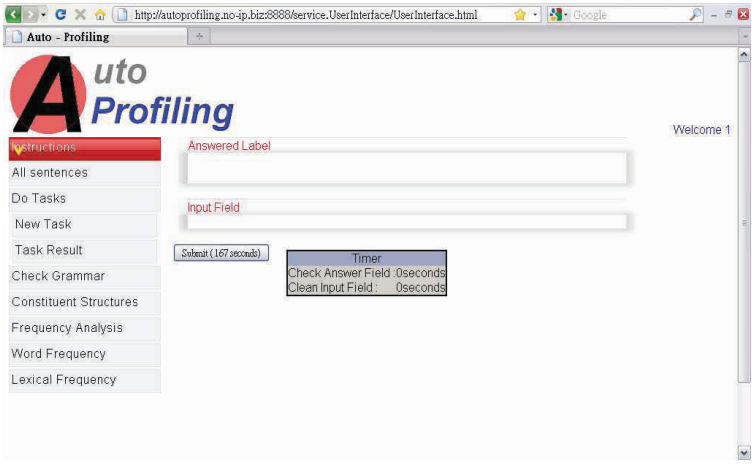


Figure 5.9: the timers of Auto Profiling

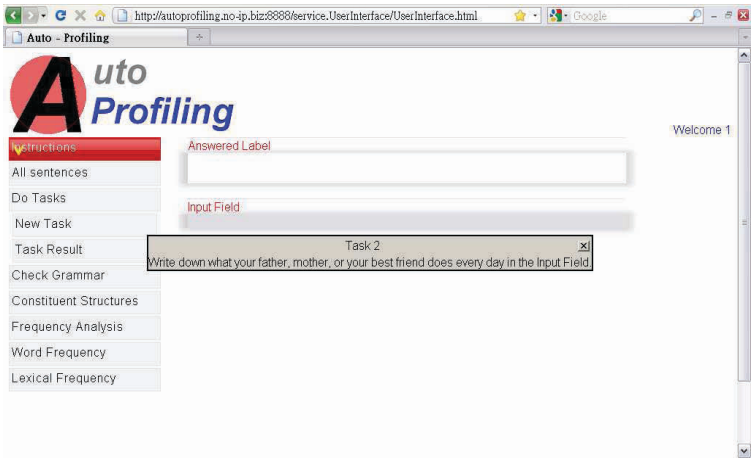


Figure 5.10: the second task of Auto Profiling

To make sure that the system collects the user's procedural skills, the automatic linguistic processing skills of the users, there is a time-constraint function, as shown under the Input Field box (Figure 5.8). There are two timers in time-constraint function. The first on the upper part of the timer is a timer for the Answer Field, the part of the current written sentence that has been uploaded. When the current sentence cannot be completed in 30 seconds, the whole sentence will be deleted, meaning it will not be retained as part of the data produced by the user. The second timer is for Input Field box. When a word cannot be completed in three seconds, it will also be deleted.

When users have finished the first task, they can click *Submit* to go on to second task (Figure 5.10).

After clicking *Submit*, the second task will begin with the prompt: 'Write down what your father, mother, or best friend do every day in the Input Field,' and this is used to elicit third singular present tense sentences. Users should again enter their answer in the Input Field box after they have closed the question window (Figure 5.10). Users will have 180 seconds to finish the second task. Like the first task, users can also enter their answer before the due time by clicking on *Submit*.

Auto Profiling

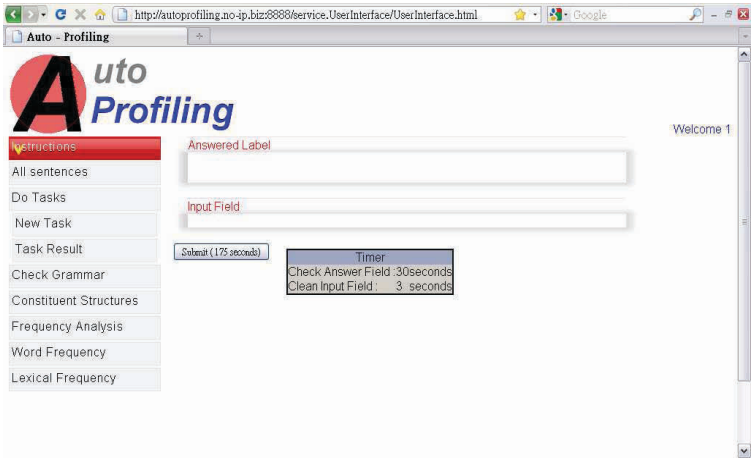


Figure 5.11: more on timers of Auto Profiling

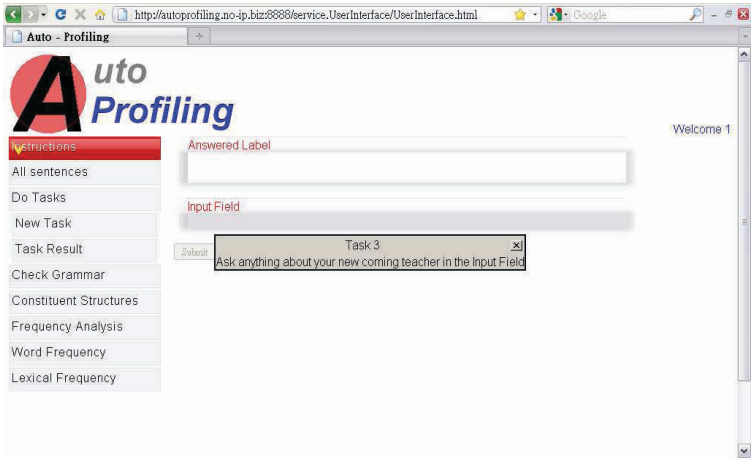


Figure 5.12: the third task of Auto Profiling

Similar to the second task, the third task will begin with a prompt, 'Ask anything about your new teacher in the Input Field,' and this is meant to elicit Wh- information questions (Figure 5.12). Users will have 120 seconds to finish the third task, though they can also submit their answer before this time is up. In Figure 5.13, users can see what they have already produced and uploaded in the Answer Label. Specifically, users can see one whole sentence—*Where is the new teacher from?*—and one on-going sentence—*Whaqt*. They can also see what will happen if they do not finish their production within the time available. Here, the sentence 'Whaqt' is not finished within 30 seconds, and is thus deleted, as shown in Figure 5.14. When a sentence is deleted, users can try again, as shown in Figure 5.15. Like the first three tasks, the last task (Figure 5.16) is 'Imagine you are talking to these

three men and you are curious about who they are and what they are doing. Write some questions to ask them in the Input Field'. This task is meant to elicit indirect questions.

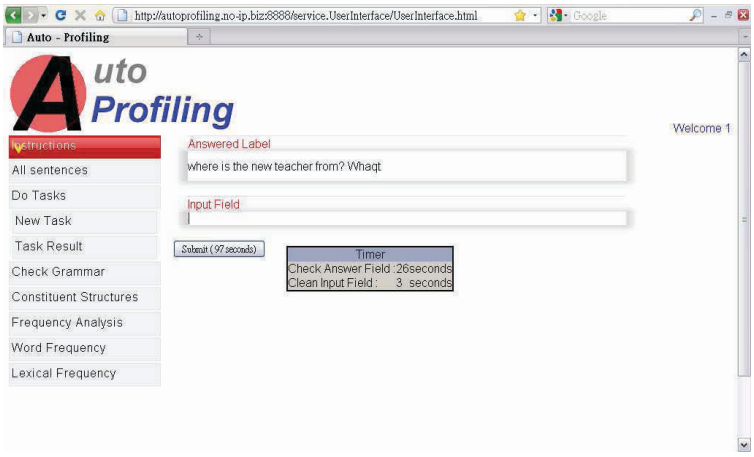


Figure 5.13: the incomplete sentence 'Whaqt'

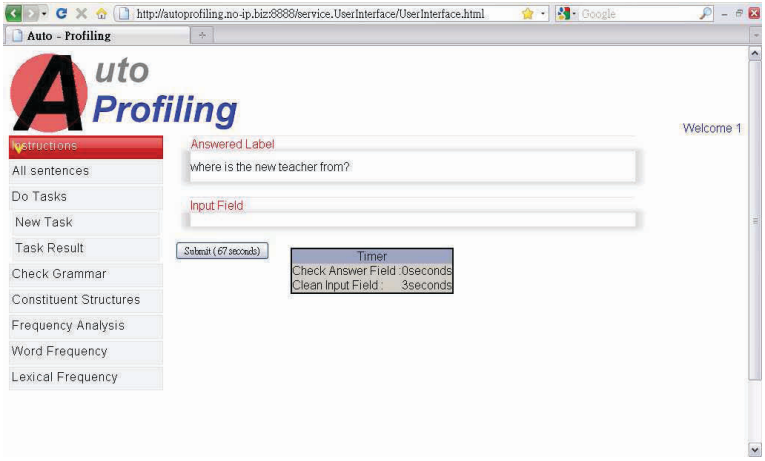


Figure 5.14: more on the incomplete sentence 'Whaqt'

Auto Profiling

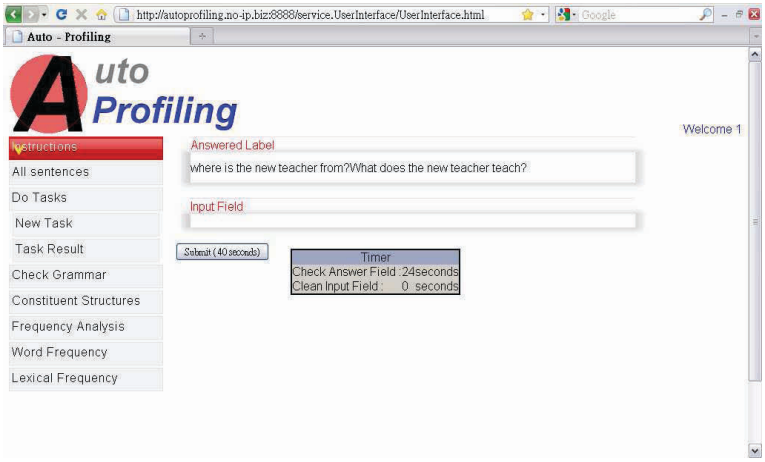


Figure 5.15: more sentence is uploaded

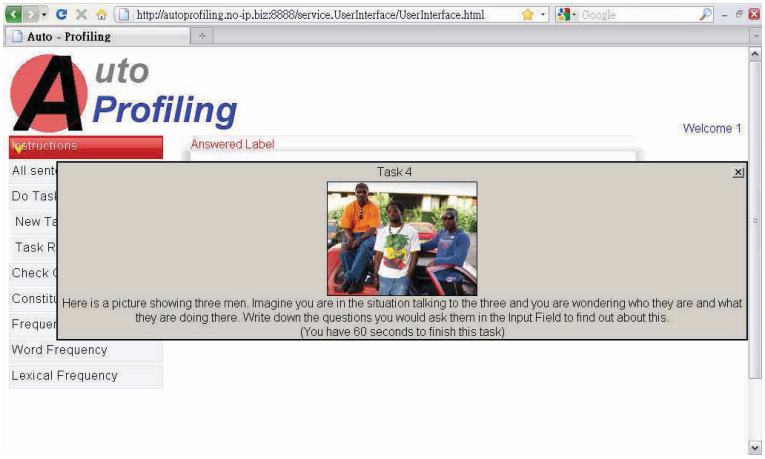


Figure 5.16: the fourth task of Auto Profiling



Figure 5.17: submit the fourth task

After a user has completed the final task, they can see their final developmental stage of English, as shown in Figure 5.18. As there is not enough data for each task, the temporary

level for each is listed as ‘0’. Although in this example each task does not have enough data, all of the tasks can be analysed together and the final developmental stage of English is Level 5. This is because the functions of distributional analysis and the emergence acquisition criteria functions are implemented, which not only take into account each individual task but also the tasks as whole. Therefore, while each task may not have enough data there will most likely be enough from all four tasks to carry out distributional analysis, and the emergence acquisition criteria can then be used to determine the final developmental stage of each informant.

As the whole data collection and analysis process is conducted in real time, some advanced learners of English do not get their final developmental stage assessed correctly, because some data are still being analysed when they click on *Submit*. To solve this problem, they can click on *Do Tasks* again and then click on *Task Result* to get the correct developmental stage of English.

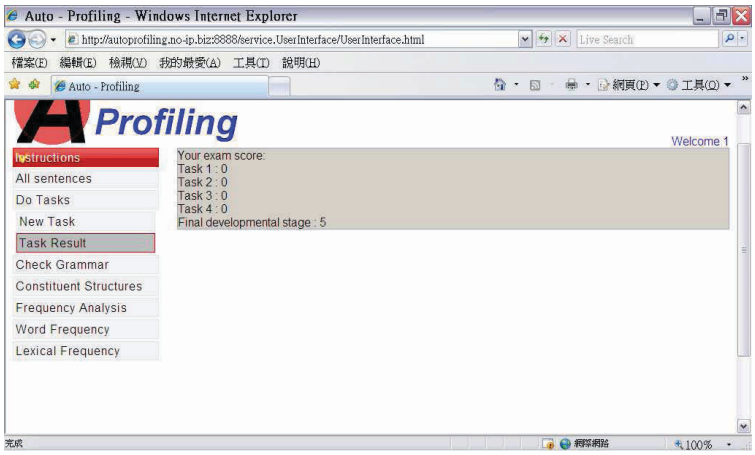
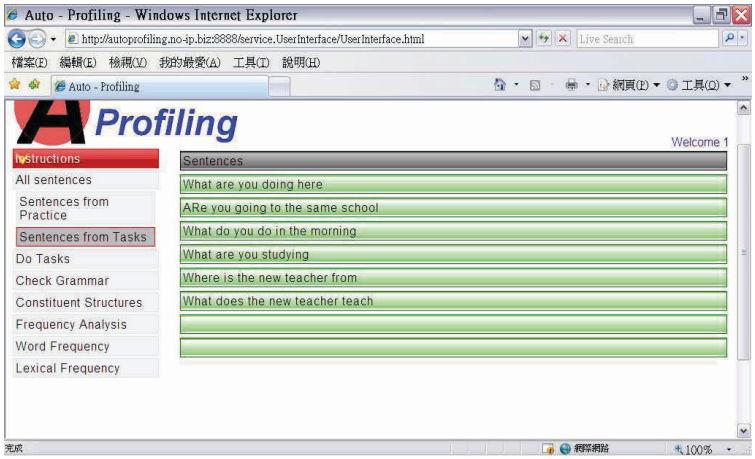


Figure 5.18: the final developmental stage



Auto Profiling

Figure 5.19: all the sentences produced

After getting the developmental stage of each informant, users can further view their other language profiling details. For example, in Figure 5.19, all of the sentences produced by the user are listed, and this can provide valuable information for teachers and/or researchers. In addition, when each sentence is clicked, more information will be given, as shown in Figure 5.20. For example, the second sentence ‘What do you do in the morning’ is provided with C-Structure, Top Level—the temporary highest level of this sentence, and Sub Group—the syntactical structure which is used for Emergence Criterion function. In addition, this sentence is given a Sentence ID that enables users to look for their own data when other informants’ data has also been saved on the same server. In addition, this ID can also be used when users are communicating with each other. Figure 5.21 shows the details of another prompt from the system—What are you studying? Furthermore, in Figure 5.22, more information is provided for the sentence—Where is the new teacher from? Users can see the Top Level is 4 and the Sub Group is 'WhIs'. Therefore, they can immediately notice that the informant produced structures related to Level 4 and the copula ‘is’. In fact, when they look into the C-Structure, they can have the whole annotation of this sentence, which has an NP, Noun Phrase, that is composed of a determiner, an adjective and a singular noun. In addition, it has a VPhrase, Verb Phrase, composed of a Copu (Copular), an NP and a Pre (Preposition).

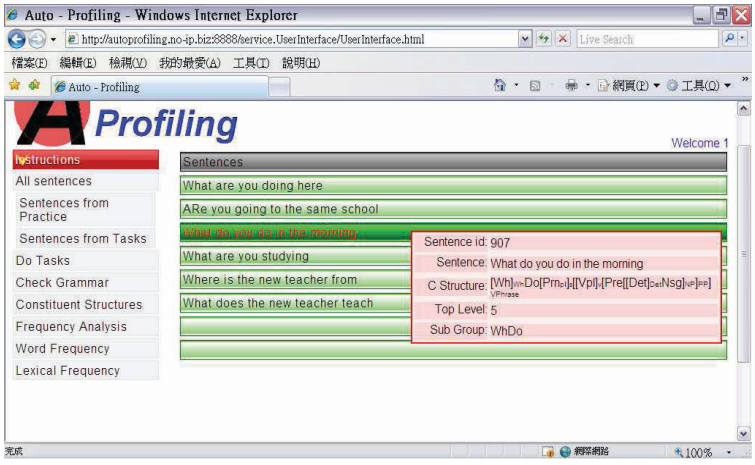


Figure 5.20: the analysis of ‘What do you do in the morning’

Auto Profiling

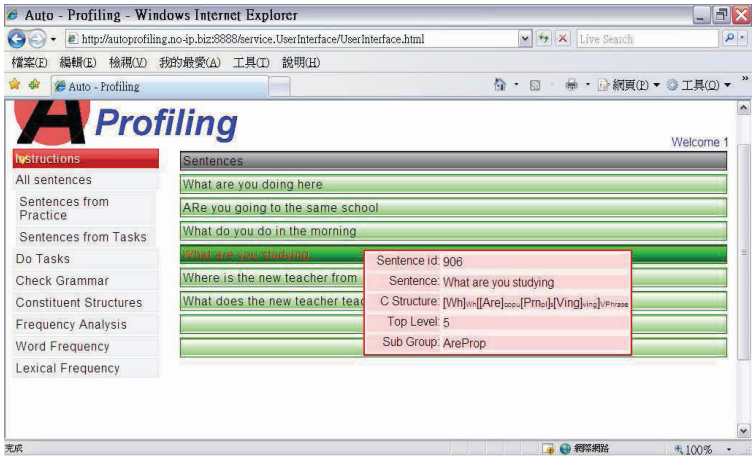


Figure 5.21: the analysis of 'What are you studying'

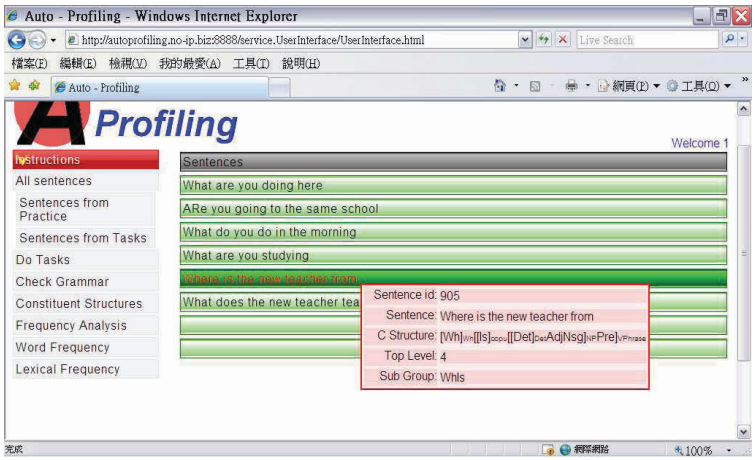


Figure 5.22: the analysis of 'Where is the new teacher from'

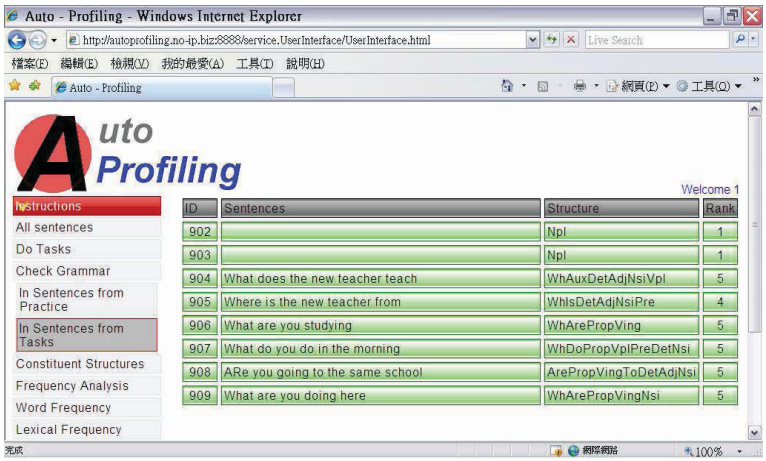


Figure 5.23: all the sentences form tasks

After viewing the language profile of an informant, users can then get feedback from the

analysis of the data produced by the informant. Specifically, when users click on *Check Grammar*, two more options appear, *In Sentences from Practice* and *In Sentences from Tasks*. After clicking the latter, the interface will appear as in Figure 5.23, which shows all the temporary highest levels of each sentence. For example, for sentence ID 906, the highest temporary level is Level 5, a level which has to be confirmed through the Emergence Criterion. In fact, they can see that this informant produced five sentences that were temporary Level 5, one sentence that was Level 4 and two blanks that were Level 1. They can view the rough syntactical structures of all the sentences of this particular informant, and users may also notice that the first two sentences are blank with the structure, Npl—Plural form of a noun and Level 1. This is a default set of structure and level in this system, because the two tasks did not receive any input. In fact, there is another default set of misspelled words. When this happens, these words will be automatically treated as Npls.

The most important feature of *Check Grammar* is to check the grammatical structure of each sentence produced by the informant. For example, when users click on sentence ID 905, the system pops up a window which states 'No error found', meaning that the sentence is correct in terms of grammatical structure. However, when they click on sentence ID 914 in Figure 5.25, they will see the corrected sentence in a pop up window, along with the TL structure 'PropVplNsiAdjNsi'—Pronoun, Verb plural form, Noun singular form, Adjective and Noun singular form.

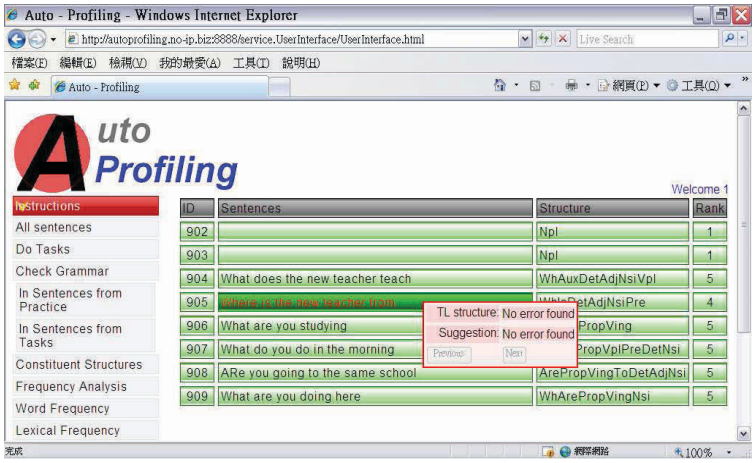


Figure 5.24: check the grammatical structure of a lighted sentence

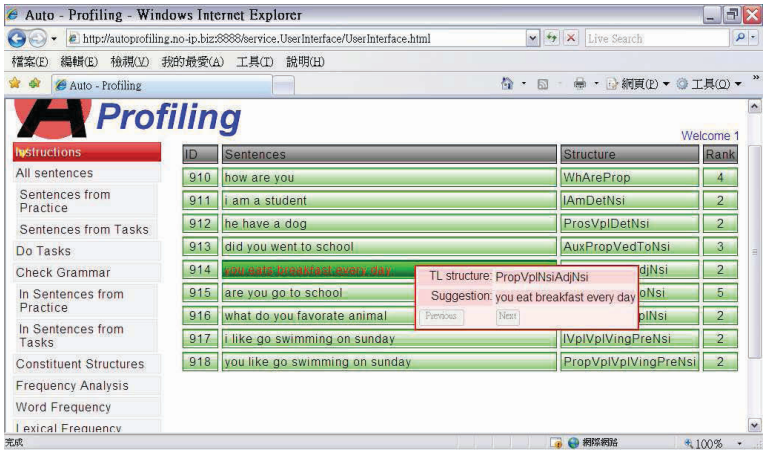


Figure 5.25: the sentence has been corrected

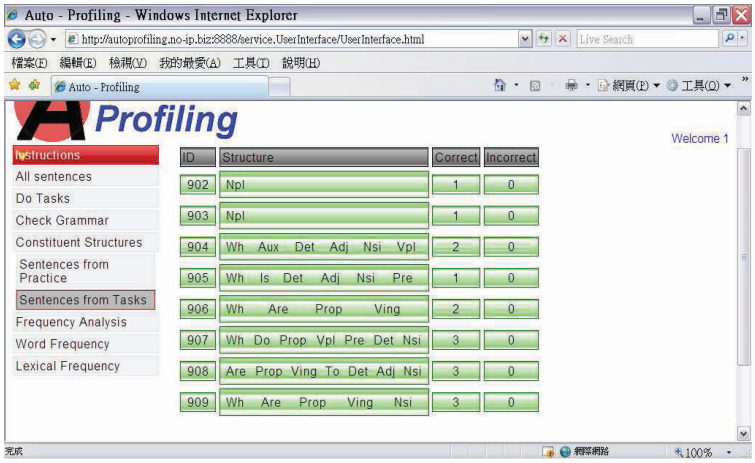


Figure 5.26: all the C-structures of a learner

Most of the feedback provided in AP is quite easy to understand. However, there are other functions may only be suitable for language experts. For example, these users can click on *Constituent Structures* and then click *Sentences from Tasks* to check all the structures in the sentences (Figure 5.26). If the structures are correct, they will be counted in the second column from the right, while the incorrect ones will be counted in the first column from the right. As there are no mistakes in these sentences, the incorrect counts are all '0'.

When users click on *Frequency Analysis* and then on *Sentences from Tasks*, they will be able to view all the frequencies of all structures produced by the informant. Here there are six structures in all the sentences. Two of them have two counts and the others have one count. When users click on the numbers in the *Count* column, they can view the actual sentences as well as their highest temporary levels. For example, in Figure 5.28, they can

not only see the structure of 'WhDo' but also the sentence 'What do you do in the morning' with the highest temporary Level 5. Another example is in Figure 29. The structure of the sentence—*Are you going to the same school?*—is 'AreProp' and its temporary highest level is also Level 5. There are two more sentences related to this structure, one is 'What are you studying?' and the other 'What are you doing here?'.

When clicking on *Word Frequency* (Figure 5.30), users can see *Sentences from Practice* and *Sentences from Tasks*. Here, the correct, incorrect as well as unknown counts will be displayed for each word type. Users can thus have an overview of all the types and tokens produced by an informant and check whether they are correct or not. Users can also check the *Lexical Frequency* of the data produced by an informant. This time the lexicons of all the data will be displayed in the interface, and again the correct and incorrect counts will be given, which enables users to know which specific words are wrongly used. The display is organized according to the types of token, and this enables users to know the profile of an informant, and provides very useful about their interlanguage distribution. Lastly, another valuable function for language experts is the ability to annotate a second language learner's ungrammatical texts. For example, in Figure 32, the sentence 'you eats breakfast every day' can still be parsed and annotated, as shown in the pop up window: a phenomenon which is very difficult for most of the current parsers to achieve.

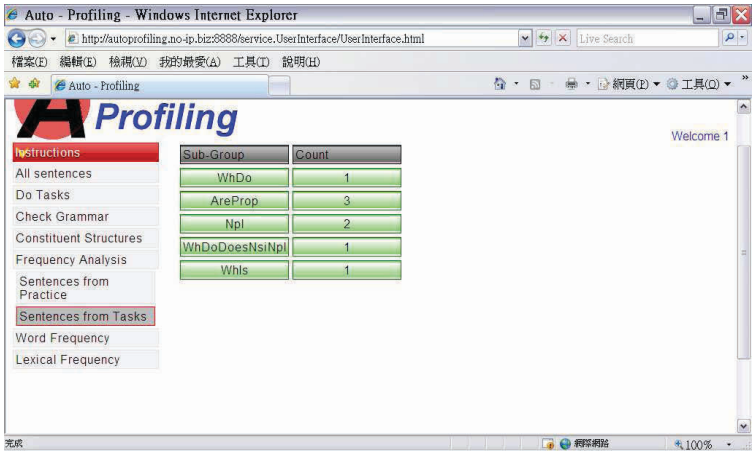


Figure 5.27: the syntactical structures produced by a learner

Auto Profiling

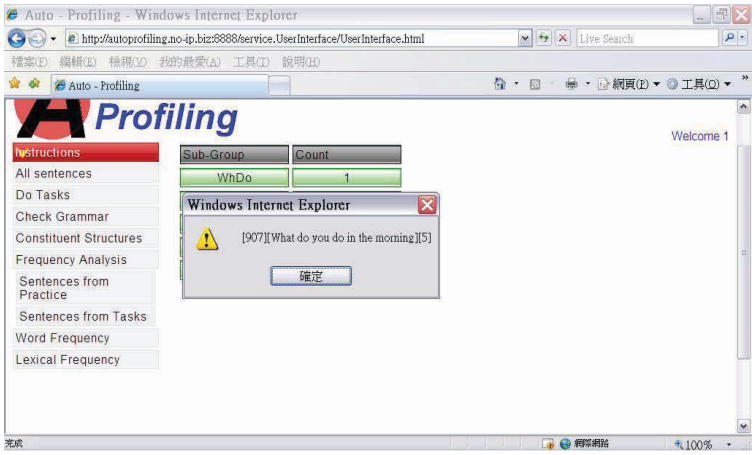


Figure 5.28: the sentence belong to a syntactical structure

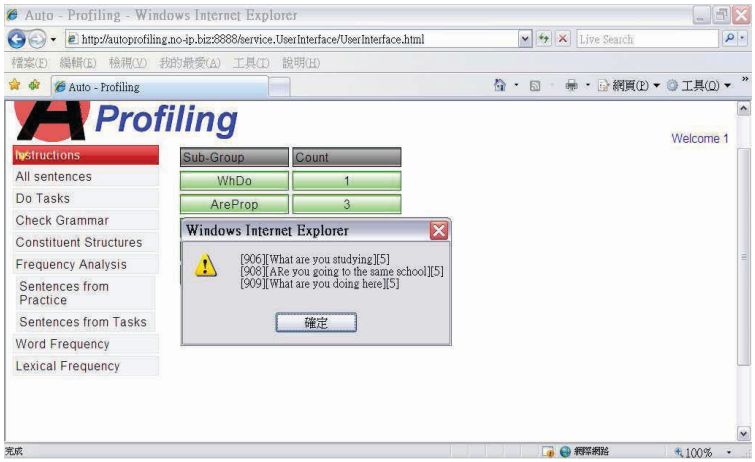


Figure 5.29: more sentences from a syntactical structure ‘AreProp’

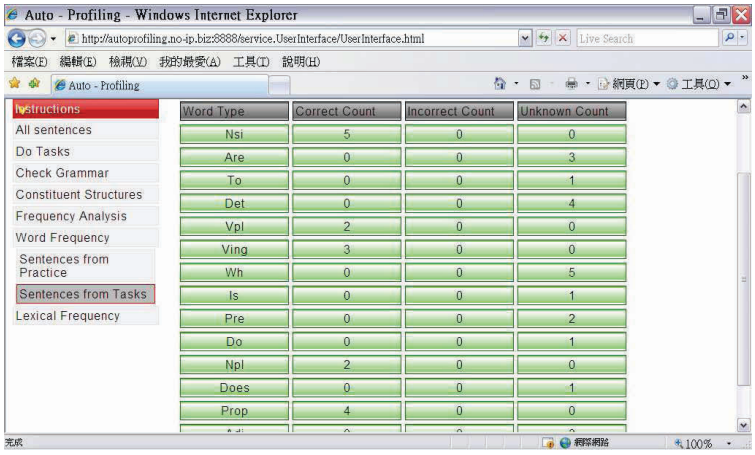


Figure 5.30: the word type from tasks

Auto Profiling

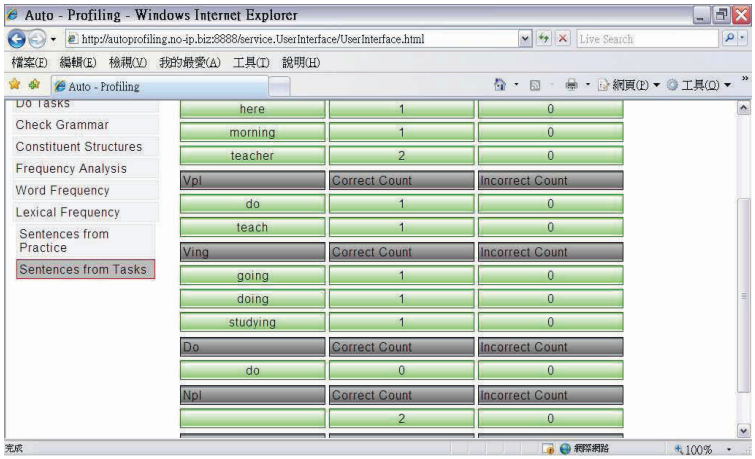


Figure 5.31: lexical frequency from tasks

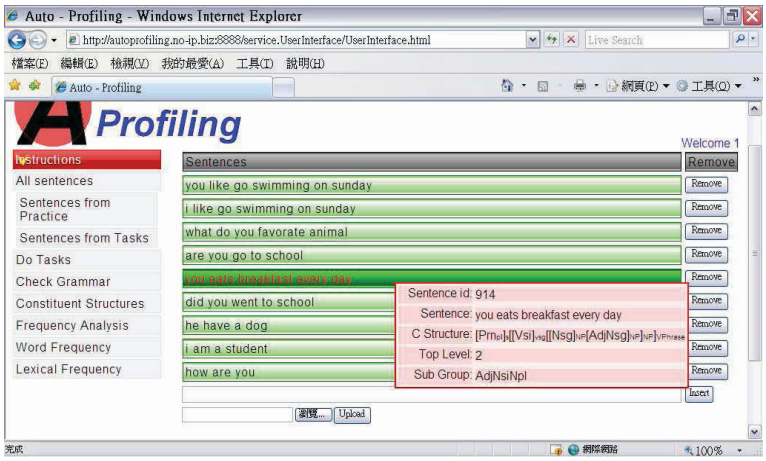


Figure 32: the annotation of ‘you eats breakfast every day’

In summary, the figures in this section show the AP system’s interfaces, which can provide users, and especially researchers, with a more detailed language profile of an informant in real time, and can be saved and retrieved easily. Finally, there are no garden path problems in any of the interfaces, which makes this system even more reliable and effective.

Chapter 6: The computational aspect

In this chapter, I will explain the computational aspect of AP by following the flow chart presented in Chart 6.1. It describes my approach to parsing and the reasons for using the Java programming language and related data processing systems. In addition, it explains how to input, code, analyse, and display informants' data. After that, it shows how to modify and evaluate some of the features. Finally, it explains how to test more advanced developmental stages. Specifically, AP uses very simple algorithms to provide basic but important linguistic information about a learner in real time. Though it may be tricked, it can accomplish some things that other high stake language testing systems cannot. First, it provides the developmental stages of English. This is very important, as levels cannot be skipped and so a learner cannot process something that is beyond their current level. Second, it provides the C-structure, which can show how learners are progressing in real time. Third, it can correct the major mistakes in learners' production, which can also speed up learning.

As noted earlier, most of the current parsers are inadequate for applied linguistics, mainly because while they have very good programming they do not incorporate the best of current linguistic knowledge. In this chapter I will thus explain how I incorporate linguistic knowledge in AP. I will then start to introduce the computational aspect of this system, including how to upgrade some of the features in the algorithms. In fact, the statements in the algorithm of developmental stages of English can be further supplemented to allow a more advanced developmental stage of English. In short, the algorithms in AP are flexible that it can be upgraded to meet the needs of automatic linguistic profiling.

6.1 The fundamental requirements in a language parser

In this section, I will introduce the fundamental requirements in a language parser. Specifically, I will explain why a parser may or may not work, as well as other key factors in its performance. One important aspect in determining the effectiveness of a parser is to check its tractability, and one way to know whether a problem is tractable or not is by comparing it to others for which the answer is known, and this is an idea which touches on complexity theory. This concept can be traced back to Barton et al. (1987, p2), who first stated that "complexity theory studies the computational resources—usually time and memory space—needed to solve particular problems, abstracting away from the details of

the algorithm and machine used to solve them." Such an approach also provides robust classification schemes—complexity classes—which can tell us whether certain problems are likely to be computationally tractable or not. It should be noted that here the word 'tractable' has a practical application, roughly meaning that the problem is always solvable in a reasonable amount of time on an ordinary computer. In short, they claimed that a hard problem cannot be switched into an easier complexity class by using a better algorithm. In fact, they even stated that this classification holds regardless of whatever computer system is used, such as a PC or a mainframe computer.

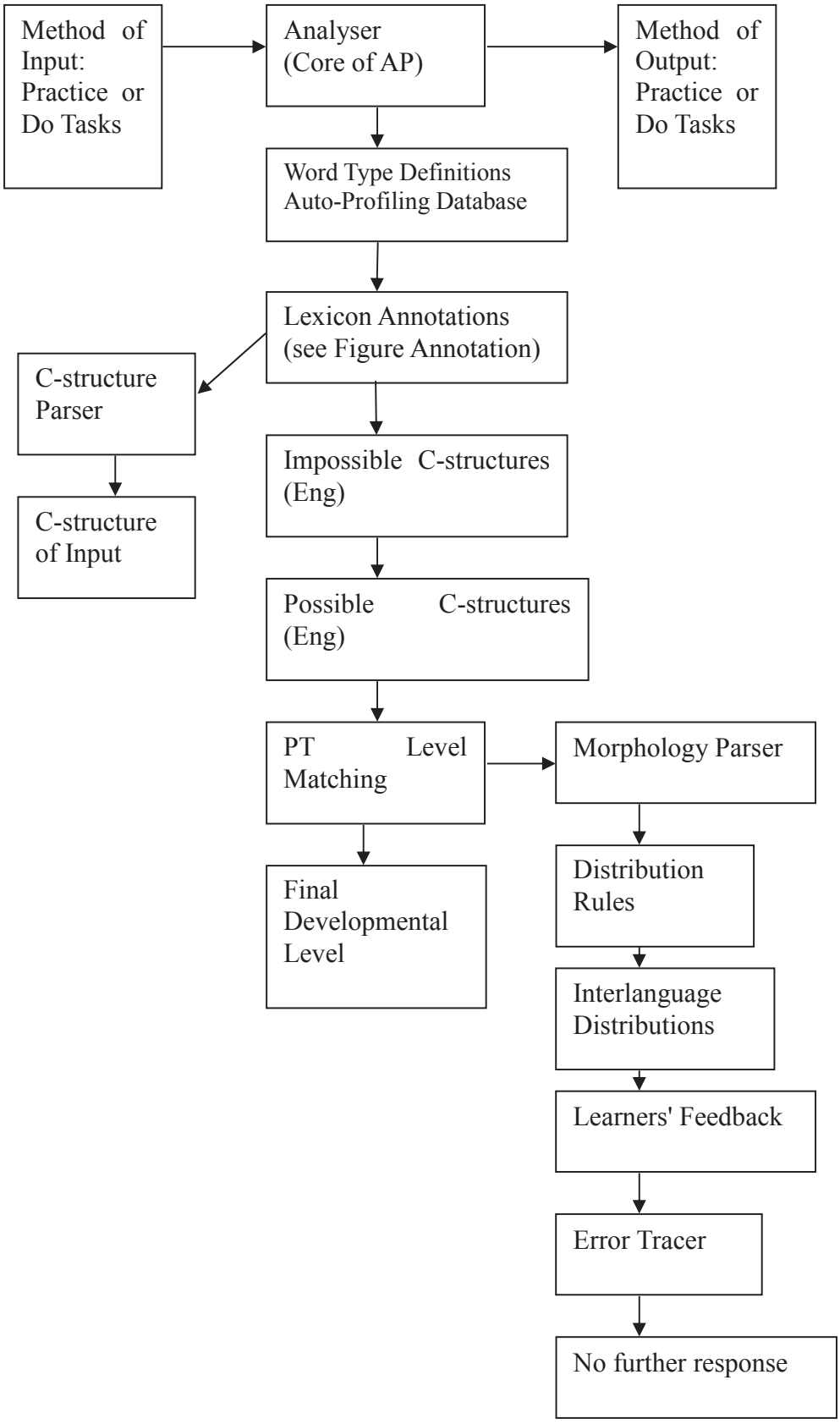
Though tractability is very important in determining whether a parsing method is going to work or not, other factors also affect the performance of a language parser, especially for second language texts. This is mainly because current statistical methods do not work well enough to be able to predict what a second learner's text structure is. For example, the words that may appear after 'eat' can be anything from 'a', 'bananas' to 'we', 'to', and so on, meaning there is no way for probability methods to be used in the algorithm, because almost anything is possible. This shows that although computers are powerful machines, without suitable linguistic knowledge, it will still have limited performance. For example, Pennington and Stevens (1992, p4) noted that Doughty successfully established several reasons for employing computers in research on second language acquisition, with the main points being that they are excellent environments for testing second language acquisition and for use in data collection and analysis. Pennington and Stevens (1992, p5) also stated that the pre-condition for successful implementation of computer-based projects in applied linguistics depends on whether there are software tools that are powerful and flexible enough to effectively assist the researcher. Unfortunately, current computer software tools are neither flexible nor fast enough to diagnose a second language learner's language knowledge.

Barton et al. (1987, p2) therefore concluded that since approaches that are solely based on computers and algorithms cannot deal with all the problems that arise from the use of natural languages, we still need to rely on human linguists to undertake language processing. This is another reason why in this project I design a parser that does not use the presupposed rules in the algorithm, but rather an algorithm based on Processability Theory (PT) (Pienemann, 1998, 2005) which can limit the scope of a learner's production in processing a second language to the processing space. Specifically, PT, which is the

construct theory of this project, is used to tackle the supposedly intractable problems mentioned above. This can be achieved because it can make the size of originally infinite problems finite by utilizing the features of the different developmental stages of English. In short, as PT provides the linguistic knowledge necessary for parsing natural languages, the project presented here should be able to help alleviate the tedious workloads of many professionals who are currently involved in diverse aspects related to parsing a second language learner's input in real time.

6.2 Basic programme structure and processing informants' data

With regard to the computational aspect of AP, I will start out with a flow chart which will enable us to have a better picture how the system is structured. I will then explain step by step about each algorithm in this chart, including how to upload, code, analyse, and display informants' data. In addition, some of the statements in the algorithms will also be shown to better introduce the system.


Method of Input: Practice or Do Tasks
Analyser (Core of AP)
Method of Output: Practice or Do Tasks
Word Type Definitions Auto-Profiling Database
Lexicon Annotations (see Figure Annotation)
C-structure Parser
C-structure of Input
Impossible C-structures (Eng)
Possible C-structures (Eng)
PT Level Matching
Morphology Parser
Final Developmental Level
Distribution Rules
Interlanguage Distributions
Learners' Feedback
Error Tracer
No further response

Auto Profiling

Chart 6.1: the structure of Auto Profiling

Auto Profiling

As this chapter has much to do with the user interfaces from Chapter five, readers can go back to previous chapter for further information that is not covered here. The rest of this chapter will mainly explain how AP can provide the computational functions for users that were introduced in the previous chapter.

The basic programme structure can be explained using the flow chart in Chart 6.1. In this chart, the method of input can be from profiling (**Do Tasks and/or Practice**) or uploading. When the machine, AP, receives the input, it will send it to the **Analyser (Core of AP)**. The input from uploaded files should be in the .TXT format, and if it is originally in another format, users can simply copy original the file and then save it as a .TXT one. Users can then click on the All Sentences icon on the left of the Auto Profiling homepage to start the procedure for uploading and/or practising. After that, the machine will pop up another screen which will provide a place for practising sentences and explain how to use the machine and keyboard. When clicking on the practising sentences icon, users will see a large box in the middle of the screen for them to practice sentences. There will also be another icon right below the box in the middle to the screen for users to browse their files for uploading. After selecting a file, users will see another icon which states 'Upload' on the right of the browsing icon, and by clicking on this the file can be uploaded and then analysed. Next, the analysed sentences in the file will be displayed on the same screen for the users to read. Bear in mind that the uploading function has the same data bank as that of the Practice Sentences. This means that both the practice and uploaded sentences will be analysed and displayed in the same place.

One particular algorithm at this stage is the time constraint function, which is part of the **Method of Input**. This is especially designed for typing with time constraints, and it is with this constraint that AP can imitate spoken production. Three seconds are used as the time constraint for users to type in a word, because when there is a two to three-second delay in speaking there is a transcription convention of using a delay symbol. Thirty seconds is used as the time constraint for writing a sentence. In addition, there is also another algorithm for further imitating speaking, and it is used in cooperation with the time constraint algorithm by using the time as a reference point as to whether a word will be uploaded or not. When a word and a sentence are produced within the time constraint, they will be uploaded to another place so that informants will not be able to change them. On the other hand, when they are produced after the time limit, they will not be uploaded, and

instead will be deleted. In other words, when informants type words and sentences into the **Analyser (Core of AP)**, the algorithms from **Method of Input** will check the time used for each word and sentence and then upload those which are within the time constraint. By using these two algorithms, AP can make users' written production imitate speaking. After receiving the input files, AP will instantly send them to its database server/-ap_config—which defines all the word types (see Figure 6.1, 6.2).

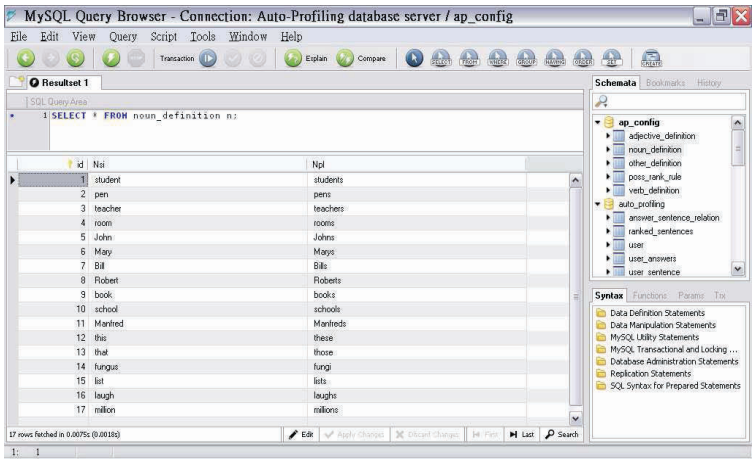


Figure 6.1: Database of nouns

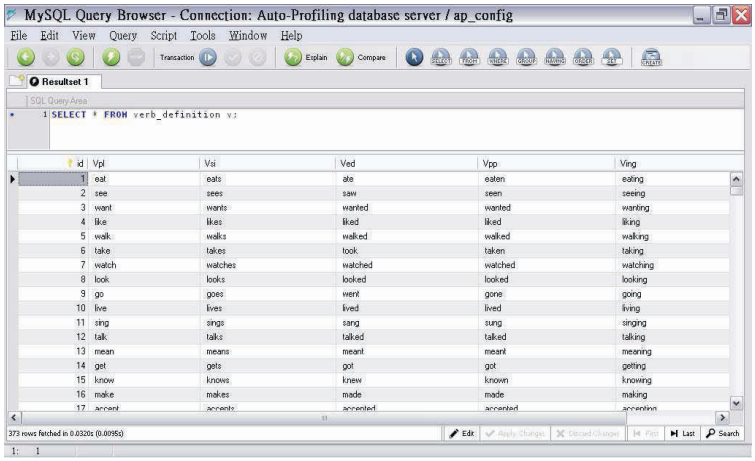


Figure 6.2: Database of verbs

This is where all the words produced by informants will be labelled with different types of lexicon according to the definitions in different word banks, such as noun and verb definitions. This is just like a learner learning to label words at the beginning of language acquisition. Therefore, the results of the labelling process can be quite varied, and may not always be correct. In short, all the words will be labelled at this stage, and each word can have one or more word types assigned to it, and these can be correct or incorrect.

Specifically, when a word belongs to several different categories, it will then be labelled with all of these. This means that when there is more than one word that belongs to different categories in a sentence, there will be many C-structures for this sentence, with the actual number depending on the specific combination of these types of words. For example, when there are three words, each of which has two types of category, the number of C-structures will be 2 X 2 X 2 = 8. (see Figure 6.3)

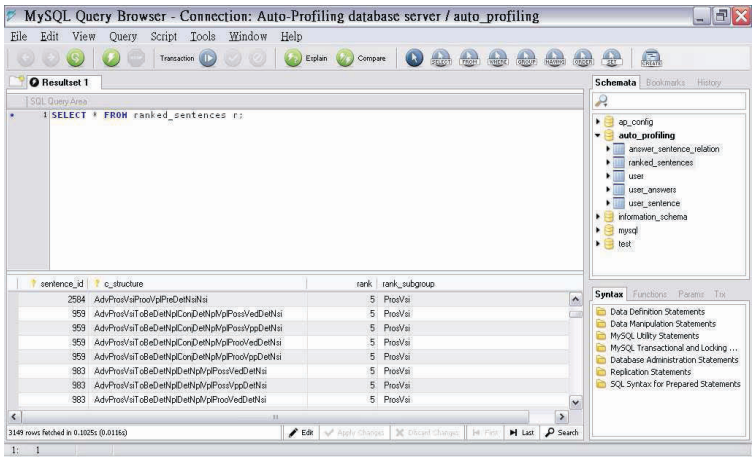


Figure 6.3: Database of C-structures

When all the words are labelled, they will be sent to **Lexicon Annotations**. This is actually the continuing process of **Word Type Definitions**. The annotated sentences can be seen in MySQL. These sentences can be further classified according to different types of processing procedures, such as noun phrases and prepositional phrases. In fact, using the algorithms of the sequence of language development from Processability Theory as the criteria to select the highest temporary level of different combination of C-structures from each sentence, the **C-structure Parser** will display the C-structure of this sentence in the **C-structure of Input**. Specifically, **C-structure Parser** will annotate informant's data to discover their C-structure (see Table 6.2), so as to know their internal/implicit language knowledge. There are many ways that linguists can label a C-structure. For example, Langacker (1973) noted that one should not conclude that surface structures are fully understood or that it is always an easy matter to ascertain the precise tree structure to be associated with a given string of morphemes. Even at this relatively overt level of syntax, much remains to be worked out, and various details remain subjects of debate. Nevertheless, some things are fairly clear:

> the morphemes of a sentence are arranged in a hierarchical structure of some kind, the major outlines of which can be sketched with reasonable assurance, and we must identify types of constituents by

> labelling or by some comparable device.
>
> Langacker (1973, p108)

Since the conceptual structures of sentences have no direct surface realization and native speakers' data have been annotated by many other parsers, AP will only annotate the C-structure of a second language learner's written data or transcribed spoken data. To achieve this goal, there is another algorithm called **Structure_filter** within the **C-structure Parser** in AP. This can automatically annotate an informant's written data according to different the processing procedures acquired by an informant. The annotation process will follow the sequence in Table 6.2. First, each input sentence will be checked to see if any part of it matches any of the verb phrasal structure. If yes, Auto Annotation will put a parenthesis around the verb phrase and label it '**VPhrase**,' and otherwise it will do nothing. Auto Annotation will then check if part of the sentence matches the Question types of sentences. If yes, it will put another parenthesis around this sentence and label it '**QMainCls**,' and otherwise do nothing. After that, it will check if part of the sentence matches the Cancel Inversion types of sentences. If yes, it will put a parenthesis around it and label it '**CnclIvrsn**,' and otherwise do nothing. Furthermore, it will again check if part of the sentence matches the Canonical types of sentences. If so, it will put a parenthesis around it and label it '**MainCls**,' and otherwise do nothing. Finally, if part of the sentence matches a Phrase type of sentence, it will put a parenthesis around it and label it '**Phrase**,' and otherwise do nothing. (see Figure 6.4)

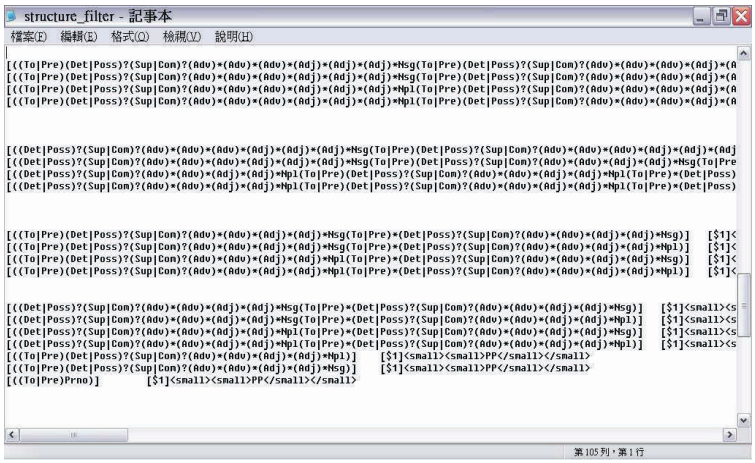


Figure 6.4: Algorithm of annotations

In the meantime, while all the annotated sentences are processed in the C-structure Parser, they are also sent to **Impossible C-structures (Eng)** (see Table 6.1) which will scan all these combinations of C-structures. This algorithm is used by researchers to detect if any

particular C-structure is produced. After filtering all impossible C-structures, the remaining ones will be processed in **Possible C-structures**. This process is to get all the possible C-structures ready for further comparison in order to find out the highest possible temporary level of each written 'sentence'. Once these possible C-structures are ready, they will then be sent to **PT Level Matching**, which will use the algorithms from Processability Theory to annotate the temporary level of each C-structure. This is done by using the key components of processing procedures in PT, such as Level 2 representing the canonical order of English sentences and Level 3 adjunct structures. When all the possible C-structures are labelled with their temporary levels of language development, **PT Level Matching** will then start to look for the highest temporary level of each 'sentence' produced by an informant. (see Figure 6.5)

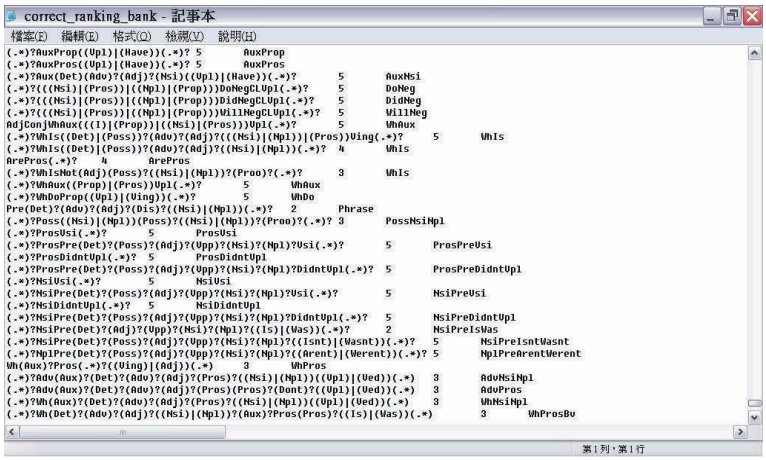


Figure 6.5: Algorithm of PT level matching

After getting all the highest temporary levels of each sentence in the file, the machine will send them to the **Final Developmental Level**, where the final developmental stage of English of this file can be ascertained. Before the final stage can be certain, the system will code all the sentences from an informant with the highest temporary levels of developmental stage. After receiving all the temporary highest levels, it will use emergence criterion to determine the final developmental stage of an informant. In addition, to acquire the final developmental stages of English for the informant, there is another parser, the **Morphology Parser**, which is concurrently provided in parallel with **PT Level Matching**. The **Morphology Parser** will analyse all the data along with **PT Level Matching**. It is actually designed to check the file's interlanguage distribution, an important step to make sure that the structures produced by the informant are actually from procedural skills, rather than formulae. To accomplish this, the **Distribution Rules** function is designed so that it

can analyse whether the morphological structures in the file are correctly distributed or not. This is done by using the rules of morphological structures in the Distributional Rule bank in the machine. These rules are mainly stated to check the correctness of the morphological structures in an input file, which is another data bank based on language acquisition. When the results are incorrect, they will be highlighted on the **Interlanguage Distributions** screen. There are many rules in this algorithm in order to display all the interlanguage distributions, most of which are related to how each lexicon should be placed in a sentence. When any word is placed in the wrong place, **Interlanguage Distributions** will save the information and then display it in the pop-up screens of the Auto Profiling system, such as Check Grammar, Lexical Frequency and Constituent Structure. It is designed to make sure that users can simply click on Constituent Structure to discover the informant's interlanguage distributions. Another function in **Interlanguage Distributions** is designed to help those who are not ready for real language profiling in the system. It thus provides another channel for such people to acquire feedback by typing a 'sentence' in the Sentence from Practice and viewing their feedback in Check Grammar. To make feedback work, Auto Profiling also needs to have another algorithm to imitate the normal feedback provided by teachers, and this is called **Learner's Feedback**, and it is designed as a combination of **Interlanguage Distributions** and **Error Tracer**. When it receives a message from **Interlanguage Distributions** and **Error Tracer**, it will link these messages to the Check Grammar and Constituent Structures, Word Frequency and Lexical Frequency functions for further display on the screen. Specifically, **Error Tracer** is an algorithm which allows the error messages linked to different functions to be displayed, and it is like the coordinator which allows different functions to communicate with each other. Therefore, with **Error Tracer** and **Interlanguage Distributions**, **Learner's Feedback** can allow users to click on the Check Grammar function and other similar functions in the AP interface to view the corrected sentences and other related feedback, such as Frequency Analysis.

In addition to the design of the algorithms in Auto Profiling, the data banks and statements in any of the algorithm modules can be changed to meet the needs of second language acquisition. This approach treats all the algorithms as different but related modules, and when there is a need for improvement each module can be upgraded and then easily linked to other modules. For example, AP uses data banks to code and analyse informants' data,

but it is very likely that the data provided by second language learners will not be in these. To address this problem, AP has several options, such as using information from the MySQL data banks. Specifically, for data which has nothing to do with the fundamental concept of analyses, researchers can use MySQL to change or add more data to meet their research needs. However, if the problem is more fundamental, the programs in AP can also be easily modified, because they are modular. There are several main modules in AP, such as the Correct_ranking_bank, C_structure, Distribution_rules, Incorrect_ranking_bank, Level_sample_sentences, Structure_filter, System_properties, and Word_Type_Definition. Consequently, whenever there is a fundamental problem with AP, researchers only need to modify the related modules, while the others can continue operating as before. For minor modifications, researchers can just add more entries to the data banks by simply clicking on the MySQL browse function and looking the for AP config file. They can then click on the specific data bank to add or delete entries, and then go back and analyse informants' data by restarting AP to load the new data. The whole modification process can be undertaken without going through the compiling process, which makes it even easier for people who are not so familiar with programming languages.

Another data bank file which is frequently modified is the Error Tracer module, which provides corrected sentences for the learners. Specifically, designers can go back to Error Tracer file to add more statements, if required. The specific procedure can be explained as follows:

First, find what error messages need to be suggested.

Second, write the error messages in the Error Tracer module along with the corrected sentences.

When this is done, the systems can be restarted, as with the modifications to the Correct_ranking bank, above.

The other data banks in AP can also be modified in a similar way in order to meet the needs of researchers, teachers or learners.

In brief, there are two main types of modifications in AP. One has to do with fundamental modifications—a process which involves the algorithms of a module, and this is related to the programming languages of AP. The other types are minor modifications, which can be done by a researcher, and these can either expand the capacity of AP or be used to test more advanced structures.

To make sure that the statements can do what they are supposed to, researchers can evaluate the modifications to AP by simply checking the implication scale of all the data longitudinally collected from a specific informant, as well as their interlanguage distributions, to see whether the results meet the construct validity of AP. For example, when researchers find that the results claim that an informant appears to have acquired one level of developmental stage without having acquired a lower level, these modifications or the whole AP will be suspect. For instance, when AP claims that a learner has acquired Level 4, the learner should be able to know how to use a copula in other sentences. If not, either the system is using an incorrect algorithm or the learner is not paying attention when doing the test. Checking the third person singular present tense is another way to see whether a learner, at Level 6, has acquired the knowledge of lower levels. Specifically, this learner should be able to use sentences like 'He goes to school in the morning.' This learner may leave out a couple of 's' or 'es' in the verbs, but not all of them. If the learner keeps using sentences like 'He go to school in the morning', we can conclude that AP is not reliable when it shows that they have acquired Level 6.

Another way to evaluate the modifications is by checking sentences that have been wrongly coded. For example, if a sentence is wrongly coded, it should be removed first and then reloaded in order to see if the modifications can handle it correctly. If it still returns an inaccurate response, then further modifications are required. Since no system can be perfect, in terms of the results and the interfaces, it should be expected that AP will be modified and improved over time.

As the statements in an algorithm can be upgraded, researchers, if possible, can also enter more statements about more advanced developmental stages of English in order to test these.

To test more advanced developmental stages researchers have to first define the syntactical or/and morphological structures of these levels, and then add the data to the Correct_ranking bank. However, some care needs to be taken when adding material, and researchers should test new structures, if possible by conducting longitudinal studies in different contexts. Finally, second language acquisition experts from other related fields should test this structure to see if it really represents a more advanced developmental stage. Specifically, when these structures are suited for such levels, they can be added to the Correct_ranking bank.

In short, all of the algorithms in AP rely on the linguistic theory, Processability Theory. Without PT, the whole system would not be able to find the developmental stage of English of a second language learner or the interlanguage distribution, or provide feedback.

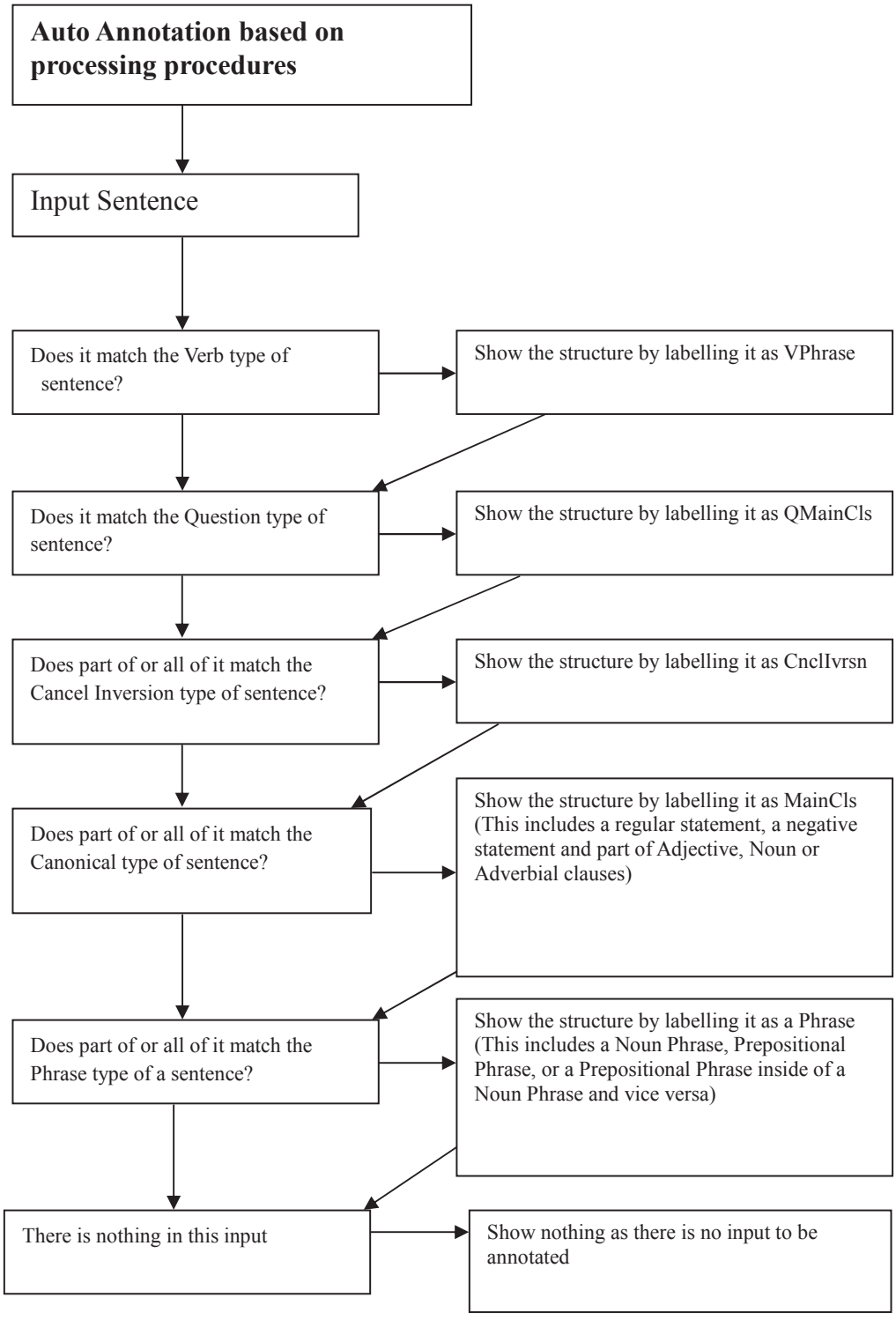

Auto Annotation based on processing procedures
Input Sentence
Does it match the Verb type of sentence?
Show the structure by labelling it as VPhrase
Does it match the Question type of sentence?
Show the structure by labelling it as QMainCls
Does part of or all of it match the Cancel Inversion type of sentence?
Show the structure by labelling it as CnclIvrsn
Does part of or all of it match the Canonical type of sentence?
Show the structure by labelling it as MainCls (This includes a regular statement, a negative statement and part of Adjective, Noun or Adverbial clauses)
Does part of or all of it match the Phrase type of a sentence?
Show the structure by labelling it as a Phrase (This includes a Noun Phrase, Prepositional Phrase, or a Prepositional Phrase inside of a Noun Phrase and vice versa)
There is nothing in this input
Show nothing as there is no input to be annotated

Table 6.2: Auto annotation procedures

Chapter 7: Feasibility study

Chapter 7 demonstrates the feasibility of using Auto Profiling in an ESL context, and here I test if the program produces reliable results. At the very beginning, I demonstrate that AP can elicit and analyse all the interlanguage data produced by the informants profiled in AP. I then give more details about the learner data, such as informants' language background, where and how they the data were produced, and how large the database is. After that, I show the screen shots of several results from different kinds of analysis, such as "temporary analysis" for one set of data, and explain the information shown on each screen. Next, I compile the machine analysis for all informants. Furthermore, I explain how the emergence criteria were implemented in AP. I also display my own analysis in the same way; i.e. with a new table laid out to compare the results from RP and AP, in order to demonstrate that the latter can analyse a second language learner's data as reliably as the analyst in the former. Subsequently, I analyse whether the reliability of AP was consistently lower or higher, whether I have been able to identify the problems in the software that caused any worse results, whether they have been fixed, and thus whether the improved program can now analyse structures correctly. Finally, I repeat the same procedure for transcripts of written texts by comparing the results from RP analysis, AP analysis and manual analysis. Again, this is to check whether AP can be as reliable and accurate as the RP analyst in determining learners' English developmental stages in writing.

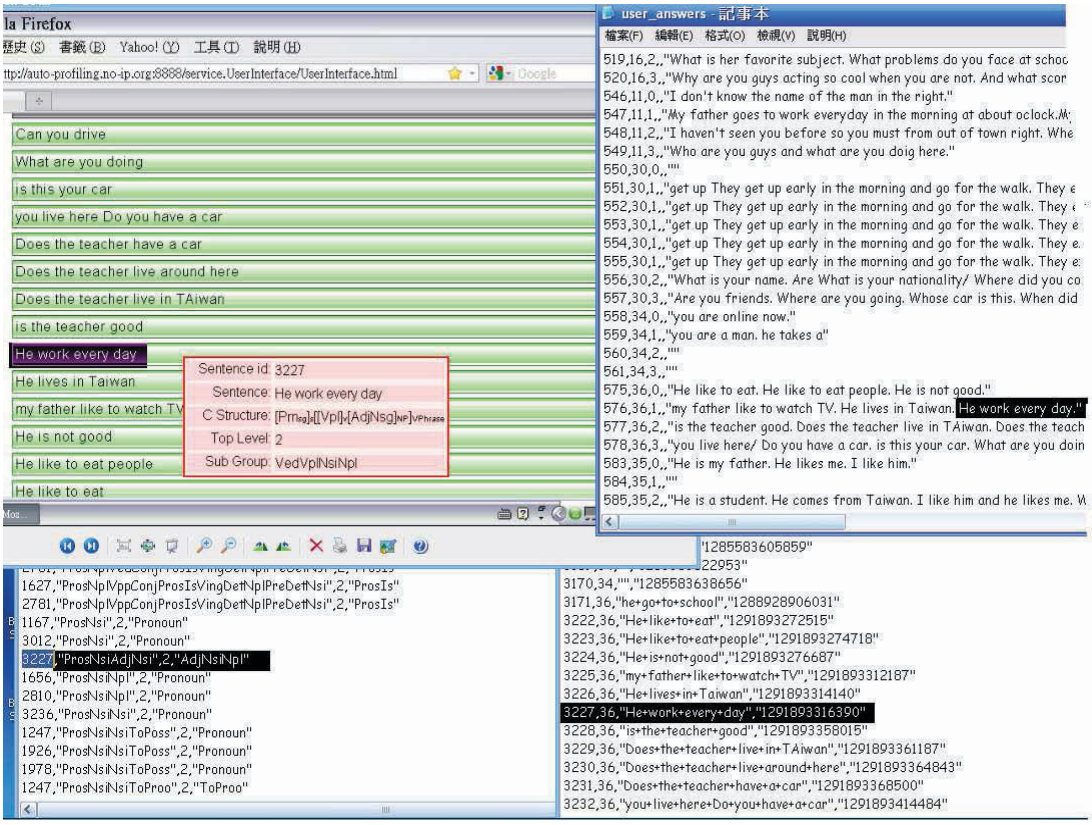
7.1 AP can elicit and analyse all the written production

In this section, I will demonstrate that AP can elicit and analyse all the produced 'sentences' by informants. To make it easier to read and prove that it can analyse all the produced 'sentences', I will take screenshots of some of the data from the system and then merge them into one screen (see the attached data files). This includes the sentences produced, analyzed, profiled and the developmental stages of each informant. In order to make the explanations more readable, I will use the ids of the sentences to link all the functions of this system such as the sentence id 3227 being analyzed, and profiled with temporary level and its possible suggested sentences. Then I will use the informant's id to link all the sentences produced by this particular informant (see more at attached MySQL file). In fact, I will use one particular informant's data and link some of the analyzed data through some screen shots. By doing this, readers will be able to understand how each sentence is analyzed, profiled and temporarily leveled as well as how each informant's data are analyzed, profiled and leveled.

As for the transcribed scripts from RP, I will do the same. In fact, I will analyze all the sentences transcribed. This means all the data from the scripts will be analyzed by hand and by machine using AP. When they have the same results, I can conclude that AP can be as reliable in profiling a second language learner as the analyst in RP.

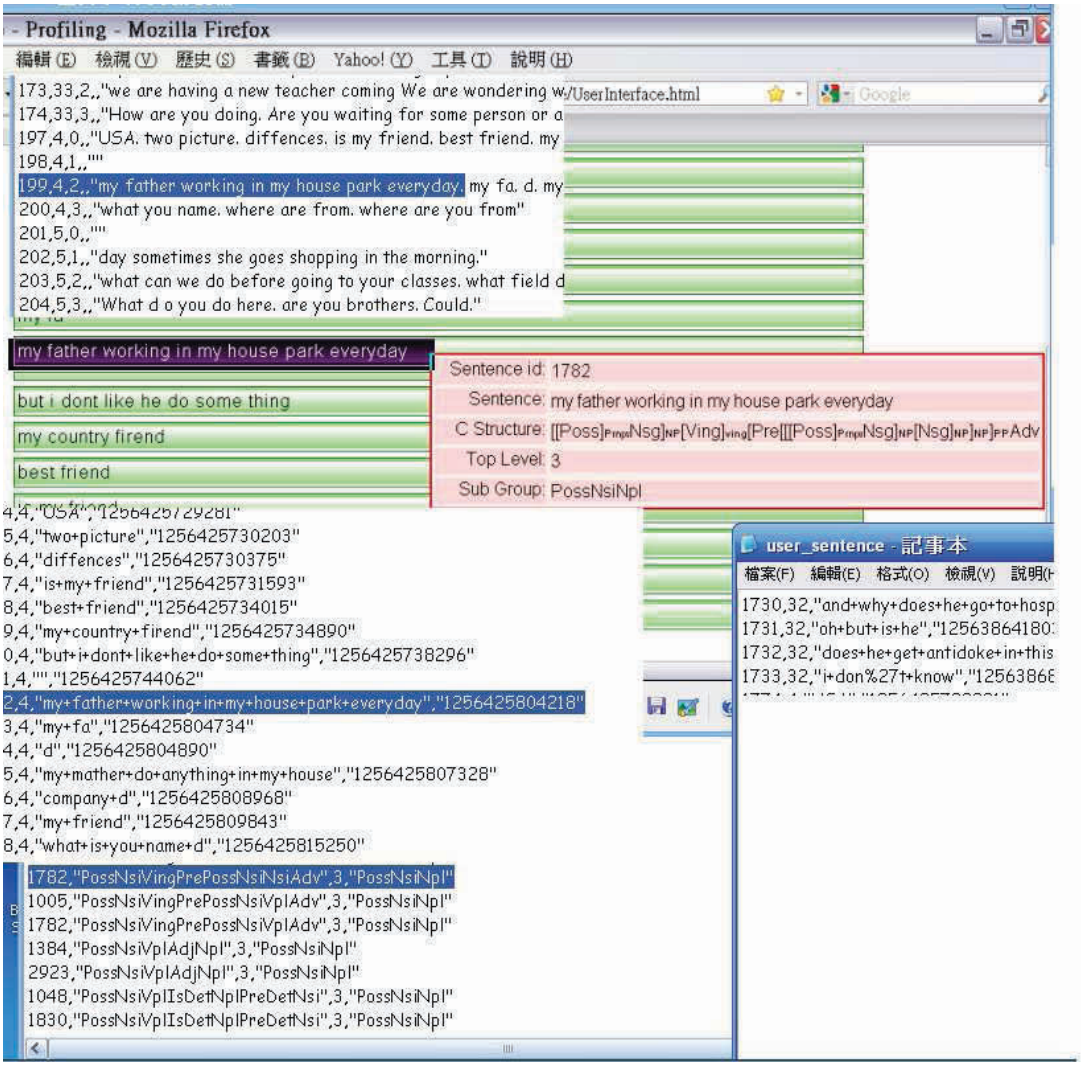
The results of how AP profiles an informant's data are shown below by using sentence id to prove that AP can elicit, analyse and display interlanguage data. The first two screenshots are from the online writing elicitation method and the last one is the transcribed scripts from RP.

Auto Profiling



Merged figure 1: the results of 'He work every day'

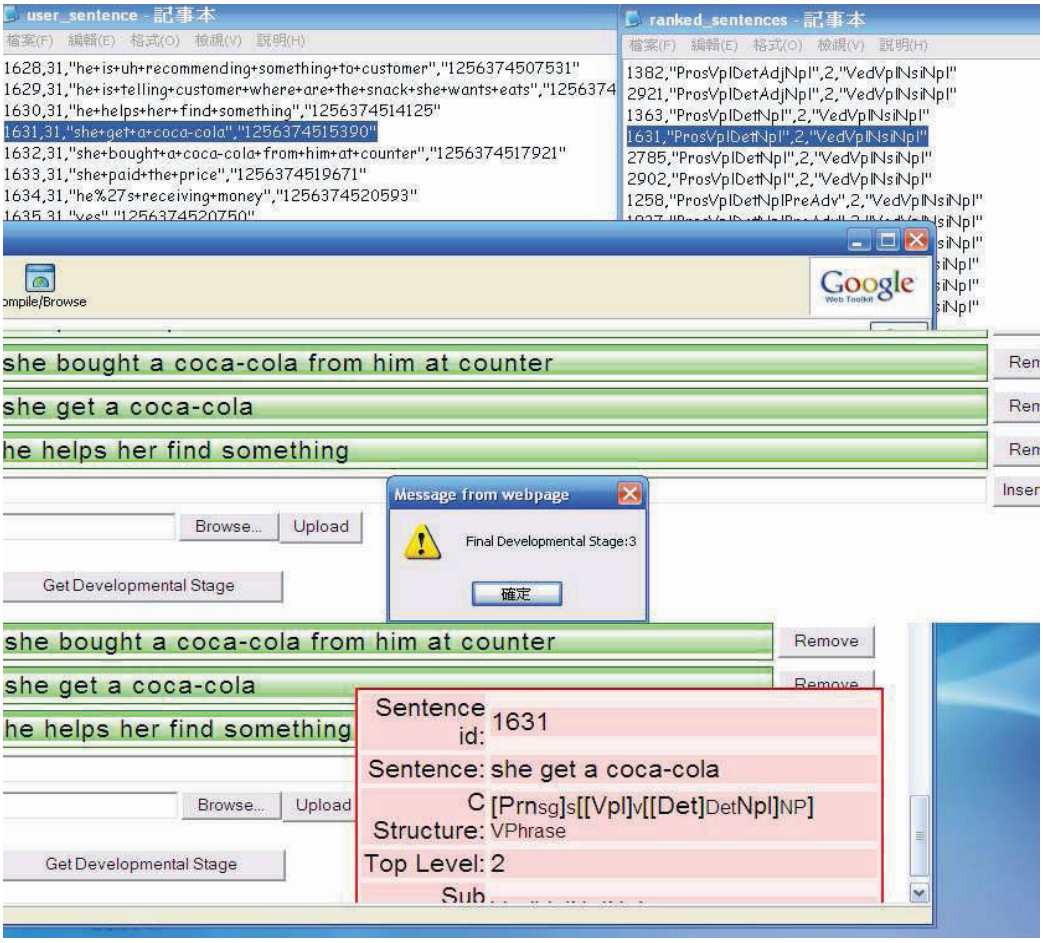
In Merged figure 1 the sentence 'He work every day' with sentence id 322 is elicited, analyzed and saved in the MySQL data system. We can see that it is analyzed in the lower right hand corner with a '+' sign between each lexicon. Its temporary level and constitutional structure, as well as Sub Group, are saved in the lower left hand corner. The result is shown in the upper left hand corner for users, such as teachers and/or researchers. In fact, the sentences produced by any particular informant can be seen in the upper right hand corner. In the figure, the sentences produced by informant 'ID 36' can be seen in the upper right hand corner, including 'He like to eat', 'He like to eat apple', and 'He work every day'.



Merged figure 2: the result of 'my father working in my house park everyday'

Merged figure 2 is another format to show how the sentence 'my father working in my house park everyday' with sentence id 1782 can be analyzed and displayed. We can see that in the highlighted sentences at the very top are those produced by the informant ID 4. Next, with a '+' sign between each lexicon, the temporary level, 3, and constitutional structure, PossNsiVingPrePossNsiNsiAdv', as well as Sub Group, PossNsiNpl, are saved at the very bottom of the figure.

In fact, all the 'sentences' produced by second language learners can be elicited, analyzed and shown in the MySQL data system. More detailed data and results can be seen in the files attached with this thesis, including user_answers, user_sentence and ranked_sentences.



Merged figure 3: the result of 'she get a coca-cola'

Merged figure 3 shows the analyzed results of a sentence 'she get a coca-cola' for sentence id 1631 from a script transcribed from RP. We can see how it analyzes data from uploaded scripts similar to how to it does with online elicitation, as the process is almost identical to that in the previous two screenshots. To start with, it has user_sentence 'she+get+a+coca-cola' in the upper left hand corner. In the upper right hand corner is the ranked sentences 'ProsVplDetNpl'. In the middle of this screenshot is the developmental stage of this script, which is '3'. At the bottom is the annotated structure of this sentence.

Again, all the 'sentences' uploaded to AP from transcribed scripts can be analyzed and shown in the MySQL data system. Further detailed data and analyzed results can also be seen in the files attached with the thesis, including user_answers, user_sentence and ranked_sentences.

7.2 The machine analysis and my own analysis of written production

In this section, I will introduce the background of the informants and their machine

analysis, as well as my own analysis of their written production.

Most of the informants in this analysis were students and teachers, aged from 12 to 40, and half of them were male students. There were four Korean students profiled in Korea, two Japanese teachers in their offices in Taiwan, one Hong Kong businessman at Central Park in Kaohsiung, Taiwan, while the rest were Taiwanese students and teachers profiled in Taipei and Kaohsiung. They were asked to test this system online or in places like a language lab, their own offices and using their own computers at school.

The tests elicited from tens of words to over a hundred from each informant, and the results show that the gender and nationality did not cause any differences. The developmental stages of English were the same from AP and manual checking. Moreover, the annotated texts were mostly correct, and those which were not were corrected after the adding of some more lists of statements in the AP-config. None of the informants showed unacquired lower levels of developmental stages of English compared with his/her current stage. In short, AP can accomplish what it was designed for in terms of eliciting, analysing and displaying data in real time (see Figure 7.13) .

Typing speed and familiarity with the keyboard will affect the results of interlanguage distributions, but not the level of acquisition. In fact, some informants did not produce enough data for analysis because of the time constraints in this system. Therefore, if AP can provide some way to determine the typing speed of an informant, the results of the interlanguage distributions will be much more similar in terms of frequency of types and/or tokens.

Another interesting occurrence is that some of the students tried to click the box ‘Submit’ several times because they thought that they had not properly clicked it yet. This is mainly because the analysis of the data in real time was still in progress. Therefore, there were many identical sentences submitted by the same informants. Luckily, because of the Emergence Criterion algorithm in AP, the results were not changed, especially in the final developmental stages of English. (see Figure 7.13).

It should be noted that most of the informants in this profiling diagnosis found that the majority of their input was deleted because they exceeded the time constraints, and this is something that future research can work on. For example, what is the most appropriate length of time for a particular informant to enter data, so that their procedural skills can be elicited, rather than the declarative ones? Another question for further consideration is what

type of input is appropriate to tell the system to finish a sentence, such as using 'Enter' key. This issue is related to the input experience an informant has. A Chinese speaking user may use the 'Enter' key to look for a word that he/she wants and then another key to select the word. Therefore, to get the Chinese word, this person has to use the 'Enter' key and another key such as '1' or '2'. It is thus perhaps not surprising that there were so many cut or fragile words in their input. Another significant issue is that these informants were initially very nervous, because they thought that they were being monitored, with all of their actions being recorded. Therefore, most of them seemed rather shy and anxious during the process of language profiling, as they felt that their data could not be erased, and would then be analysed and displayed. This is another research topic that future work can investigate, and specifically how informants can be made to feel more relaxed when using the system. In fact, although these informants had been notified that the data would only be used to check if the system works, some of them still felt a bit shy and anxious, because they wanted to produce good results.

In order to let readers to have a better understanding of how AP operates in a real situation, some screen shots are presented, below. They show just one set of data from participant No. 9, who had acquired Level 5 (see Figure 7.2) in their developmental stage of English. This informant was from Korea, and she was a senior high school student. In this profiling process, AP collected 94 words in a ten-minute elicitation task. Specifically, in Figure 7.1, AP has gathered nine sentences produced by the student. As mentioned earlier, the number of sentences and words do not affect the analysis in determining the developmental stages of English, and this is a very common phenomenon in collecting writing. Although some of the tasks did not obtain enough data, including tasks 1 through 4, which were thus marked '0' in developmental stage of English, AP could still code and analyse this informant's developmental stage of English, Level 5, and all the interlanguage distributions were also provided in real time. For example, in Figure 7.3, AP displays all the syntactical structures of all the sentences produced by this informant. With these aggregated sentence structures, this informant's general interlanguage distribution can be seen. In addition, more detailed information can be seen in other figures. For instance, in Figure 7.4, AP shows all the grouped syntactical structures, meaning AP classifies all the structures so that those of the same structure will be in the same classification/group. More detailed information can be seen in the first group, *WhAre*, which has two similar sentences at Level 4: *'Who are you*

from' and '*Who are you guys and what are you doing here*'. These two sentences will only be counted as one instead of two because they have a similar syntactical structure. More groups of structures can be seen in Figures 7.5, 7.6 and 7.7., which show three different syntactical structures at Level 5. This grouping function actually works with the Emergence Criteria function. As there are three different counts of the same level, AP can claim that this informant has acquired Level 5, as shown in Figure 7.2. Then, in Figures 7.8 and 7.9, AP presents all the types and tokens as well as the frequency of lexicons produced by this informant. This is the place where researchers can view the morphological structures and the frequency of this informant. Finally, in Figures 7.10, 7.11 and 7.12, AP shows all the lexical frequency of the data produced by this informant. This is a where researchers can further check the lexicons and their frequency. In short, with these figures, AP can provide a very clear picture of an informant's developmental stage of English and his/her interlanguage distribution. In fact, with this information, I can easily aggregate all the informants' data, such as in Figure 7.13, which shows the AP analysis.

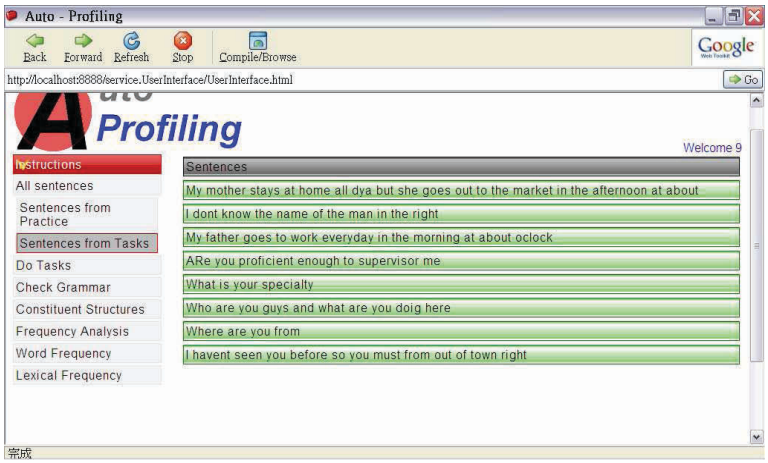


Figure 7.1: all the sentences from tasks

Auto Profiling

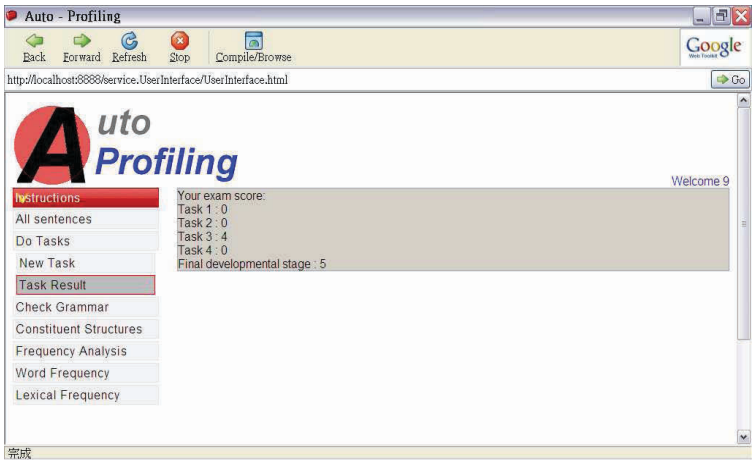


Figure 7.2: the developmental stage of a learner

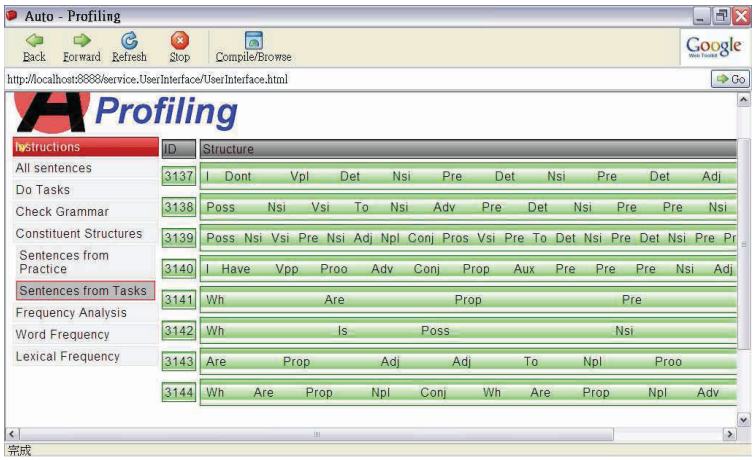


Figure 7.3: all the C-structures of a learner

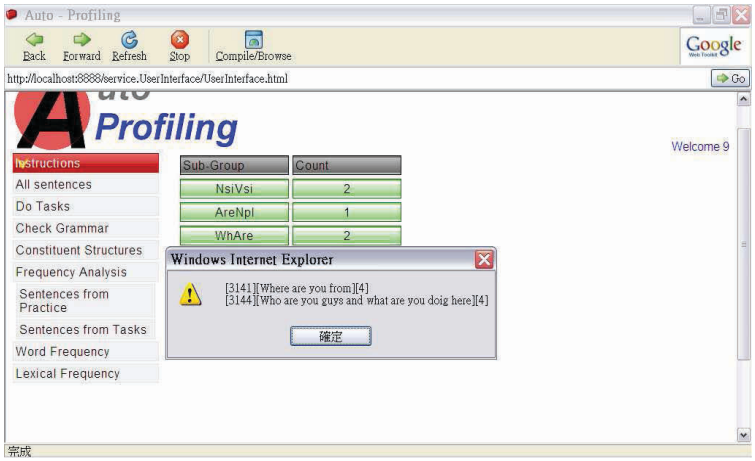


Figure 7.4: the sentences belong to ‘WhAre’



Figure 7.5: the sentence belong to 'IDontDidntWont'

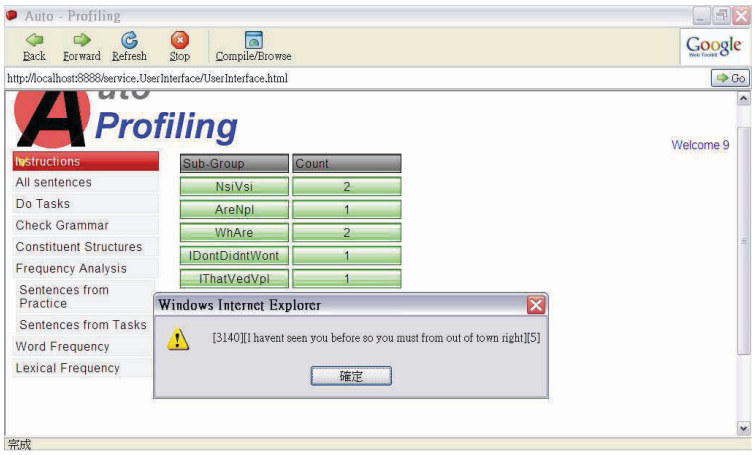


Figure 7.6: the sentence belong to 'IThatVedVpl'

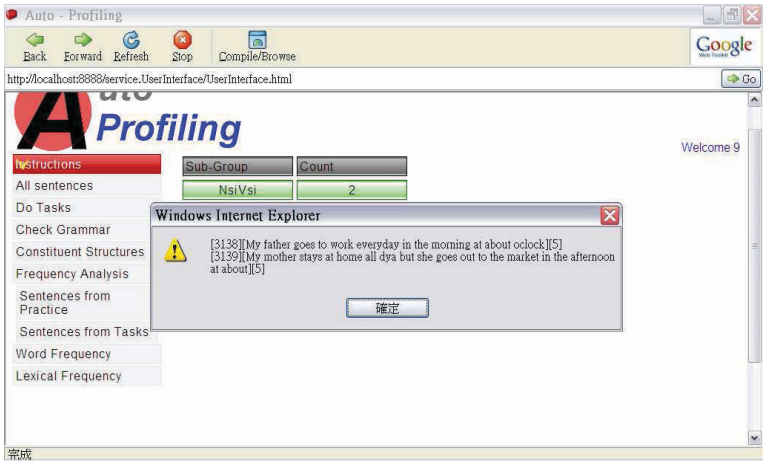


Figure 7.7: the sentences belong to 'NsiVsi'

Auto Profiling

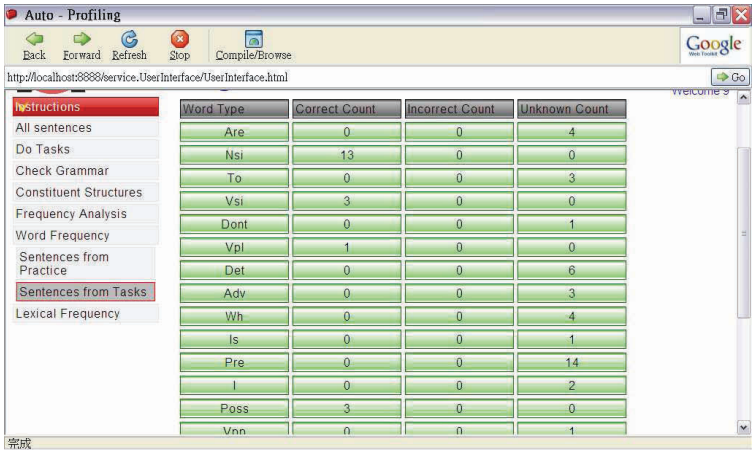


Figure 7.8: word frequency from tasks

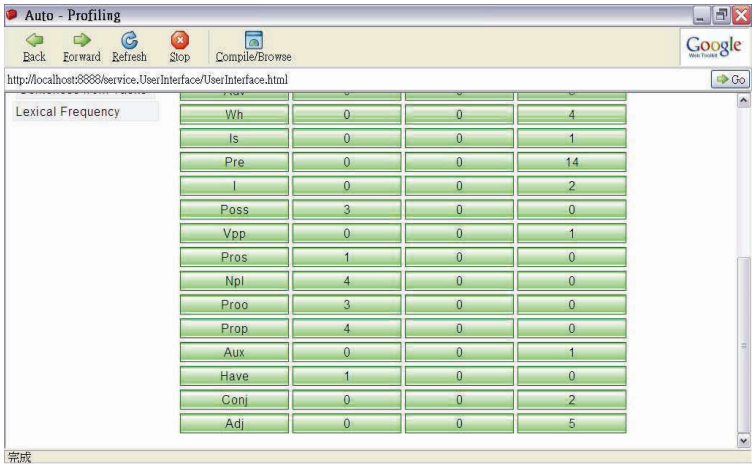


Figure 7.9: more word frequency from tasks

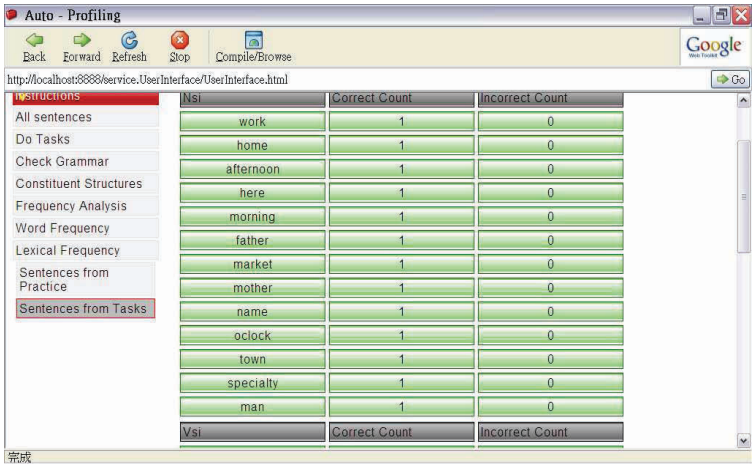


Figure 7.10: lexical frequency from tasks

Auto Profiling

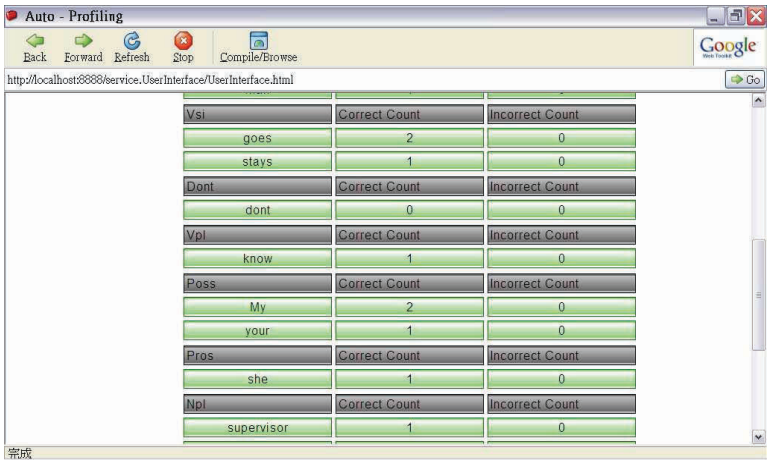


Figure 7.11: more lexical frequency from tasks

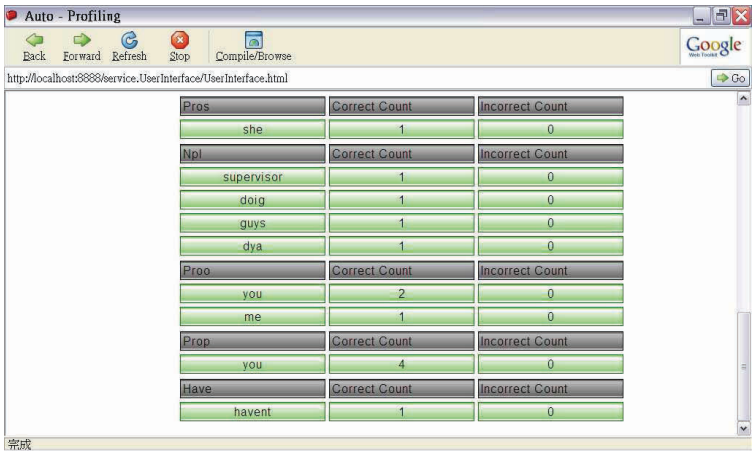


Figure 7.12: more lexical frequency from tasks

Informant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cancel Inver.																				
Aux/Do2nd	+		+					+	+	+	+			+	+					+
3sg-s	+		+			+		/	+	+	+			+	+				+	+
Y/N Inver	+		/			+		+	+	+	/	+	+	+	+				/	+
Particle V	/		+	+		/		+	/	/	/	/	/	/	/				/	/
Copu. Inver.	/	+	+	+		+		+	/	+	+	+	+	+	+				+	+
Neg+V	/	/	/	/		/		/	+	/	/	/	/	/	/				/	/
Do Front	/	/	/	/		/		/	/	/	/	/	/	/	/				/	/
Topi	/	/	/	/		/		/	/	/	/	/	/	/	/				/	/
ADV	/	/	+	/	/	/		+	/	/	/	/	/	/	/				/	/
SVO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	/	+
Plural	/	+	+	+	+	+	/	+	+	+	/	/	+	+	+	/	/	/	+	+
Poss. Pro	+	+	+	+	+	+	/	+	+	+	+	+	+	+	+	+	+	/	+	/
Object Pro	+	+	/	/	/	+	/	+	+	+	/	/	/	+	/	/	/	/	+	/
Sg. Words	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
AP Level	5	4	5	4	3	5	2	5	5	5	5	4	4	5	5	2	2	2	5	5
Manual L.	5	4	5	4	3	5	2	5	5	5	5	4	4	5	5	2	2	2	5	5
Percentage of Agreement	100%																			

Figure 7.13: Auto Profiling Analysis

7.3 Comparison of the transcripts of written texts using RP analysis, AP analysis and manual analysis.

The results of the AP and RP are very similar. They both can provide the developmental stages of English and different syntactical structures, as well as morphological structures shown on the screen in real time. This is related to the interlanguage distribution of an informant. Unlike most of the other systems, both AP and RP display the language development rather than provide descriptors. However, RP may return higher

developmental stages of English than AP does. This is related to how a sentence is treated in RP and AP. It should be noted that if these two systems have the same sentences, they will have the same developmental stages of English, because they both use the same construct theory, Processability Theory. This proves that AP can be as accurate as the analyst in RP in discovering the developmental stage of an informant. Another difference is that AP has more data than RP, because AP uses automatic processes to elicit, analyse and display results, whereas RP uses semi-automatic ones. Moreover, the results in AP can be checked and traced online at any time for any particular informant, and this is currently not available in RP. Finally, the method of diagnosing an informant's language knowledge is different, as RP analyses the speaking skills of an informant, while AP analyses the written ones. This is also another direction for future research, looking at the differences between these two skills for the same informant. At present, AP uses time constraints to emulate speaking, but there are other factors such as the structure of a brain, that can be used so that a better imitation can be achieved. Specifically, the details of the comparison of the results of RP and AP are as follows.

RP can directly tally the features on a screen and get the results. However, AP needs an informant to type in the sentences during tasks. Therefore, RP can have only one result at a time and needs two experts to work together. It can also ignore certain emotional terms such as 'Oh', 'Yeah', 'Hmm' and so on. Unlike RP, AP will collect all the data and analyse it in a computer application. Therefore, it can collect data from many informants at the same time. Also, the results of analysis will be much quicker and clearer, because all of the data produced by an informant will be analysed. This is not true for RP, because manual procedures are used, and thus its analysis will focus on the main features only, while AP will process all the features as long as they are submitted into the system. Another key difference is that when it comes to deciding when a sentence stops, there will be differences between these two systems because currently AP will use '.', '!', and '?' to distinguish one sentence from another. This may also affect the differences in deciding the final developmental stages of English.

Besides these non-essential differences, the results of the AP and RP are very similar. They both can provide the developmental stages of English, with different syntactical and morphological structures shown on the screen in real time, and this is related to the interlanguage distribution of an informant. Figure 7.14 presents an analysis of AP from the

transcribed texts analysed by RP. In the bottom of the table we can see the developmental stages of English of each script from both AP and manual methods. The '+' sign means the informant has acquired the structure, while the '/'sign means not enough information is presented for that particular structure. The developmental stages may be different from the results of RP, because how the end of a sentence is decided is different. In addition, the temporary level of each sentence may be judged differently, because the value given to a sentence may be different. For example, an incorrect sentence like 'Where are you go to school' can be temporarily labelled as Levels 3, 4 or even 5.

Moreover, in normal situations, the texts transcribed in RP have some symbols which are used in speaking, such as '...' to represent pauses, hesitation, and so on. This will affect the results with regard to when a sentence should be finished. Therefore, a sentence with such symbols may be treated differently in RP and AP (see Figure 7.15). For RP, it will be treated as one sentence, but AP will automatically treat it as two or more separate ones. This will affect the temporary level of this sentence, as for RP it may be treated as Level 4, while for AP it may be treated as Levels 2, 3 or 4, depending on where the sentence ends.

Informant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cancel Inver.																				
Aux/Do2nd		+		+		+		+	+											
3sg-s	+	+		/		+		/	+											
Y/N Inver	+	+		+		+		+	/											
Particle V	/	+		/		/		/	/											
Copu. Inver.	/	+		+		/		+	/											
Neg+V	/	/		+		/		/	+											
Do Front	/	/		/		/		/	/											
Topi	/	/		+		+		/	+											
ADV	+	+	+	/	+	/	+	+	+											
SVO	+	+	+	+	+	+	+	+	+											
Plural	+	+	+	+	+	+	+	+	/											
Poss. Pro	+	+	+	+	+	+	+	+	+											
Object Pro	/	+	/	+	/	+	+	+	+											
Sg. Words	+	+	+	+	+	+	+	+	+											
AP Level	5	5	3	5	3	5	3	5	5											
Manual L.	5	5	3	5	3	5	3	5	5											
Percentage of Agreement	100%																			

Figure 7.14: RP transcribed texts analysis compared to Manual analysis

Informant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cancel Inver.																				
Aux/Do2nd		+		+		+		+	+											
3sg-s	+	+		/		+		/	+											
Y/N Inver	+	+		+		+		+	/											
Particle V	/	+		/		/		/	/											
Copu. Inver.	/	+		+		/		+	/											
Neg+V	/	/		+		/		/	+											
Do Front	/	/		/		/		/	/											
Topi	/	/		+		+		/	+											
ADV	+	+	+	/	+	/	+	+	+											
SVO	+	+	+	+	+	+	+	+	+											
Plural	+	+	+	+	+	+	+	+	/											
Poss. Pro	+	+	+	+	+	+	+	+	+											
Object Pro	/	+	/	+	/	+	+	+	+											
Sg. Words	+	+	+	+	+	+	+	+	+											
AP Level	5	5	3	5	3	5	3	5	5											
RP Level.	*5*	*5*	*3*	*5*	*3*	*5*	*3*	*5*	*5*											
Percentage of Agreement																				

Figure 7.15: RP transcribed texts analysis done by AP compared to RP analysis

7.4 Reliability

As the purpose of this project is to design a system which can do automatic linguistic profiling in an ESL context, I will list the specific questions as well as qualitative and quantitative approaches to examine whether AP can do what it was designed for. Four specific questions are considered, as follows:

1. Can AP be as reliable and accurate as the analyst in RP in determining learners' developmental stages of English?
2. Can AP use an online survey method to elicit data from informants?
3. Can AP describe the learners' developmental stages of online written English in real time?
4. Can AP correctly describe what learners have acquired in terms of their interlanguage distributions?

The answers to these four research questions are positive. Specifically, after hundreds of online and/or on the spot tests of the system, I found that AP is very reliable and accurate in analysing data, including with regard to both the developmental stages of English and the interlanguage distributions. In fact, the quantitative and qualitative methods also show that AP can be improved to almost a 100% correct rate in coding, analysing and displaying. In other words, for all the informants AP can correctly identify their developmental stages of English and interlanguage distributions through online analysis of their written data. This means that AP is a reliable language profiling tool for providing positive answers to the four research questions.

In addition to the four research questions, a quantitative study is undertaken to see whether AP can be improved so that the correction rate rises from 90% to 100%. The answer to this is again positive, and can be explained from several perspectives that are related to mistakes in the profiling. The first sets of mistakes are related to unknown words, which are not in the data bank. Specifically, after online and on the spot testing, the mistakes due to unknown words were found to account for no more than 5% of the total words elicited, and this problem can be addressed by simply adding words to the data bank. In fact, this adding process is unlikely to be necessary, as the informants are second language learners who normally do not have a large vocabulary. Even if there is a misspelled word, AP can automatically treat it as a plural form of a noun, and this will not affect the language profile outcomes of a learner. The second set of potential mistakes or problems are because the

algorithm in AP is incorrect, such as with regard to its annotation function. This type of mistake can be easily amended because of the simple and effective algorithms in Auto Profiling (see section 6.2). Other problems may relate to how strict the classifications should be. For example, should the sentence ‘How are you’ be treated as temporary Level 1 or Level 4? When treated as level 1, it is diagnosed as a formula sentence. while when diagnosed as level 4, it is treated as a Copular Inversion. The answer to this question may affect the final developmental stage of English, so it is not a trivial issue. In fact, this kind of mistake can be seen at the beginning of the process of designing the annotation algorithm and/or the distribution rules. However, at the end of the design process, annotation and interlanguage distribution mistakes are very rare. Specifically, after modifying the Correct Ranking Bank and Distribution Rules, as well as the Structure Filter modules, any problems, such as wrong annotation and lower ranks, were solved and the system was improved. The last set of potential mistakes did not occur, because the informants produced enough data to prevent problems in deciding whether their sentences were formulae or not. In short, the results show that the system can be improved so that the correction rate rises from 90% to 100%.

In addition, a qualitative study is undertaken to check whether AP meets three sequential tests. Specifically, the results of the first test should be 95% correct with regard to item analysis, a high percentage recommended by my advisor, with the aim of achieving a very efficient system, and then later on this can be improved. Next, the results of the second test should be 100% correct using the same data. Finally, the results of the third test with new data should be better than those of the first test.

The results of the first test of the profiling system were also positive. In fact, after three major changes to the system, the results of the first test were always over 95% correct with regard to item analysis. The second version was then developed when it was found that the first one could not operate the time-constrained function to simulate speaking conditions, and this is critical when AP elicits informants’ written data. This process took another half year to develop successfully, and the third version of AP is the current one, in which the modules have been upgraded, especially those for the C-structure and Correction functions. This process required a significant amount of testing, as if one part the system was out of order, the whole system would not be able to function properly because the analysed data are shared by different parts of the system. However, this also means that if one part of the

system is fixed, the rest of the system will be on the track of profiling language. Therefore, although AP may rely on many different programming systems and modules to achieve its objectives, it is quite easy to maintain its performance so long as each algorithm does what it is supposed to. In short, even before the actual testing of the 'finished' profiling system, it underwent a long process of trials and revisions, especially with regard to the programming and algorithms. Consequently, this system has already been tested many hundreds of times. The final version of AP has also been tested online and in real situations, with at least 100 informants logged onto the system at once. It is at least 95% right in terms of coding and analysing data items, such as words and sentences, and in providing the developmental stages of English. Therefore, the system is able to pass the first test.

The results of the second test were better than those of the first one, and it was100% correct using the same data. Finally, the results of the third test with new data were again positive, due to the elements that were modified after the first two tests. Consequently, under normal circumstances, the correction rate was always over 95%. In fact, as AP is an automatic system, which can code, analyse or display informants' data by the computational algorithms, there will be no inter- or intra- variances by whatever approaches are used. Consequently, the results of AP will always be the same for any given input. In addition, AP has the time-constrained function, and after more than 100 online assessments, I found that unless the test takers are very familiar with using a keyboard, there will be many deleted words and sentences. However, this does not change the developmental stages of English. For example, the informants in Korea provided the following solid results. The onsite Auto Profiling operation in Korea in April, 2009, was an interesting and fruitful experience, and included four informants aged around 18. First, one of the informants used a specific strategy to get better results. He was a student from an international high school, with quite good proficiency in English. When he found out about the time-constrained function, he did not type as fast as possible, but rather thought carefully before entering the words. At the end of the assessment, although he did not produce a lot of sentences he still achieved Level 5, which proves that informants do not have to type in a lot of sentences to get a good result. Moreover, another student still obtained the same feedback as those who entered more sentences. This proves that the general typing speed does not affect the overall result of AP, so long as the data is entered within the time constraints.

To sum up, the aggregated data and successful test results show that the Auto Profiling

system is feasible for conducting automatic linguistic profiling in the ESL context.

Chapter 8 The Evolution of Auto Profiling

In this chapter, I will I will discuss the highly difficult evolution of the AP system, including some major problems I encountered and some strategies I used to overcome these. Specifically, in order to expand the functions of a linguistic parser for a second language learner, there are three major changes in the system. The first system is relatively simple in terms of functions. I simply tried to see if it was possible to design a parser that could analyze second language data, as there has not yet been a parser that can automatically analyze second language data efficiently. The second version was then developed when it was found that the first one could not operate the time-constrained function to simulate speaking conditions, and this is critical when AP elicits informants' written data. In fact, there is also another function to go with the system, the erasable function to imitate slips of the tongue when speaking. Finally, the third version of AP is the current one, in which the modules have been upgraded, especially those for the C-structure and Correction functions. In short, the upgrading process of the system is innovative, creative as well as somehow 'unprecedented' because it is a system that was never designed for a second language learner.

During the development of the system, there were several problems that arose:

First, there have been three major changes in the system, each of which will affect the variables in it. Specifically, I have to define what each variable in the system is and how it should be used otherwise I may have a system which cannot achieve what I intend to either because the scope of a variable is too narrow or too general. When a variable is too narrow, it will not get a matched item during analysis. However, when it is too general, it may cause some unnecessary consequences such as too many matched items during analysis.

To solve this problem, I needed to go back to the linguistic theory, Processability Theory, and Rapid Profile for further consultation. For example, using the concept of PT and the applications of PT by RP, I could use different levels of developmental stages to define the temporary level of each produced 'sentence'. By doing this, my variables would not be too narrow or too general.

Another problem is to decide how much time I should give to the informants to type in their words and sentences. To solve this problem is not easy. First, I have to know how much time to allow an ordinary student to type in a word and a sentence. In fact, my advisor thought that we could use a timer and a paragraph to test out how much time is needed for a

particular informant. However, this idea was dropped, because I thought it would take more time for an informant to complete the profiling, which is against my idea of quickly getting a profile for each informant. In fact, I set the time by testing out how much is needed to type a word and sentence. Eventually, after several trials, I thought 3 seconds for a word and 30 seconds for a sentence were appropriate, because that almost always allowed me to elicit what I wanted.

One other problem I faced is how to find the bugs during the writing of the program, especially in the algorithms, where there were the contradictory statements in the algorithms for a function and/or procedural. Luckily, after much debugging, I found out that I could again use Processability Theory to clarify some of the overlapping functions by using statements based on syntactical and morphological structures. This can save the need for a lot of unnecessary statements when matching the structures produced. Specifically, as I did not use probabilities to design this parser, I used the concept from the PT concept to define the scope of each statement in the algorithm. This can systematically layout the statements in the functions, helping me to find other contradictory statements in the algorithm.

The last common problem that I faced, was that when searching for matching items or structures, the computer will start out a set sequence which will affect the results of the analysis. For example, the item ‘Aux’ will be matched earlier than the item ‘Will’ because the letter ‘A’ is before the letter ‘W’. This is like the variation of language: a phenomenon when matching more than two results within the ‘Hypothesis Space’, I had to fine tune the statements in the algorithms so that the variations would not affect the results of matching. One fine tuning process is by adding one or more variables such, as ‘Did’, ‘Will’ and ‘Aux’.

Fortunately, after confirming that all the data and results could be exported for researchers, my advisor and I thought that we should stop expanding the functions, because there would be an endless upgrading process. Also, he recommended that I find a way to manage the system so as to make the display more user-friendly.

Chapter 9 Benefits of Auto Profiling

In this chapter, I will discuss and summarise the benefits of AP, which will be presented according to the relationships among teaching, learning and research. First, when it comes to teaching and learning, AP can provide suitable intervention, contextualized assessment, and processing procedures. Specifically, it can provide information as to whether a learner is ready for intervention. Doughty and Williams (1998, p192) stated that the challenge of determining what learners actually notice remains a difficult one. Explicit correction should thus be given, but ideally without stopping the flow of interaction. This can be achieved by intervening for less than a minute before resuming the task or conversation at hand. However, Doughty and Williams found that the problem is then how to provide the explicit focus on form at precisely the moment when the learner is capable of seeing the relationship between what was meant and how it should be said. This again proves the importance of knowing whether the learner is psychologically ready for an intervention. When the learner is ready, it is certain that through explicit intervention they will notice a difference between their own utterance and the target form. Nevertheless, most of the current methods cannot provide feedback or correction in real time for teachers to provide explicit or implicit corrections. Fortunately, AP can provide a profile of each learner in real time. Therefore, teachers can provide processable recasts or similar forms of feedback for learners, and this can save them a lot of time about deciding what to teach.

In addition, AP is a contextualized assessment system which can find out what learners can do in a simulated context. Doughty and Williams (1998, p193 citing Segalowitz & Gatbonton, 1994) pointed out that rules and forms learned in isolated grammar lessons may be remembered in similar contexts, but they may be harder to retrieve in the context of communicative interaction, making them essentially unusable. Making matters worse, Pienemann (1998) noted that learners taught in this fashion do not acquire the target levels of language, because they cannot use the rules and forms in real situations. Therefore, there is a sound practical basis for the integration of attention to form within communicative activities in psychological research on learning and memory. By extension, it is also only through real situations or communicative activities that an assessment system can really find out what learners can do or acquire, and achieving this is one of the aims of this project. As AP uses contextualized and time-constrained tasks to elicit learners' texts, it is able to more accurately assess learners' communicative ability. This can enable AP to elicit

learners' processing procedures, and thus help learners to understand what they do and do not know. As a result, they will be able to associate their learning with existing knowledge, making it more likely that it will be remembered.

Another benefit of AP is enabling more communication among researchers. Specifically, with AP, researchers can bridge the gap between psycho-linguistics and socio-linguistics because it can meet some of the important needs of both perspectives with regard to providing enough language profiling in terms of quantitative and qualitative data. Punch (2005, p41) pointed out that, broadly speaking, there are two main roles for a substantive explanatory theory in a study, namely testing or generating theory. The first is generally called theory verification and the second theory generation. When conducting theory verification and generation, researchers may use quantitative or qualitative methods, or both, depending on the research area, topic and context, but neither approach is better than the other. However, Punch pointed out that, historically, theory verification studies in social science research have more often been quantitative, and theory generation studies qualitative. Specifically, he pointed out that a theory verification study aims to test a theory, or, more accurately, to test propositions (that is, hypotheses) derived from the theory. In fact, he said that this is a very common model in social science areas which have traditionally emphasized quantitative research, such as psychology and some areas of education. Such a study starts with a theory, deduces hypotheses from it, and proceeds to test these. When it comes to language research, there has been a lot of research on language education, such as strategies and approaches to learning, supported by many different theories and concepts, and these can provide a variety of ways of understanding how a language is acquired.

However, because of the wide variety of approaches, these are sometimes difficult for other researchers to grasp, never mind apply. Although some researchers, especially in applied linguistics, think it a good idea to have different kinds of perspectives to explain various phenomena, at the present time they are only in the process of discovering problems related to such phenomena, and are not yet working on solving them. Meanwhile, in the real world, there are many students and teachers looking for solid theories to address their current problems in learning and teaching a language. In addition, any potential solid theories should be able to be tested within a short period of time, so that all the current theories can be examined and the best ones utilized. Fortunately, in this project I used PT, a very well-

tested theory, as the construct theory to design AP. This is so that there is a common platform for different perspectives of teaching and learning. As mentioned earlier, many perspectives need learners' authentic data based on grammatical items to examine the theories they are presenting. With the system presented in this work, when researchers use AP to verify their theory, they can actually accumulate their knowledge because they are using a well-tested theory as the platform.

Still another benefit of AP is providing professional help for teachers who are in need of a reliable assessment tool. In fact, even professional examiners have problems in acquiring reliable outcomes, not to mention ordinary teachers who are busy in class.

To be able to have reliable outcomes, a lot of professions have to work closely with each other, and this includes frequent communication, discussion and training. However, even if such work can be carried out, the scoring process may still be unreliable. First, the scoring procedures employed by researchers may serve as sources or error. Second, important qualities of measurement behaviours may be distorted or obscured by the characteristics of the scores that have been selected to represent them. Moreover, teachers have their own ideas of how to conduct testing. Finally, it seems from the literature that most of the studies on language testing do not attempt to present a fully integrated system. This is due to the fact that each system is unique in terms of construct validity, which is often far from robust. Consequently, one aim in designing AP is for researchers and teachers to work together. When researchers and teachers are working on an experiment, they can use the system for pre- and post-testing to find out whether there really is a difference in dependent variables—and whether any differences that are found are from treatment differences, rather than from the subjects.

Another benefit of AP is solving the problems of preventive teaching, because it can provide reliable language profiling of many learners in real time. Preventive teaching is inefficient and often ineffective, as teachers frequently teach materials and/or concepts before learners are actually ready to receive them, and thus mistakes will be addressed before learners have made them. To this end, Long (1996) noted that Tomasello and Herron's (1988, 1989) findings suggest that learners are better able to attend to and use information that is presented to them at the moment when they are the initiators of the relevant utterance, rather than when the attention to form is presented "preventively." With AP's task-based elicitation method, teachers can pinpoint areas of weakness that

learners should work on in order to reach their next developmental stage of English. Moreover, the Correction Function can provide instant feedback, enabling students to proceduralize their learning and speed up acquisition. Therefore, teachers do not need to use the preventive approach with the AP system. Furthermore, understanding of the target form does not require the same level of processability as acquiring the relevant developmental stage, as learners can process the structure passively because they do not need to produce it. This is very similar to Ellis and Cardieno's reports, which are widely used in teaching. In short, AP uses this approach by first providing material according to the learners' developmental stages, and then allowing them to 'passively' try to understand their next developmental stage. When the learners are passively familiar with this material, they then are ready to produce the structure 'actively' in the communicative learning environment.

AP can also provide frequent and appropriate assessment for learning and teaching. Specifically, it is very common for teachers to conduct tests to find out how much learners understand and how the teaching needs to change to meet the learners' needs. However, students commonly complain that tests are either unfair or not what they had been told to expect. Fortunately, AP can provide quick and easy assessment and feedback for both learners and teachers. This is also in line with the recommendations of Doughty and Long (2005, p403), who pointed out that it is necessary to develop practical measures of automaticity that can be easily administered in learning settings, and that do not require complex research designs involving only laboratory-based testing. In particular, they stated that it would be helpful to have measures that could be used in single case studies, so that the role of automaticity in a learner's language-skill development could be traced over time. As AP can provide online assessment and feedback in real time, teachers do not have to worry how to conduct tests and how to provide feedback quickly, or how to trace learners' interlanguage over time.

Providing a platform for teachers is another benefit of AP. With this system, each student's interlanguage distribution profile can be known in real time, and this can help the teacher to address their individual needs. Moreover, when a student has to go to another class, the new teacher who has access to this profile can immediately start to help them. In addition, teachers can share their teaching results more easily, because they have a common and reliable platform to evaluate students' language profiles. Once the results have been

obtained, they can be shared and discussed so that curriculum can be adjusted accordingly. Furthermore, teachers can use AP to evaluate their teaching methodology, and thus find out the best approaches to help their students. Finally, if teachers' want to publish research findings they can rely on this platform to do pre-, during and post-testing. With AP, they can save a lot of time in terms of locating subjects as well as testing them, and the results of this system can be validated in different experiments, because it has a consistent construct theory and almost has no inter- and intra-variances.

Finally, learners can also get many benefits from AP. When learners are working together, they feel more comfortable than when working with teachers. However, there is always the problem that they do not know whether what they have done on is right or wrong, and to find out they must go to a more knowledgeable person for feedback, which in class this is usually the teacher, who is not always available.

Fortunately, with the AP system students can overcome this problem by simply uploading their answers, and then they will receive immediate feedback and details of their interlanguage distribution profiles. In addition, the parents of learners can use the interlanguage distribution profile to know how their children are doing and what needs to be improved. This can save a lot of time that would otherwise be spent communicating with teachers. Moreover, parents can ask their children to take an online test at any time, and immediately get the results. As parents can work to motivate their own children as well as ensure that the necessary homework is being done, their ability to use AP can greatly improve learning outcomes.

Chapter 10: Directions for further research

With AP as the platform, there are many research areas that can be looked into in future work. One is an examination of the differences between spoken and written English when using different time-constrained functions. Specifically, with the time-constrained function provided by AP, writing can emulate speaking. When enough data are collected, the differences between spoken and written English can be roughly known. However, the speed of typing will affect the interlanguage results. At present, some of the final developmental stages of English found for writing are lower than those for speaking, and this is mainly because of the time-constrained function, which will delete incomplete words and sentences. Therefore, we need to find the most appropriate amount of time needed to type in a word and a sentence for each different individual, so that we can really have confidence in knowing how writing and speaking are related to each other. The second area for further research can be to examine the effects of AP in SLA research. Specifically, once we can prove the feasibility of AP, we can start working on how it can help verify theories. This is a cross-disciplinary project, and thus it will take some time, but at least there will be a reliable platform for different professionals to start their research without having to separately code and analyse linguistic features. The third possible direction for further research can be how to make AP more user-friendly, such as providing a forum in which users can discuss the results so as to develop or verify theories and teaching materials. Moreover, comparing AP with other language tests with regard to their effects on teaching and learning is another possible research issue. Specifically, in order to know how each teaching methodology really works, a valid language test/profile system is essential. Unfortunately, so far there is no assessment system which has a construct theory to prove that what is assessed is really what it is intended to be assessed. Also, there are no integrated theories in learning and teaching. As AP can be a reliable method of diagnosing each learner's language knowledge, it can be used to compare with other testing systems in terms of enhancing teaching and learning. Finally, how AP can help educational authorities design curricula and/or syllabus is another possible research direction. As AP is very useful in profiling a learner's language development, educational authorities can undertake research on how they can use it in designing teaching activities and/or materials.

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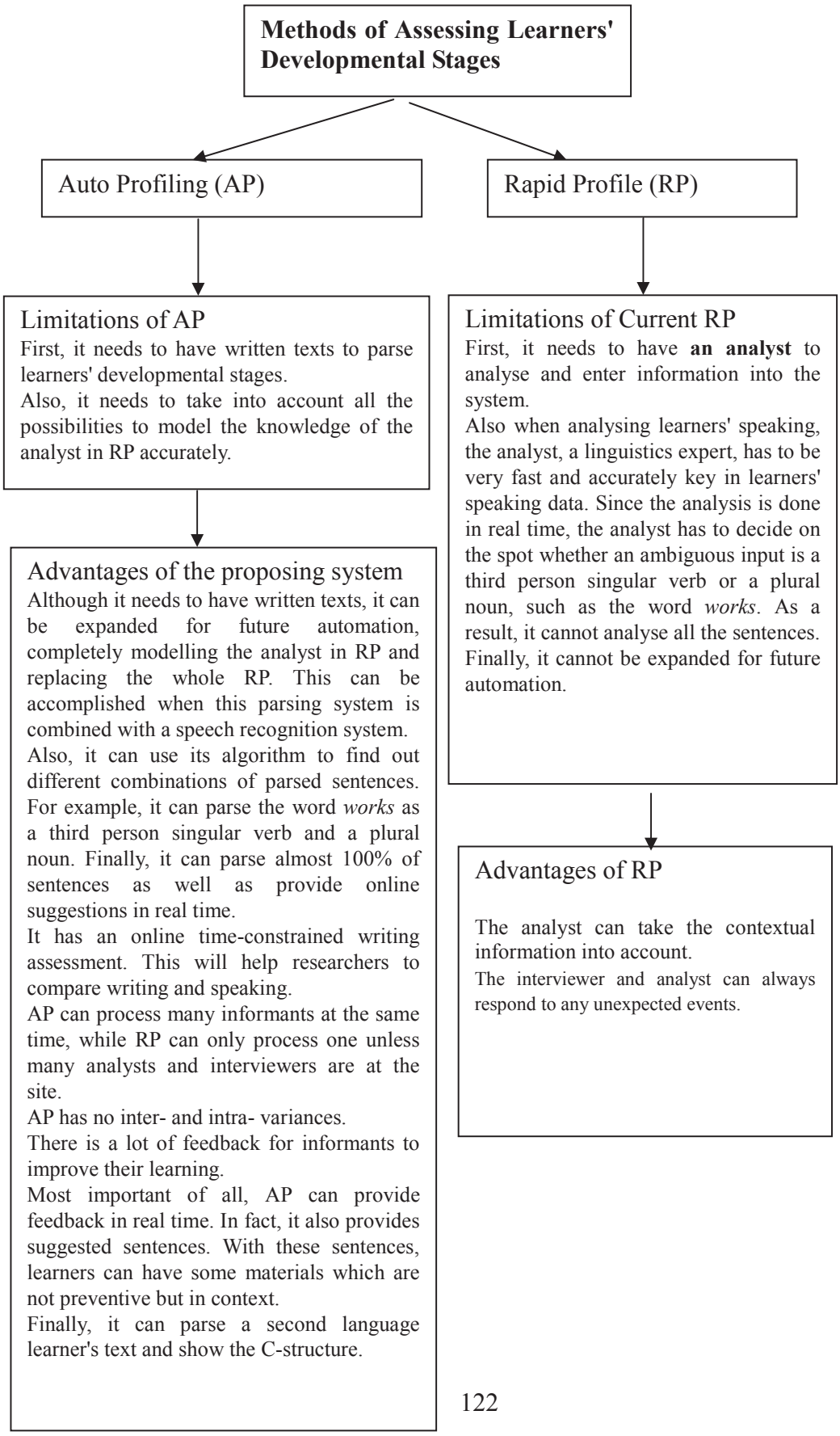
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Abbreviations:

AP	**Auto Profiling**
CA	**Conversational Analysis**
CHILDES	**Child Language Data Exchange System**
COMOLA	**COmputer MOdel for Language Acquisition**
L1	**First language**
L2	**Second language (including other languages acquired after L1)**
LARSP	**The Language Assessment, Remediation and Screening Procedure**
MM	**Multidimensional Model**
PT	**Processability Theory**
RP	**Rapid Profile**
SLA	**Second Language Acquisition**
SLL	**Second Language Learners**
TL	**Target Language**

Appendix A: A Comparison of Auto Profiling and Rapid Profile



Appendix B: Users' Answers

"answer_id","user_id","question_number","rank","sentences"
12,2,0,,"I ike it."
13,2,1,,"that is really gre. I don; that is great idea."
14,2,2,,"he does not like her."
15,2,2,,"he does not like her."
16,2,2,,"there is th eanswer."
17,2,3,,"Task four completed."
123,19,0,,"the first picture shows a group of peopa"
124,19,1,,""
125,19,2,,"the new coming teacher is very handsome and very nice he is tall and th.where do you come from. how long is your work."
126,19,3,,"who re they from."
127,26,0,,"USA.two picture. diffences. is my friend. best friend. my country firend. but i don't like he do some thing."
128,26,1,,"my father working in my house park everyday. my fa d. my father do anything in my house. company d. my friend."
129,26,2,,"what is you name d. what you name.where are you from. where are from."
130,26,3,,""
131,27,0,,""
132,27,1,,""
133,27,2,,"day sometimes she goes shopping in the morning."
134,27,3,,"what can we do before going to your classes. what field do you master in. t type of teaching style do you use. may I introduce myself first. what do you re freom your student. should we do any extra reading. what d o you do here. are you brothers."
135,28,0,,""
136,28,1,,"but ny mom most my mom mostly write reports. or what my friends does. i don't know what my dad does. theyre all about a pers."
137,28,2,,"is my teacher a men or a woman. ishe or she married had he or she got any chldren. is he or she mean. have you got a friend here."
138,28,3,,"what's your name. what are you doing here."

139,29,0,,"IN recently he the. and he is the most fmaous leader of the world. busi tbusi Busi is the U> S i do not believe his qual. All people in the world always believe him because he is the leader of the world."
140,29,1,,"S. Sometimes my mother draws some picture for me. my mother is the artist which in busan artist memeber."
141,29,2,,"are you go now on that dress. I'm really wondering where you a. I really like the reciece it from my mom> fication cause of his misorder. li. my father sit is the ceo at the company."
142,29,3,,"do you really like to be teach in here. and are you at the first time teach some subject for studetns. please tell me the university which you graduated."
163,31,0,,""
164,31,1,,"they get ready to go to wrok. they do call me every day they pray to gad for me evey dsy. day they go they fo they do eat sleep. I hope they do miss me every."
165,31,2,,"what is your mane. name. where have you been bofore before coming here. what would you expect from us. what kind of subject are you teaching. what is you interest. w are you going to haelp to mprove our studying skills. what should I do."
166,31,3,,"how are you.may I ask how d you get here."
167,32,0,,""
168,32,1,,"my father goes to work eveyday in the morning at about oclocl. I don't know the name of the man in thr right. where are you from. my mother stays at home all day but she goes out to the in the afternoon at about. are you proficient enought to supervisor me."
169,32,2,,"what is your spciality. I i i know the name of the man in the le."
170,32,3,,"who are you guys and what are you doig here. I haven't seen you beofre so you must form out of town right."
171,33,0,,"there are two pictures. ONe is about President Bush announcing something. The other one is presenting an commotin going on. I am guessing there is some between these two picture. I assume Mr. Bush is trying to solve the problem."
172,33,1,,"my father is retied army. he has nothing important to do everyd day. He likes to interfere others business all the time. think he is very annoying. love."
173,33,2,,"we are having a new teacher coming We are wondering what is she like.Is she a nice person. Will she teach us with interesting information. or is she a very strict one. She will be very harsh on every student."

174,33,3,,"How are you doing. Are you waiting for some person or are you justing sitting here for nothing. Is there anything I can hlep you with."
197,4,0,,"USA. two picture. diffences. is my friend. best friend. my country firend. but i don't like he do some thing."
198,4,1,,""
199,4,2,,"my father working in my house park everyday. my fa. d. my mather do anything in my house. company d. my friend. what is you name d."
200,4,3,,"what you name. where are from. where are you from"
201,5,0,,""
202,5,1,,"day sometimes she goes shopping in the morning."
203,5,2,,"what can we do before going to your classes. what field do you master in. t type of teaching style do you use. may I introduce myself first. what do you re from your student. Should we do any extra reading."
204,5,3,,"What d o you do here. are you brothers. Could."
208,6,0,,""
209,6,1,,"but ny mom most my mom mostly write reports. or what my friends does. I don't know what my dad does. theyre all about a pers."
210,6,2,,"is my teacher a men or a woman. ishe or she married had he or she got any dren. is he or she mean. have you got a friend here."
211,6,3,,"whats your name. what are you doing here."
212,7,0,,""
213,7,1,,"Do you really like to be teach in herer. And are you at the first time teach some subject for students. Please tell me the university which you graduated. S. Sometimes my mother draws some picture for me."
214,7,2,,"My mother is the artist which in busan artist member> are you go now on that dress. I'm really wondering where you a. I relly like the it from my mom. fication cause of his misorder. li. My father sit is the ceo at the company. IN recently he the. president and he is the most famous leader of the world."
215,7,3,,"predisent and he is teh most famous leader of the world. busi tbusi busi is the U. S ometimes i d not believe his qual. All people in the world always believe him because he is the leader of the"
216,8,0,,""

217,8,1,,"my mother worried about me. she makes food for my family."

218,8,2,,"what is your name. old are you. do you have boyfriend or girl friend."

219,8,3,,"where are you come from. i think they are bad guys."

220,9,0,,"executive election president vote.exectitive election president vote."

221,9,1,,"generous kind angel beautiful."

222,9,2,,"student teaching hobby clas grades."

223,9,3,,"career hobby job."

224,10,0,,""

225,10,1,,"they get ready to go to work. they do call me every day they pray to gad for me every dsy. day they go they fo they do eat sleep. I hope they do miss me every."

226,10,2,,"what is your mane. name. where have you been bofore before coming here. What would you expect from us. hat kind of subject are you teaching. what is you interest. w are you going to haelp to mprove our studying skills. what should I do for"

227,10,3,,"hello how are you. may I ask how d you get here."

232,12,0,,"there are two pictures. ONe is about President Bush announcing something. The other one is presenting an commotion going on. I am guessing there is some between these two picture. I assume Mr. Bush is trying to solve the problem."

233,12,1,,"My father is a retired army. He has nothing important to do everyday. He likes to interfere others business all the time. think he is very annoying lov. Love. We are having a new teacher coming we are wondering what is she like."

234,12,2,,"Is she a nice person. Will she teach us with interesting information. Or is she a very strict one. She will be very harsh on every student."

235,12,3,,"How are you doing. Are you waiting for some person or are you justing sitting here for nothing. Is there anything I can helpl you with."

405,13,0,,""

406,13,1,,"My father goes to work in the morning. He likes to"

407,13,2,,"How old are you. /W What color do you like. is your best friend."

408,13,3,,"How do you come to school. are You"

409,14,0,,"Bush was sead bad m.bad IS he truly bad man."

410,14,1,,"My mather is making ca. my father is goingto his office."

411,14,2,,"Are you going to Japan. Can you speak Japanise. Can you make hotcake. have you ever been to USA. e are you ng"

412,14,2,,"Are you going to Japan. Can you speak Japanise. Can you make hotcake. have you ever been to USA. e are you ng"
413,14,3,,"ARe you What are you doing na. Is this your car."
415,15,0,,""
416,15,1,,"they eaat meal.they like to talk to peop."
417,15,2,,"what your name.to do you like to talk to tudents. are do you enjoy your job. will you remember our name. how"
418,15,3,,"can you guys dance are yopu y. are you brothers. are you"
425,17,0,,"a THey are at strike. b.a. The American President is addressing a ch. a. They are angery. b. He looks like happy. a. He is ve. talktive. They are busy."
426,17,1,,"father watches TV everyday. Mother cooks everyday. Friend goes shopping everyday. Friend goes swimming everyday."
427,17,1,,"father watches TV everyday. Mother cooks everyday. Friend goes shopping everyday. Friend goes swimming everyday."
428,17,2,,"How tall are you. How old are you. Why do you like to dress red clothes. How about your eyeshadow. How do you emake up. How do go to school. What is your habby. Do you like to sing. Do you like to take"
429,17,3,,"Are you friends or families. Where do you come from. What is your profession. What do you do here. Do you like to talk. Do you take a rest here. What is your topic. Do you like enjoy your leisure time."
430,18,0,,"t. the leader"
431,18,1,,"cooki.watch tv. see a movie. sing. use computer. reading."
432,18,2,,"how older are you. what's your name. what's your favorite."
433,18,3,,"why are you there why are you there. are you like red car. your skin are"
460,37,0,,"they are rivals. it seems something between them. against bush."
461,37,1,,"her work. a hard worker."
462,37,2,,"what are the goals of this course. where and when can we see you after class. how can i e the"
463,37,2,,"what are the goals of this course. where and when can we see you after class. how can i e the"
464,37,2,,"what are the goals of this course. where and when can we see you after class. how can i e the"

465,37,2,,"what are the goals of this course. where and when can we see you after class. how can i e the"

466,37,2,,"what are the goals of this course. where and when can we see you after class. how can i e the"

467,37,2,,"what are the goals of this course. where and when can we see you after class. how can i e the"

468,37,2,,"what are the goals of this course. where and when can we see you after class. how can i e the"

469,37,3,,"may i know who you why are you here. what are you doing here. are you"

470,39,0,,"the i is s rival.ng for him. bush looks unhappy.n tion will help them."

471,39,0,,"the i is s rival.ng for him. bush looks unhappy.n tion will help them."

472,39,1,,"my best friend takes a train to school. arrives at school by eight 'clock. then she starts her work in the department office.she is very busy. so she lunch at work."

473,39,1,,"my best friend takes a train to school. arrives at school by eight 'clock. then she starts her work in the department office.she is very busy. so she lunch at work."

474,39,2,,"t what are the goals of this course. how can we learn best.help."

475,39,3,,"who are you. what are you doing here. do you feel happy."

476,39,3,,"who are you. what are you doing here. do you feel happy."

477,39,3,,"who are you. what are you doing here. do you feel happy."

479,40,0,,"thet look busy and tired"

480,40,1,,"my friends goes to school everyday"

481,40,2,,"what"

482,40,3,,"picture they aer ready to"

496,41,0,,""

497,41,1,,""

498,42,0,,"I like to eat ice"

499,42,1,,"I like to play ball"

500,42,2,,"I"

501,42,3,,"ball"

502,43,0,,""

503,43,1,,"i like to piay ball"

504,43,2,,"i piay"

505,43,3,,"i read my book"

506,43,3,,"i read my book"

507,44,0,,"pie. I like to eat apple pie"

508,44,0,,"pie. I like to eat apple pie"

509,44,0,,"pie. I like to eat apple pie"

510,44,0,,"pie. I like to eat apple pie"

511,44,0,,"pie. I like to eat apple pie"

512,44,0,,"pie. I like to eat apple pie"

513,44,0,,"pie. I like to eat apple pie"

514,44,1,,"I like to play compurter games"

515,44,2,,"I played on line games."

516,44,3,,"parents"

517,16,0,,"The picture on the left side shows that their peple support them. But the picture on the right is facing problems."

518,16,1,,"My brother brakes my guitar everyday. His guitar skills aren't good but likes to show off. I like to playu guitar not flute or piano"

519,16,2,,"What is her favorite subject. What problems do you face at school like we do now. What kind of music do you like. Is it heavy metal. Whatr kind of food do you enjoy the most now>"

520,16,3,,"Why are you guys acting so cool when you are not. And what scores do you get in the exams. I bet you are worst then me. I think they have too much fun like that. We don't welcome them."

546,11,0,,"I don't know the name of the man in the right."

547,11,1,,"My father goes to work everyday in the morning at about oclock.My mother stays at home all dya but she goes out to the market in the afternoon at about."

548,11,2,,"I haven't seen you before so you must from out of town right. Where are you from.What is your specialty. ARe you proficient enough to supervisor me."

549,11,3,,"Who are you guys and what are you doig here."

550,30,0,,""

551,30,1,,"get up They get up early in the morning and go for the walk. They excercise in the park for one hour every morning."

552,30,1,,"get up They get up early in the morning and go for the walk. They excercise in

the park for one hour every morning."
553,30,1,,"get up They get up early in the morning and go for the walk. They excercise in the park for one hour every morning."
554,30,1,,"get up They get up early in the morning and go for the walk. They excercise in the park for one hour every morning."
555,30,1,,"get up They get up early in the morning and go for the walk. They excercise in the park for one hour every morning."
556,30,2,,"What is your name. Are What is your nationality/ Where did you come from. When did you come to Taiwan. Where do you live. Are you married."
557,30,3,,"Are you friends. Where are you going. Whose car is this. When did you buy it. Do you die you buy this car."
558,34,0,,"you are online now."
559,34,1,,"you are a man. he takes a"
560,34,2,,""
561,34,3,,""
575,36,0,,"He like to eat. He like to eat people. He is not good."
576,36,1,,"my father like to watch TV. He lives in Taiwan. He work every day."
577,36,2,,"is the teacher good. Does the teacher live in TAiwan. Does the teacher live around here. Does the teacher have a car."
578,36,3,,"you live here/ Do you have a car. is this your car. What are you doing. Can you drive."
583,35,0,,"He is my father. He likes me. I like him."
584,35,1,,""
585,35,2,,"He is a student. He comes from Taiwan. I like him and he likes me. We are freidns. He has a lot of friends. I also have a lot of friends. My friendd and his freends are good friendss."
586,35,3,,""
587,45,0,,"There are many people on the left picture. There is only one person on the right. I know the right one but I don't know the left one."
588,45,1,,"My father is a worker. He works almost every day. He llikes to watch TV. When he has time he like to go to Taipei. He sometimes does a lot of cooking."
589,45,2,,"Is he a teacher. are you know him. Can you asks him. t What is his name. Is he

old. Are you go to see him."

590,45,3,,"What are you doing. Are you waiting for someone. Can you tell him where are you. I don't know this place. Can you fix this car."

Appendix C: Ranked Sentences

"sentence_id","c_structure","rank","rank_subgroup"

1219,"Adj",1,"Adj"

1602,"Adj",1,"Adj"

1606,"Adj",1,"Adj"

1714,"Adj",1,"Adj"

2712,"Adj",1,"Adj"

2716,"Adj",1,"Adj"

2751,"Adj",1,"Adj"

3064,"Adj",1,"Adj"

963,"AdjAdjAdvNplVplToDetNplConjProsVplPossNsiToDetNsi",3,"AdvNsiNpl"

987,"AdjAdjAdvNplVplToDetNplProsVplPossNsiToDetNsi",3,"AdvNsiNpl"

963,"AdjAdjAdvNplVppToDetNplConjProsVplPossNsiToDetNsi",3,"PossNsiNpl"

987,"AdjAdjAdvNplVppToDetNplProsVplPossNsiToDetNsi",3,"PossNsiNpl"

1841,"AdjAreProo",1,"N/A"

1841,"AdjAreProp",1,"N/A"

1569,"AdjConjWhAuxIVplAdv",5,"WhAux"

2679,"AdjConjWhAuxIVplAdv",5,"WhAux"

89,"AdjIsAdvNp",1,"N/A"

89,"AdjIsDisNp",1,"N/A"

2310,"AdjIsProsNplAdjNsi",4,"IsPros"

1157,"AdjNpl",2,"AdjNsiNpl"

1293,"AdjNpl",2,"AdjNsiNpl"

2933,"AdjNpl",2,"AdjNsiNpl"

3002,"AdjNpl",2,"AdjNsiNpl"

999,"AdjNsi",2,"AdjNsiNpl"

1255,"AdjNsi",2,"AdjNsiNpl"

1265,"AdjNsi",2,"AdjNsiNpl"

1268,"AdjNsi",2,"AdjNsiNpl"

1274,"AdjNsi",2,"AdjNsiNpl"

1361,"AdjNsi",2,"AdjNsiNpl"

1415,"AdjNsi",2,"AdjNsiNpl"

1711,"AdjNsi",2,"AdjNsiNpl"

1727,"AdjNsi",2,"AdjNsiNpl"

1728,"AdjNsi",2,"AdjNsiNpl"

1775,"AdjNsi",2,"AdjNsiNpl"

1934,"AdjNsi",2,"AdjNsiNpl"

1944,"AdjNsi",2,"AdjNsiNpl"

1947,"AdjNsi",2,"AdjNsiNpl"

1953,"AdjNsi",2,"AdjNsiNpl"

1986,"AdjNsi",2,"AdjNsiNpl"

1996,"AdjNsi",2,"AdjNsiNpl"

1999,"AdjNsi",2,"AdjNsiNpl"

2005,"AdjNsi",2,"AdjNsiNpl"

2748,"AdjNsi",2,"AdjNsiNpl"

2764,"AdjNsi",2,"AdjNsiNpl"

2765,"AdjNsi",2,"AdjNsiNpl"

2863,"AdjNsi",2,"AdjNsiNpl"

2900,"AdjNsi",2,"AdjNsiNpl"

1409,"AdjNsiAdj",2,"AdjNsiNpl"

2857,"AdjNsiAdj",2,"AdjNsiNpl"

963,"AdjNsiAdvNplVplToDetNplConjProsVplPossNsiToDetNsi",3,"AdvNsiNpl"

987,"AdjNsiAdvNplVplToDetNplProsVplPossNsiToDetNsi",3,"AdvNsiNpl"

963,"AdjNsiAdvNplVppToDetNplConjProsVplPossNsiToDetNsi",3,"PossNsiNpl"

987,"AdjNsiAdvNplVppToDetNplProsVplPossNsiToDetNsi",3,"PossNsiNpl"

1342,"AdjNsiHasDetNsiConjProsVplToDetAdjNsi",2,"AdjNsiNpl"

2982,"AdjNsiHasDetNsiConjProsVplToDetAdjNsi",2,"AdjNsiNpl"

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2838,"AdjNsiIsNpl",2,"AdjNsiNpl"

1438,"AdjNsiIsPreProo",2,"AdjNsiNpl"

2886,"AdjNsiIsPreProo",2,"AdjNsiNpl"

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1221,"AdjNsiNpl",2,"AdjNsiNpl"

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2924,"AdjNsiNsiConjAdjPreDetPreDetNplVplPreDetNpl",2,"AdjNsiNpl"

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1675,"AdjNsiProsVplToDetNsiTo",2,"AdjNsiNpl"

2829,"AdjNsiProsVplToDetNsiTo",2,"AdjNsiNpl"

1230,"AdjNsiVplToProoToVplPossNsi",3,"PossNsiNpl"

3075,"AdjNsiVplToProoToVplPossNsi",3,"PossNsiNpl"

1230,"AdjNsiVppToProoToVplPossNsi",3,"PossNsiNpl"

3075,"AdjNsiVppToProoToVplPossNsi",3,"PossNsiNpl"

1342,"AdjNsiVsiDetNsiConjProsVplToDetAdjNsi",5,"Ns"

2982,"AdjNsiVsiDetNsiConjProsVplToDetAdjNsi",5,"NsiVsi"

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1917,"Adv",1,"Adv"

1968,"Adv",1,"Adv"

3032,"Adv",1,"Adv"

1721,"AdvAdj",1,"N/A"

2758,"AdvAdj",1,"N/A"

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3038,"AdvAdvNpl",1,"N/A"

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3266,"AdvAreAdjNplPreDetAdjNsi",4,"AreNpl"

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3266,"AdvAreAdjNplPreDetVppNsi",4,"AreNpl"

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984,"AdvDetNsiNsiWhProsVppToDetNplAdvAdvVplNsiProsVsiVingPre",5,"ProsVsi"

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2006,"AdvDetNsiVplNsiPreNsi",3,"AdvNsiNpl"

984,"AdvDetNsiVplWhProsVedToDetNplAdvAdvVplNsiProsVsiVingPre",5,"ProsVsi"

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984,"AdvDetNsiVplWhProsVppToDetNplAdvAdvVplNsiProsVsiVingPre",5,"ProsVsi"

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1924,"AdvNpl",1,"N/A"

1976,"AdvNpl",1,"N/A"

1421,"AdvNsi",1,"N/A"

2869,"AdvNsi",1,"N/A"

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965,"AdvProoNsiAdjNsiVplNsiPreDetNplProsVingPre",3,"AdvSntcNplNsi"

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967,"AdvProsDoVplPreNsiNsi",2,"ProsPropVedVpl"

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3040,"AdvProsNotAdj",1,"N/A"

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2588,"AdvProsNsiPreVpl",2,"Pronoun"

2589,"AdvProsNsiPreVpl",2,"Pronoun"

1604,"AdvProsNsiProo",2,"Pronoun"

2714,"AdvProsNsiProo",2,"Pronoun"

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2800,"AdvProsVed",3,"AdvPros"

1262,"AdvProsVplNsiToPoss",3,"AdvPros"

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1993,"AdvProsVplNsiToPoss",3,"AdvPros"

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1941,"AdvProsVplNsiToProo",3,"AdvPros"

1993,"AdvProsVplNsiToProo",3,"AdvPros"

1269,"AdvProsVplVpl",3,"AdvPros"

1948,"AdvProsVplVpl",3,"AdvPros"

2000,"AdvProsVplVpl",3,"AdvPros"

1276,"AdvProsVplVplToNsi",3,"AdvPros"

1955,"AdvProsVplVplToNsi",3,"AdvPros"

2007,"AdvProsVplVplToNsi",3,"AdvPros"

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983,"AdvProsVsiToBeDetNplDetNplVplProoVppDetNsi",5,"ProsVsi"

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3058,"AdvToVplNsiPrePossNsi",3,"PossNsiNpl"
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2778,"AdvVplConjAdvVplProsAdvVpl",1,"N/A"
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2778,"AdvVplConjPreVplProsAdvVpl",1,"N/A"
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1822,"AdvVplProoDetNsiWhPropNpl",2,"VplProo"
1354,"AmIAdj",4,"AmI"
2994,"AmIAdj",4,"AmI"
1242,"AmIAdjAdjNpl",2,"AdjNsiNpl"
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1973,"AmIAdjAdjNpl",2,"AdjNsiNpl"
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2332,"AreDoProoVplPossNsi",3,"PossNsiNpl"
2332,"AreDoPropVplPossNsi",5,"DoProp"
110,"AreProoNpl",1,"N/A"
2405,"AreProoPreAdjNsi",2,"AdjNsiNpl"
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2405,"AreProoVplAdjNsi",2,"VedVplNsiNpl"

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3279,"AreProoVplToVplProo",2,"VplProo"

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811,"ArePropDetAdjNsi",4,"AreNpl"

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1149,"ArePropVingPreAdjNsiConjArePropNplVingAdvPreNsi",5,"PropVing"

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3281,"ArePropVingPreNsi",5,"AreProp"

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2323,"ArePropWhArePropVingNpl",4,"WhAre"

2332,"AreVplProoVplPossNsi",3,"PossNsiNpl"

2332,"AreVplPropVplPossNsi",3,"PossNsiNpl"

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3157,"AreWhIsPossNplWhAuxPropVplPre",5,"WhAux"

3157,"AreWhIsPossNplWhAuxPropVppPre",4,"WhIs"

3157,"AreWhIsPossNplWhDidProoVplPre",4,"WhIs"

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3157,"AreWhIsPossNplWhDidPropVppPre",4,"WhIs"

3157,"AreWhIsPossNplWhVedProoVplPre",4,"WhIs"

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3157,"AreWhIsPossNplWhVedPropVplPre",4,"WhIs"

3157,"AreWhIsPossNplWhVedPropVppPre",4,"WhIs"

1802,"Aux",1,"N/A"

3231,"AuxDetNsiHaveDetNsi",5,"AuxNsi"

1700,"AuxDetNsiVpl",5,"AuxNsi"

2737,"AuxDetNsiVpl",5,"AuxNsi"

3231,"AuxDetNsiVplDetNsi",5,"AuxNsi"

3230,"AuxDetNsiVplPreAdv",5,"AuxNsi"

3229,"AuxDetNsiVplPreNsi",5,"AuxNsi"

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2606,"AuxIVpl",1,"N/A"

2607,"AuxIVpl",1,"N/A"

2608,"AuxIVpl",5,"AuxI"

1021,"AuxIVplNplAdj",2,"VedVplNsiNpl"

1797,"AuxIVplNplAdj",2,"VedVplNsiNpl"

1021,"AuxIVplNplAdv",2,"VedVplNsiNpl"

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2569,"AuxIVplWhPropWhArePropNsi",4,"WhAre"

3284,"AuxProoNplAdjNsi",2,"AdjNsiNpl"

2314,"AuxProoVplNpl",2,"VedVplNsiNpl"

2315,"AuxProoVplNpl",2,"VedVplNsiNpl"

2318,"AuxProoVplNpl",2,"VedVplNsiNpl"

2320,"AuxProoVplNpl",2,"VedVplNsiNpl"

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2333,"AuxProoVplPossNsi",3,"PossNsiNpl"

3286,"AuxProoVplProo",2,"VplProo"

1314,"AuxProoVplProoNplDetNsiPreDetNsi",2,"VplProo"

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3282,"AuxProoVplProoWhAreProo",2,"VplProo"

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3284,"AuxPropNplAdjNsi",2,"AdjNsiNpl"

3235,"AuxPropVpl",5,"AuxProp"

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1693,"AuxProsNsiAdjNsi",2,"AdjNsiNpl"

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1145,"AuxProsVplProoPreAdjNsi",5,"AuxPros"

1888,"AuxProsVplProoPreAdjNsi",5,"AuxPros"

1691,"AuxProsVplToPossNsi",5,"AuxPros"

2728,"AuxProsVplToPossNsi",5,"AuxPros"

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1574,"ComNplNpl",1,"N/A"

2684,"ComNplNpl",1,"N/A"

1240,"ConjAdjNplProsVsi",5,"ProsVsi"

1919,"ConjAdjNplProsVsi",5,"ProsVsi"

1971,"ConjAdjNplProsVsi",5,"ProsVsi"

1451,"ConjAdjNsiIsNpl",2,"AdjNsiNpl"

2899,"ConjAdjNsiIsNpl",2,"AdjNsiNpl"

1437,"ConjAdjNsiIsPreProo",2,"AdjNsiNpl"

2885,"ConjAdjNsiIsPreProo",2,"AdjNsiNpl"

1248,"ConjAdjProsVpl",2,"ProsVpl"

1927,"ConjAdjProsVpl",2,"ProsVpl"

1979,"ConjAdjProsVpl",2,"ProsVpl"

1394,"ConjAdjVplToNsi",2,"VplNsiNpl"

2842,"ConjAdjVplToNsi",2,"VplNsiNpl"

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3014,"ConjAdv",1,"N/A"

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1232,"ConjAdvDetNsiNpl",1,"N/A"

3077,"ConjAdvDetNsiNpl",1,"N/A"

1193,"ConjAdvNpl",1,"N/A"

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1998,"ConjProsNsiNsiPreDetNsi",2,"Pronoun"

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2016,"ConjProsVplVplToToVpl",2,"ProsVpl"

1433,"ConjProsVplWhProsVplPreProo",3,"WhProsV"

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1372,"ConjVedNsiProsVppAdjNsiPreVpl",2,"VedVplNsiNpl"

2911,"ConjVedNsiProsVppAdjNsiPreVpl",2,"VedVplNsiNpl"

1386,"ConjVedPreDetNsiNsiDetNsiProsVplPreDetNsi",2,"ProsVpl"

2925,"ConjVedPreDetNsiNsiDetNsiProsVplPreDetNsi",2,"ProsVpl"

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2925,"ConjVedPreDetNsiVplDetNsiProsVplPreDetNsi",2,"VedVplNsiNpl"

1624,"ConjVplConjAdvVplProsAdvVpl",1,"N/A"

2778,"ConjVplConjAdvVplProsAdvVpl",1,"N/A"

1624,"ConjVplConjPreVplProsAdvVpl",1,"N/A"

2778,"ConjVplConjPreVplProsAdvVpl",1,"N/A"

1387,"ConjVplDetNplConjVedPreDetNplConjProsHaveVplNsiDetNplPreDetNpl",2,"Ved
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2926,"ConjVplDetNplConjVedPreDetNplConjProsHaveVplNsiDetNplPreDetNpl",2,"Ved
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1387,"ConjVplDetNplConjVedPreDetNplConjProsVplVplNsiDetNplPreDetNpl",2,"VedVp
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2926,"ConjVplDetNplConjVedPreDetNplConjProsVplVplNsiDetNplPreDetNpl",2,"VedVp
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2926,"ConjVplDetNplConjVplPreDetNplConjProsHaveVplNsiDetNplPreDetNpl",2,"VedV
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2916,"ConjVplPreDetAdjNsiNsiPreDetNsi",2,"AdjNsiNpl"
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2916,"ConjVplPreDetAdjNsiVplPreDetNsi",2,"AdjNsiNpl"
1377,"ConjVplPreDetAdvNsiNsiPreDetNsi",2,"VplNsiNpl"
2916,"ConjVplPreDetAdvNsiNsiPreDetNsi",2,"VplNsiNpl"
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2916,"ConjVplPreDetAdvNsiVplPreDetNsi",3,"AdvNsiNpl"
1386,"ConjVplPreDetNsiNsiDetNsiProsVplPreDetNsi",2,"ProsVpl"
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1386,"ConjVplPreDetNsiVplDetNsiProsVplPreDetNsi",2,"VedVplNsiNpl"
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2911,"ConjVppNsiProsVedAdjAdjPreVpl",2,"ProsVed"
1372,"ConjVppNsiProsVedAdjNsiPreVpl",2,"VedVplNsiNpl"
2911,"ConjVppNsiProsVedAdjNsiPreVpl",2,"VedVplNsiNpl"
1372,"ConjVppNsiProsVplAdjAdjPreVpl",2,"ProsVpl"
2911,"ConjVppNsiProsVplAdjAdjPreVpl",2,"ProsVpl"
1372,"ConjVppNsiProsVplAdjNsiPreVpl",2,"VedVplNsiNpl"
2911,"ConjVppNsiProsVplAdjNsiPreVpl",2,"VedVplNsiNpl"

1372,"ConjVppNsiProsVppAdjNsiPreVpl",2,"AdjNsiNpl"

2911,"ConjVppNsiProsVppAdjNsiPreVpl",2,"AdjNsiNpl"

1386,"ConjVppPreDetNsiNsiDetNsiProsVplPreDetNsi",2,"ProsVpl"

2925,"ConjVppPreDetNsiNsiDetNsiProsVplPreDetNsi",2,"ProsVpl"

1386,"ConjVppPreDetNsiVplDetNsiProsVplPreDetNsi",2,"VedVplNsiNpl"

2925,"ConjVppPreDetNsiVplDetNsiProsVplPreDetNsi",2,"VedVplNsiNpl"

1588,"ConjWh",1,"N/A"

2698,"ConjWh",1,"N/A"

1863,"ConjWhAreProp",4,"WhAre"

1607,"ConjWhAuxProsVplAdjNsi",5,"WhAux"

2717,"ConjWhAuxProsVplAdjNsi",5,"WhAux"

1607,"ConjWhAuxProsVplNsiNsi",5,"WhAux"

2717,"ConjWhAuxProsVplNsiNsi",5,"WhAux"

1730,"ConjWhAuxProsVplToNsi",5,"WhAux"

2767,"ConjWhAuxProsVplToNsi",5,"WhAux"

1607,"ConjWhDidProsVplAdjNsi",5,"WhProsPropDidWill"

2717,"ConjWhDidProsVplAdjNsi",5,"WhProsPropDidWill"

1607,"ConjWhDidProsVplNsiNsi",5,"WhProsPropDidWill"

2717,"ConjWhDidProsVplNsiNsi",5,"WhProsPropDidWill"

1730,"ConjWhDoesProsVplToNsi",5,"DoesPros"

2767,"ConjWhDoesProsVplToNsi",5,"DoesPros"

2669,"ConjWhNplDoProoVplPreDetNpl",2,"DetNpl"

2669,"ConjWhNplDoPropVplPreDetNpl",5,"DoProp"

2669,"ConjWhNplVplProoVplPreDetNpl",3,"WhNsiNpl"

2669,"ConjWhNplVplPropVplPreDetNpl",3,"WhNsiNpl"

1381,"ConjWhNsiVplPossPreNsiProsVplToDetNplConjNsiNsi",3,"WhNsiNpl"

2920,"ConjWhNsiVplPossPreNsiProsVplToDetNplConjNsiNsi",3,"WhNsiNpl"

1381,"ConjWhNsiVplPossPreNsiProsVplToDetNplConjVplNsi",3,"WhNsiNpl"

2920,"ConjWhNsiVplPossPreNsiProsVplToDetNplConjVplNsi",3,"WhNsiNpl"

1381,"ConjWhNsiVplProoPreNsiProsVplToDetNplConjNsiNsi",3,"WhNsiNpl"

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1028,"ConjWhPossNplAux",3,"PossNsiNpl"
1810,"ConjWhPossNplAux",3,"PossNsiNpl"
1028,"ConjWhPossNplDoes",3,"PossNsiNpl"
1810,"ConjWhPossNplDoes",3,"PossNsiNpl"
1028,"ConjWhPossNplVsi",3,"PossNsiNpl"
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2695,"ConjWhProsHaveNsi",3,"Wh"
1585,"ConjWhProsVplNsi",3,"WhProsV"
2695,"ConjWhProsVplNsi",3,"WhProsV"
1436,"ConjWhProsVplPreDetNpl",3,"WhProsV"
2884,"ConjWhProsVplPreDetNpl",3,"WhProsV"
1609,"ConjWhProsVplToDetNsiNpl",3,"WhProsV"
2719,"ConjWhProsVplToDetNsiNpl",3,"WhProsV"
1593,"ConjWhProsVplToVplDetNsi",3,"WhProsV"
2703,"ConjWhProsVplToVplDetNsi",3,"WhProsV"
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2717,"ConjWhVedProsVplAdjNsi",2,"VedVplNsiNpl"
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2717,"ConjWhVedProsVplNsiNsi",2,"VedVplNsiNpl"
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2692,"ConjWhVedVpl",2,"WhVplVed"
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2767,"ConjWhVsiProsVplToNsi",2,"ProsVpl"
2358,"Det",1,"N/A"
2360,"Det",1,"N/A"
2364,"Det",1,"N/A"
1277,"DetAdjNsi",2,"AdjNsiNpl"
1956,"DetAdjNsi",2,"AdjNsiNpl"
2008,"DetAdjNsi",2,"AdjNsiNpl"
2547,"DetAdjNsi",2,"AdjNsiNpl"

2359,"DetAdjNsiIsNplDetNpl",2,"AdjNsiNpl"

1134,"DetAdjNsiIsNplDetNplVingPre",2,"AdjNsiNpl"

1877,"DetAdjNsiIsNplDetNplVingPre",2,"AdjNsiNpl"

1435,"DetAdjNsiPreNsi",2,"AdjNsiNpl"

2883,"DetAdjNsiPreNsi",2,"AdjNsiNpl"

992,"DetAdjNsiVsiDetNsiPreNpl",5,"Ns"

994,"DetAdjVingNsiIsAdvNplConjAdvAdjProsIsAdjConjNpl",2,"NsiIs"

1431,"DetAdvNplNpl",2,"Phrase"

2879,"DetAdvNplNpl",2,"Phrase"

992,"DetAdvNsiVsiDetNsiPreNpl",5,"Ns"

2572,"DetIIsNplNpl",2,"IThatIsAre"

2576,"DetIIsNplNpl",2,"IThatIsAre"

1367,"DetNplNsi",2,"Phrase"

2906,"DetNplNsi",2,"Phrase"

1241,"DetNsi",2,"Phrase"

1345,"DetNsi",2,"Phrase"

1364,"DetNsi",2,"Phrase"

1398,"DetNsi",2,"Phrase"

1403,"DetNsi",2,"Phrase"

1920,"DetNsi",2,"Phrase"

1972,"DetNsi",2,"Phrase"

2394,"DetNsi",2,"Phrase"

2846,"DetNsi",2,"Phrase"

2851,"DetNsi",2,"Phrase"

2903,"DetNsi",2,"Phrase"

2985,"DetNsi",2,"Phrase"

1419,"DetNsiConjDetNsiNsi",2,"DetNsi"

2867,"DetNsiConjDetNsiNsi",2,"DetNsi"

1296,"DetNsiIsNotNsi",2,"NsiIs"

2936,"DetNsiIsNotNsi",2,"NsiIs"

2359,"DetNsiNsiIsNplDetNpl",2,"NsiIs"

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985,"DetNsiNsiPossToDetWhProsVingPre",2,"ProsVing"

961,"DetNsiNsiProoToDetWhProsVingPre",2,"ProsVing"

985,"DetNsiNsiProoToDetWhProsVingPre",2,"ProsVing"

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2673,"DetNsiPreDetAdjNsiVsiAdjPossNplNsiProo",5,"NsiPreVsi"

2658,"DetNsiPreDetAdjNsiVsiAdjPossNplVplProo",3,"PossNsiNpl"

2673,"DetNsiPreDetAdjNsiVsiAdjPossNplVplProo",5,"NsiPreVsi"

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985,"DetNsiVplPossToDetWhProsVingPre",2,"ProsVing"

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3054,"DetNsiVplProo",2,"VplProo"

961,"DetNsiVplProoToDetWhProsVingPre",2,"VplProo"

985,"DetNsiVplProoToDetWhProsVingPre",2,"VplProo"

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2356,"DetPropArePreVpl",2,"ProsPropIsAre"

2023,"DidProoVplNsi",2,"VedVplNsiNpl"

2023,"DidPropVplNsi",5,"DidProp"

956,"DisDetNsi",2,"Phrase"

980,"DisDetNsi",2,"Phrase"

1700,"DoesDetNsiVpl",5,"Does"

2737,"DoesDetNsiVpl",5,"Does"

3231,"DoesDetNsiVplDetNsi",5,"Does"

3230,"DoesDetNsiVplPreAdv",5,"Does"

3229,"DoesDetNsiVplPreNsi",5,"Does"

3230,"DoesDetNsiVplPreNsi",5,"Does"

1694,"DoesProsHaveDetNsi",4,"DoesDidPros"

2731,"DoesProsHaveDetNsi",4,"DoesDidPros"

1693,"DoesProsNsiAdjNsi",2,"AdjNsiNpl"

2730,"DoesProsNsiAdjNsi",2,"AdjNsiNpl"

1693,"DoesProsVplAdjNsi",5,"DoesPros"

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2769,"DoesProsVplNplPreAdjNsi",5,"DoesPros"

1732,"DoesProsVplNplPreNsiNsi",5,"DoesPros"

2769,"DoesProsVplNplPreNsiNsi",5,"DoesPros"

1693,"DoesProsVplNsiNsi",5,"DoesPros"

2730,"DoesProsVplNsiNsi",5,"DoesPros"

1691,"DoesProsVplToPossNsi",5,"DoesPros"

2728,"DoesProsVplToPossNsi",5,"DoesPros"

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2390,"DoProoVplDetNsiNsi",2,"VedVplNsiNpl"

2390,"DoProoVplDetVplNsi",2,"VedVplNsiNpl"

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3165,"DoProoVplPropVplAdjNsi",2,"VedVplNsiNpl"

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2392,"DoProoVplVplPossNplNsi",3,"PossNsiNpl"

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1057,"DoPropAdvVplDetNsi",2,"VedVplNsiNpl"

1155,"DoPropAdvVplPreNpl",5,"DoProp"

1820,"DoPropAdvVplToBeVplPreNpl",5,"DoProp"

1698,"DoPropHaveAdjNsi",5,"DoProp"

2735,"DoPropHaveAdjNsi",5,"DoProp"

1842,"DoPropHaveNplConjNsiNsi",5,"DoProp"

1697,"DoPropHaveNsi",5,"DoProp"

2734,"DoPropHaveNsi",5,"DoProp"

3165,"DoPropNsiProoVplAdjNsi",2,"VedVplNsiNpl"

3165,"DoPropNsiProoVplNsiNsi",2,"VedVplNsiNpl"

3165,"DoPropNsiPropVplAdjNsi",2,"VedVplNsiNpl"

3165,"DoPropNsiPropVplNsiNsi",2,"VedVplNsiNpl"

2392,"DoPropPreVplPossNplNsi",3,"PossNsiNpl"

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2601,"DoPropVplAdj",5,"DoProp"

1698,"DoPropVplAdjNsi",5,"DoProp"

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2020,"DoPropVplNpl",5,"DoProp"

1842,"DoPropVplNplConjNsiNsi",5,"DoProp"

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3165,"DoPropVplProoVplAdjNsi",5,"DoProp"

3165,"DoPropVplProoVplNsiNsi",5,"DoProp"

3165,"DoPropVplPropVplAdjNsi",5,"DoProp"

3165,"DoPropVplPropVplNsiNsi",5,"DoProp"

2389,"DoPropVplToNsi",5,"DoProp"

2383,"DoPropVplToVpl",5,"DoProp"

2384,"DoPropVplToVpl",5,"DoProp"

2389,"DoPropVplToVpl",5,"DoProp"

2392,"DoPropVplVplPossNplNsi",5,"DoProp"

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1034,"HaveProoVedDetNsiNsi",2,"VedVplNsiNpl"

1816,"HaveProoVedDetNsiNsi",2,"VedVplNsiNpl"

2317,"HavePropNplBeenToNpl",4,"Have"

2321,"HavePropNplBeenToNpl",4,"Have"

1034,"HavePropVedDetNsiAdv",4,"Have"

1816,"HavePropVedDetNsiAdv",4,"Have"

1034,"HavePropVedDetNsiNsi",4,"Have"

1816,"HavePropVedDetNsiNsi",4,"Have"

1034,"HavePropVppDetNsiAdv",5,"HaveHadIPropVpp"

1816,"HavePropVppDetNsiAdv",5,"HaveHadIPropVpp"

1034,"HavePropVppDetNsiNsi",5,"HaveHadIPropVpp"

1816,"HavePropVppDetNsiNsi",5,"HaveHadIPropVpp"

2770,"HesDetNsiDetNsiPreNpl",2,"Hes"

1660,"I",1,"N/A"

Auto Profiling

2634,"I",1,"N/A"

2814,"I",1,"N/A"

1046,"IAdvPreDetNplProoPrePossNplNplNplPrePossNpl",3,"PossNsiNpl"

1046,"IAdvPreDetNplProsPrePossNplNplNplPrePossNpl",3,"PossNsiNpl"

3261,"IAdvVplDetNplPreNpl",2,"VedVplNsiNpl"

1046,"IAdvVplDetNplProoPrePossNplNplNplPrePossNpl",3,"PossNsiNpl"

1046,"IAdvVplDetNplProsPrePossNplNplNplPrePossNpl",3,"PossNsiNpl"

807,"IAmDetAdjNsi",2,"IThatBeAm"

1135,"IAmVingAdvIsAdjPreAdjAdjNsi",2,"AdjNsiNpl"

1878,"IAmVingAdvIsAdjPreAdjAdjNsi",2,"AdjNsiNpl"

1135,"IAmVingAdvIsAdjPreNplAdjNsi",2,"AdjNsiNpl"

1878,"IAmVingAdvIsAdjPreNplAdjNsi",2,"AdjNsiNpl"

1596,"IAuxNsiWhIsDetAdjNsiPropVed",4,"WhIs"

2706,"IAuxNsiWhIsDetAdjNsiPropVed",4,"WhIs"

1596,"IAuxNsiWhIsDetAdjNsiPropVpp",4,"WhIs"

2706,"IAuxNsiWhIsDetAdjNsiPropVpp",4,"WhIs"

1596,"IAuxNsiWhIsDetAdvNsiPropVed",4,"WhIs"

2706,"IAuxNsiWhIsDetAdvNsiPropVed",4,"WhIs"

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2706,"IAuxNsiWhIsDetAdvNsiPropVpp",4,"WhIs"

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2738,"IDontVpl",2,"IThatVedVpl"

809,"IDontVplAdj",2,"IThatVedVpl"

3283,"IDontVplAdjNsi",5,"IDontDidntWont"

3137,"IDontVplDetNsiPreDetNsiPreDetAdj",5,"IDontDidntWont"

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1811,"IDontVplWhPossNsiVsi",6,"IDontVpl"

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2738,"IDoVpl",2,"IThatVedVpl"

809,"IDoVplAdj",2,"IThatVedVpl"

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3091,"IHaveVppProoAdvAdvPropAuxPrePrePreNsiAdj",5,"IThatVedVpl"

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1131,"IHaveVppProoNplConjProoAuxVplPrePreNsiAdj",5,"IThatVedVpl"

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1131,"IHaveVppPropNplConjProoAuxVplPrePreNsiAdj",5,"IThatVedVpl"

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1826,"ImAdvVingWhPropDet",1,"N/A"

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1827,"INplPreDetProsPrePossNpl",3,"PossNsiNpl"

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2670,"INplPropAreSupAdvProo",1,"N/A"

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1827,"INplVplDetProsPrePossNpl",3,"PossNsiNpl"

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88,"INpPros",1,"N/A"

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90,"INpThatIsAdjNs",1,"N/A"

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3254,"IPreProo",2,"PreProo"

3258,"IPreProoConjProsVsiProo",5,"ProsVsi"

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2632,"IPreToVplNsi",2,"VedVplNsiNpl"

2633,"IPreToVplNsi",2,"VedVplNsiNpl"

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2654,"IPreToVplNsiNsi",2,"VedVplNsiNpl"

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2710,"IsAdjNplNpl",2,"AdjNsiNpl"

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2690,"IsAdjNsi",4,"IsNsi"

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3006,"IsProsPre",4,"IsPros"

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2640,"IVedPossNsi",3,"PossNsiNpl"

2656,"IVedPreNsiNpl",2,"INsiNpl"

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2671,"IVplPropHaveAdvAdjNplPreNsi",2,"AdjNsiNpl"

2671,"IVplPropHaveAdvAdjNplPreThat",2,"AdjNsiNpl"

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2662,"IVplToNplNsiNotNsiConjNsi",2,"IThatVedVpl"

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2969,"NotNpl",1,"N/A"

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1577,"NplAdj",1,"N/A"

1713,"NplAdj",1,"N/A"

2687,"NplAdj",1,"N/A"

2750,"NplAdj",1,"N/A"

2947,"NplAdj",1,"N/A"

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2979,"NplAdjNsiVedDetNsiToToPossNsi",3,"PossNsiNpl"

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2979,"NplAdjNsiVplDetNsiToToPossNsi",3,"PossNsiNpl"

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2682,"NplAdvNpl",1,"N/A"
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981,"NplAdvProsVplDisProoNsiPossNsiDisConjVplAdvProsNsiNplConjNplPreDetNsiPreDetNpl",3,"AdvPros"
981,"NplAdvProsVplDisProoNsiPossNsiDisConjVplAdvProsVplNplConjNplPreDetNsiPr

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957,"NplAdvProsVplDisProoNsiPossNsiDisConjVplConjAdvProsNsiNplConjNplPreDetN
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1045,"NplAdvVingWhProoDet",1,"N/A"
1045,"NplAdvVingWhPropDet",1,"N/A"
2319,"NplAreProoNpl",2,"NsiNplIsAre"
2322,"NplAreProoNpl",2,"NsiNplIsAre"
1118,"NplAreProoVingToNplToNplPossVingNpl",2,"NsiNplIsAre"
1861,"NplAreProoVingToNplToNplPossVingNpl",2,"NsiNplIsAre"
2319,"NplArePropNpl",2,"NsiNplIsAre"
2322,"NplArePropNpl",2,"NsiNplIsAre"
1118,"NplArePropVingToNplToNplPossVingNpl",2,"NsiNplIsAre"
1861,"NplArePropVingToNplToNplPossVingNpl",2,"NsiNplIsAre"
1731,"NplConjIsPros",4,"IsPros"
2768,"NplConjIsPros",4,"IsPros"
1032,"NplConjProsAdjHadProsConjProsVedNplNpl",2,"VedVplNsiNpl"
1814,"NplConjProsAdjHadProsConjProsVedNplNpl",2,"VedVplNsiNpl"
1032,"NplConjProsAdjVedProsConjProsVedNplNpl",2,"VedVplNsiNpl"
1814,"NplConjProsAdjVedProsConjProsVedNplNpl",2,"VedVplNsiNpl"
1032,"NplConjProsAdjVppProsConjProsVedNplNpl",2,"VedVplNsiNpl"
1814,"NplConjProsAdjVppProsConjProsVedNplNpl",2,"VedVplNsiNpl"
1833,"NplConjProsIsNplSupNplNsiPreDetNsi",2,"ProsIs"
1316,"NplConjWhIsDetNsiPre",4,"WhIs"
2956,"NplConjWhIsDetNsiPre",4,"WhIs"
1243,"NplDetNsi",1,"N/A"
1670,"NplDetNsi",1,"N/A"
1922,"NplDetNsi",1,"N/A"
1974,"NplDetNsi",1,"N/A"
2824,"NplDetNsi",1,"N/A"
1616,"NplDetNsiDetNsiPreNpl",1,"N/A"

1137,"NplIsVingToVplDetNsi",2,"VedVplNsiNpl"

1880,"NplIsVingToVplDetNsi",2,"VedVplNsiNpl"

1448,"NplNotNpl",1,"N/A"

2896,"NplNotNpl",1,"N/A"

1159,"NplNpl",1,"N/A"

1160,"NplNpl",1,"N/A"

1729,"NplNpl",1,"N/A"

2766,"NplNpl",1,"N/A"

3004,"NplNpl",1,"N/A"

3005,"NplNpl",1,"N/A"

2575,"NplNplAuxVplProo",2,"VplProo"

2579,"NplNplAuxVplProo",2,"VplProo"

1835,"NplNplINplNotVplPossNpl",3,"PossNsiNpl"

1834,"NplNplNplIsDetNpl",2,"DetNpl"

1039,"NplNplNplIsDetNplNplIDoNotVplPossNpl",5,"IDo"

1039,"NplNplNplIsDetNplNplIVplNotVplPossNpl",3,"PossNsiNpl"

1845,"NplNplNsiVpl",1,"N/A"

1846,"NplNplNsiVpl",1,"N/A"

1030,"NplNplPreDetNpl",2,"DetNpl"

1812,"NplNplPreDetNpl",2,"DetNpl"

1836,"NplNplPreDetNsiAdvVplProoConjProsIsDetNsiPreDet",2,"VplProo"

1040,"NplNplPreDetNsiAdvVplProoConjProsIsDetNsiPreDetNsi",2,"VplProo"

1828,"NplNplPrePossNpl",3,"PossNsiNpl"

2022,"NplNplProoVplDetNsi",2,"VedVplNsiNpl"

2022,"NplNplPropVplDetNsi",2,"VedVplNsiNpl"

2575,"NplNplWillVplProo",2,"VplProo"

2579,"NplNplWillVplProo",2,"VplProo"

1307,"NplNsi",1,"N/A"

1423,"NplNsi",1,"N/A"

2871,"NplNsi",1,"N/A"

2947,"NplNsi",1,"N/A"

1179,"NplNsiAdv",1,"N/A"

3024,"NplNsiAdv",1,"N/A"

1158,"NplNsiConjAdj",1,"N/A"

3003,"NplNsiConjAdj",1,"N/A"

1847,"NplNsiNplAdj",1,"N/A"

1849,"NplNsiNsi",1,"N/A"

1339,"NplNsiNsiVedDetNsiToToPossNsi",3,"PossNsiNpl"

2979,"NplNsiNsiVedDetNsiToToPossNsi",3,"PossNsiNpl"

1339,"NplNsiNsiVplDetNsiToToPossNsi",3,"PossNsiNpl"

2979,"NplNsiNsiVplDetNsiToToPossNsi",3,"PossNsiNpl"

1339,"NplNsiNsiVppDetNsiToToPossNsi",3,"PossNsiNpl"

2979,"NplNsiNsiVppDetNsiToToPossNsi",3,"PossNsiNpl"

2667,"NplNsiPreNsiDoPropVplDetSupAdv",5,"DoProp"

2667,"NplNsiPreNsiVplProoVplDetSupAdv",2,"VplProo"

1796,"NplNsiPreVingNsiDoPropVpl",5,"DoProp"

1796,"NplNsiPreVingNsiVplProoNsi",2,"VplProo"

1796,"NplNsiPreVingNsiVplProoVpl",2,"VplProo"

1400,"NplPossNsi",3,"PossNsiNpl"

2848,"NplPossNsi",3,"PossNsiNpl"

1220,"NplPreAdjNpl",2,"AdjNsiNpl"

3065,"NplPreAdjNpl",2,"AdjNsiNpl"

1174,"NplPreDetAdjNsi",2,"AdjNsiNpl"

3019,"NplPreDetAdjNsi",2,"AdjNsiNpl"

2573,"NplPreProo",2,"PreProo"

2577,"NplPreProo",2,"PreProo"

1584,"NplProoConjDetAdjVedPreDetNsi",1,"N/A"

2694,"NplProoConjDetAdjVedPreDetNsi",1,"N/A"

1584,"NplProoConjDetAdjVppPreDetNsi",1,"N/A"

2694,"NplProoConjDetAdjVppPreDetNsi",1,"N/A"

1352,"NplProsIsDetNpl",2,"ProsIs"

2992,"NplProsIsDetNpl",2,"ProsIs"

1308,"NplProsNsiPreAdvConjProsVplNpl",2,"VedVplNsiNpl"

2948,"NplProsNsiPreAdvConjProsVplNpl",2,"VedVplNsiNpl"

1357,"NplProsVplNsiPreAdjNsiConjProsVsiDetNsiNpl",5,"ProsVsi"

2997,"NplProsVplNsiPreAdjNsiConjProsVsiDetNsiNpl",5,"ProsVsi"

1357,"NplProsVplNsiPreNsiNsiConjProsVsiDetNsiNpl",5,"ProsVsi"

2997,"NplProsVplNsiPreNsiNsiConjProsVsiDetNsiNpl",5,"ProsVsi"

3238,"NplVingAdj",2,"Ving"

3237,"NplVingAdv",2,"Ving"

1641,"NplVingDetNpl",2,"DetNpl"

2795,"NplVingDetNpl",2,"DetNpl"

1634,"NplVingNsi",2,"Ving"

2788,"NplVingNsi",2,"Ving"

3237,"NplVingNsi",2,"Ving"

2610,"NplVplNplConjNpl",2,"VedVplNsiNpl"

1796,"NplVplPreVingNsiDoProoNsi",2,"NsiNplVedVpl"

1796,"NplVplPreVingNsiDoProoVpl",2,"NsiNplVedVpl"

1796,"NplVplPreVingNsiDoPropNsi",2,"NsiNplVedVpl"

1796,"NplVplPreVingNsiDoPropVpl",5,"DoProp"

1796,"NplVplPreVingNsiVplProoNsi",2,"VplProo"

1796,"NplVplPreVingNsiVplProoVpl",2,"VplProo"

1796,"NplVplPreVingNsiVplPropNsi",2,"NsiNplVedVpl"

1796,"NplVplPreVingNsiVplPropVpl",2,"NsiNplVedVpl"

1608,"NplVplProo",2,"VplProo"

2718,"NplVplProo",2,"VplProo"

2574,"NplVsiNpl",2,"INsiNpl"

2578,"NplVsiNpl",2,"INsiNpl"

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2590,"NplWhAreDetNplPreAdjNsi",2,"AdjNsiNpl"

3277,"NplWhIsPossNsi",4,"WhIs"

1310,"NplWhIsProsNsiPrePossNsi",4,"IsPros"

2950,"NplWhIsProsNsiPrePossNsi",4,"IsPros"

1310,"NplWhIsProsVplPrePossNsi",4,"IsPros"

2950,"NplWhIsProsVplPrePossNsi",4,"IsPros"

2305,"NplWhNsiDoPropVpl",5,"DoProp"

1292,"NplWhNsiIsProsVplToDetNsi",4,"IsPros"

2932,"NplWhNsiIsProsVplToDetNsi",4,"IsPros"

2305,"NplWhNsiVplProoPre",3,"WhNsiNpl"

2305,"NplWhNsiVplProoVpl",3,"WhNsiNpl"

2305,"NplWhNsiVplPropPre",3,"WhNsiNpl"

2305,"NplWhNsiVplPropVpl",3,"WhNsiNpl"

1113,"Nsi",1,"Nsi"

1142,"Nsi",1,"Nsi"

1163,"Nsi",1,"Nsi"

1290,"Nsi",1,"Nsi"

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1298,"Nsi",1,"Nsi"

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1338,"Nsi",1,"Nsi"

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2938,"Nsi",1,"Nsi"

2976,"Nsi",1,"Nsi"

2978,"Nsi",1,"Nsi"

3008,"Nsi",1,"Nsi"

1594,"NsiAdjNsi",2,"AdjNsiNpl"

2704,"NsiAdjNsi",2,"AdjNsiNpl"

1017,"NsiAdvProsVsiNplPreDetNsi",5,"ProsVsi"

1793,"NsiAdvProsVsiNplPreDetNsi",5,"ProsVsi"

1832,"NsiConjProsIsDetSupNplNsiPreDetNsi",2,"ProsIs"

1705,"NsiIsNsi",2,"NsiIs"

2742,"NsiIsNsi",2,"NsiIs"

1133,"NsiIsPreNsiNplNplNsi",2,"NsiIs"

1876,"NsiIsPreNsiNplNplNsi",2,"NsiIs"

1021,"NsiIVplNplAdj",2,"VedVplNsiNpl"

1797,"NsiIVplNplAdj",2,"VedVplNsiNpl"

1021,"NsiIVplNplAdv",2,"VedVplNsiNpl"

1797,"NsiIVplNplAdv",2,"VedVplNsiNpl"

1121,"NsiIVplWhNplProoVplAdv",2,"IThatVedVpl"

1864,"NsiIVplWhNplProoVplAdv",2,"IThatVedVpl"

1121,"NsiIVplWhNplProoVplNsi",2,"VedVplNsiNpl"

1864,"NsiIVplWhNplProoVplNsi",2,"VedVplNsiNpl"

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1864,"NsiIVplWhNplPropVplAdv",3,"WhNsiNplProsProp"

1121,"NsiIVplWhNplPropVplNsi",3,"WhNsiNplProsProp"

1864,"NsiIVplWhNplPropVplNsi",3,"WhNsiNplProsProp"

2569,"NsiIVplWhProoWhAreProoAdv",2,"IThatVedVpl"

2569,"NsiIVplWhProoWhAreProoNsi",2,"IThatVedVpl"

2569,"NsiIVplWhProoWhArePropAdv",4,"WhAre"

2569,"NsiIVplWhProoWhArePropNsi",4,"WhAre"

2569,"NsiIVplWhPropWhAreProoAdv",2,"IThatVedVpl"

2569,"NsiIVplWhPropWhAreProoNsi",2,"IThatVedVpl"

2569,"NsiIVplWhPropWhArePropAdv",4,"WhAre"

2569,"NsiIVplWhPropWhArePropNsi",4,"WhAre"

1008,"NsiNpl",1,"N/A"

1786,"NsiNpl",1,"N/A"

1393,"NsiNplIsVplPre",2,"VplPre"

2841,"NsiNplIsVplPre",2,"VplPre"

1370,"NsiNplPreVplNsi",2,"VedVplNsiNpl"

2909,"NsiNplPreVplNsi",2,"VedVplNsiNpl"

1264,"NsiNsi",1,"N/A"

1943,"NsiNsi",1,"N/A"

1995,"NsiNsi",1,"N/A"

1342,"NsiNsiHasDetNsiConjProsVplToDetAdjNsi",2,"AdjNsiNpl"

2982,"NsiNsiHasDetNsiConjProsVplToDetAdjNsi",2,"AdjNsiNpl"

1390,"NsiNsiIsNpl",2,"NsiIs"

2838,"NsiNsiIsNpl",2,"NsiIs"

1438,"NsiNsiIsPreProo",2,"PreProo"

2886,"NsiNsiIsPreProo",2,"PreProo"

2924,"NsiNsiNsiConjAdjPreDetAdvDetNplNsiPreDetNpl",2,"DetNpl"

2924,"NsiNsiNsiConjAdjPreDetAdvDetNplVplPreDetNpl",3,"AdvNsiNpl"

1385,"NsiNsiNsiConjAdjPreDetPreDetNplNsiPreDetNpl",2,"DetNpl"

2924,"NsiNsiNsiConjAdjPreDetPreDetNplNsiPreDetNpl",2,"DetNpl"

1385,"NsiNsiNsiConjAdjPreDetPreDetNplVplPreDetNpl",2,"DetNpl"

2924,"NsiNsiNsiConjAdjPreDetPreDetNplVplPreDetNpl",2,"DetNpl"

2924,"NsiNsiNsiConjNsiPreDetAdvDetNplNsiPreDetNpl",2,"DetNpl"

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1385,"NsiNsiNsiConjNsiPreDetPreDetNplVplPreDetNpl",2,"DetNpl"

2924,"NsiNsiNsiConjNsiPreDetPreDetNplVplPreDetNpl",2,"DetNpl"

1859,"NsiNsiPreNsiAreProoVing",1,"N/A"

1859,"NsiNsiPreNsiArePropVing",5,"AreProp"

1230,"NsiNsiVplToProoToVplPossNsi",3,"PossNsiNpl"

3075,"NsiNsiVplToProoToVplPossNsi",3,"PossNsiNpl"

1230,"NsiNsiVppToProoToVplPossNsi",3,"PossNsiNpl"

3075,"NsiNsiVppToProoToVplPossNsi",3,"PossNsiNpl"

1342,"NsiNsiVsiDetNsiConjProsVplToDetAdjNsi",5,"Ns"

2982,"NsiNsiVsiDetNsiConjProsVplToDetAdjNsi",5,"NsiVsi"

1311,"NsiPreDetNsi",2,"Phrase"

2951,"NsiPreDetNsi",2,"Phrase"

1284,"NsiPrePossNsi",3,"PossNsiNpl"

1429,"NsiPrePossNsi",3,"PossNsiNpl"

1963,"NsiPrePossNsi",3,"PossNsiNpl"

2015,"NsiPrePossNsi",3,"PossNsiNpl"

2877,"NsiPrePossNsi",3,"PossNsiNpl"

3284,"NsiProoNplAdjNsi",2,"AdjNsiNpl"

2314,"NsiProoVplNpl",2,"VedVplNsiNpl"

2315,"NsiProoVplNpl",2,"VedVplNsiNpl"

2318,"NsiProoVplNpl",2,"VedVplNsiNpl"

2320,"NsiProoVplNpl",2,"VedVplNsiNpl"

3286,"NsiProoVplProo",2,"VplProo"

1314,"NsiProoVplProoNplDetNsiPreDetNsi",2,"VplProo"

2954,"NsiProoVplProoNplDetNsiPreDetNsi",2,"VplProo"

3282,"NsiProoVplProoWhAreProo",2,"VplProo"

3282,"NsiProoVplProoWhAreProp",2,"VplProo"

3284,"NsiPropNplAdjNsi",2,"AdjNsiNpl"

2613,"NsiPropNplAdjTo",2,"Pronoun"

3284,"NsiPropNplNsiNsi",2,"Pronoun"

3285,"NsiPropNplProo",2,"Pronoun"

3235,"NsiPropVpl",2,"Pronoun"

2314,"NsiPropVplNpl",2,"VedVplNsiNpl"

2315,"NsiPropVplNpl",2,"VedVplNsiNpl"

2318,"NsiPropVplNpl",2,"VedVplNsiNpl"

2320,"NsiPropVplNpl",2,"VedVplNsiNpl"

3286,"NsiPropVplProo",2,"VplProo"

1314,"NsiPropVplProoNplDetNsiPreDetNsi",2,"VplProo"

2954,"NsiPropVplProoNplDetNsiPreDetNsi",2,"VplProo"

3282,"NsiPropVplProoWhAreProo",2,"VplProo"

3282,"NsiPropVplProoWhAreProp",2,"VplProo"

1110,"NsiPropVplPropNplPropDoVplVpl",2,"ProsPropVedVpl"

1853,"NsiPropVplPropNplPropDoVplVpl",2,"ProsPropVedVpl"

1110,"NsiPropVplPropNplPropVplVplVpl",2,"ProsPropVedVpl"

1853,"NsiPropVplPropNplPropVplVplVpl",2,"ProsPropVedVpl"

3276,"NsiPropVsiProo",2,"Pronoun"

1669,"NsiProsVsiToNsiNsi",5,"ProsVsi"

2823,"NsiProsVsiToNsiNsi",5,"ProsVsi"

1181,"NsiVed",2,"INsiNpl"

3026,"NsiVed",2,"INsiNpl"

1848,"NsiVingNsiNplNpl",2,"Ving"

2370,"NsiVsiAdv",5,"Vsi"

2371,"NsiVsiAdv",5,"Vsi"

2372,"NsiVsiNplAdv",5,"ProsNsiVsi"

2373,"NsiVsiNplAdv",5,"ProsNsiVsi"

2368,"NsiVsiNsiAdv",5,"ProsNsiVsi"

2369,"NsiVsiNsiAdv",5,"ProsNsiVsi"

2374,"NsiVsiVingAdv",5,"ProsNsiVsi"

2375,"NsiVsiVingAdv",5,"ProsNsiVsi"

1601,"NsiWasPre",2,"NsiNplWasWere"

2711,"NsiWasPre",2,"NsiNplWasWere"

Auto Profiling

1383,"Poss",1,"N/A"

2922,"Poss",1,"N/A"

1236,"PossDoDetNpl",2,"DetNpl"

1915,"PossDoDetNpl",2,"DetNpl"

1965,"PossDoDetNpl",2,"DetNpl"

1783,"PossNpl",3,"PossNsiNpl"

3262,"PossNplConjPossNplAreAdjNpl",3,"PossNsiNpl"

1785,"PossNplDoNsiPrePossNsi",3,"PossNsiNpl"

2311,"PossNplIsVingNpl",3,"PossNsiNpl"

1006,"PossNplNpl",3,"PossNsiNpl"

1785,"PossNplVplNsiPrePossNsi",3,"PossNsiNpl"

2611,"PossNplVsiToNsiAdv",3,"PossNsiNpl"

1009,"PossNsi",3,"PossNsiNpl"

1300,"PossNsi",3,"PossNsiNpl"

1301,"PossNsi",3,"PossNsiNpl"

1443,"PossNsi",3,"PossNsiNpl"

1787,"PossNsi",3,"PossNsiNpl"

2546,"PossNsi",3,"PossNsiNpl"

2891,"PossNsi",3,"PossNsiNpl"

2940,"PossNsi",3,"PossNsiNpl"

2941,"PossNsi",3,"PossNsiNpl"

2406,"PossNsiAre",3,"PossNsiNpl"

1007,"PossNsiDoNsiPrePossNsi",3,"PossNsiNpl"

1384,"PossNsiHaveAdjNpl",3,"PossNsiNpl"

2923,"PossNsiHaveAdjNpl",3,"PossNsiNpl"

1881,"PossNsiIsDetNplNsi",3,"PossNsiNpl"

3269,"PossNsiIsDetNsi",3,"PossNsiNpl"

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1825,"PossNsiIsDetNsiWhPreNplNsiNsiAreProoVplAdvPreNsiNsi",3,"PossNsiNpl"

1825,"PossNsiIsDetNsiWhPreNplNsiNsiAreProoVplAdvPreThatNsi",3,"PossNsiNpl"

1825,"PossNsiIsDetNsiWhPreNplNsiNsiArePropVplAdvPreAdjNsi",6,"NsiIs"

1825,"PossNsiIsDetNsiWhPreNplNsiNsiAnePropVplAdvPreNsiNsi",6,"NsiIs"

1825,"PossNsiIsDetNsiWhPreNplNsiNsiAnePropVplAdvPreThatNsi",6,"NsiIs"

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2312,"PossNsiIsNplPossNsi",3,"PossNsiNpl"

1003,"PossNsiNpl",3,"PossNsiNpl"

1779,"PossNsiNpl",3,"PossNsiNpl"

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2661,"PossNsiNplNplAdjConjVsiToVplPre",3,"PossNsiNpl"

2660,"PossNsiNplPossNsiAdv",3,"PossNsiNpl"

1192,"PossNsiNsiNplConjPossNsiDisNplPreProo",3,"PossNsiNpl"

3037,"PossNsiNsiNplConjPossNsiDisNplPreProo",3,"PossNsiNpl"

1192,"PossNsiNsiNplConjProoNsiDisNplPreProo",3,"PossNsiNpl"

3037,"PossNsiNsiNplConjProoNsiDisNplPreProo",3,"PossNsiNpl"

3225,"PossNsiPreToNsiNsi",3,"PossNsiNpl"

3225,"PossNsiPreToVplNsi",3,"PossNsiNpl"

1838,"PossNsiVedPreProo",3,"PossNsiNpl"

1005,"PossNsiVingPrePossNsiNsiAdv",3,"PossNsiNpl"

1782,"PossNsiVingPrePossNsiNsiAdv",3,"PossNsiNpl"

1005,"PossNsiVingPrePossNsiVplAdv",3,"PossNsiNpl"

1782,"PossNsiVingPrePossNsiVplAdv",3,"PossNsiNpl"

1384,"PossNsiVplAdjNpl",3,"PossNsiNpl"

2923,"PossNsiVplAdjNpl",3,"PossNsiNpl"

1048,"PossNsiVplIsDetNplPreDetNsi",3,"PossNsiNpl"

1830,"PossNsiVplIsDetNplPreDetNsi",3,"PossNsiNpl"

1007,"PossNsiVplNsiPrePossNsi",3,"PossNsiNpl"

1703,"PossNsiVplToNsiAdjNsi",3,"PossNsiNpl"

2740,"PossNsiVplToNsiAdjNsi",3,"PossNsiNpl"

3225,"PossNsiVplToNsiNsi",3,"PossNsiNpl"

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1168,"PossNsiVppDetNsi",3,"PossNsiNpl"

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3139,"PossNsiVsiPreNsiAdjNplConjProsVsiPreToDetNsiPreDetNsiPrePre",5,"NsiVsi"

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3138,"PossNsiVsiToNsiAdvPreDetNsiPrePreNsi",5,"NsiVsi"

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2302,"PossNsiVsiToNsiPreDetNsi",5,"Ns"

3138,"PossNsiVsiToVplAdvPreDetNsiPrePreNsi",5,"NsiVsi"

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1414,"PreAdjNsi",2,"AdjNsiNpl"

2862,"PreAdjNsi",2,"AdjNsiNpl"

3039,"PreAdjNsi",2,"AdjNsiNpl"

1164,"PreAdjNsiDetNpl",2,"AdjNsiNpl"

3009,"PreAdjNsiDetNpl",2,"AdjNsiNpl"

1442,"PreAdjNsiHaveDetNsi",2,"AdjNsiNpl"

2890,"PreAdjNsiHaveDetNsi",2,"AdjNsiNpl"

1696,"PreAdjNsiProsVplNsiPossNsi",3,"PossNsiNpl"

2733,"PreAdjNsiProsVplNsiPossNsi",3,"PossNsiNpl"

1696,"PreAdjNsiProsVppNsiPossNsi",3,"PossNsiNpl"

2733,"PreAdjNsiProsVppNsiPossNsi",3,"PossNsiNpl"

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1388,"PreDetNplConjNplProsVsiNsiNsiNpl",5,"ProsVsi"
2927,"PreDetNplConjNplProsVsiNsiNsiNpl",5,"ProsVsi"
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1405,"PreDetNsi",2,"Phrase"
1939,"PreDetNsi",2,"Phrase"
1991,"PreDetNsi",2,"Phrase"
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2990,"PreDetNsi",2,"Phrase"

1653,"PreDetNsiAdvProsIsVingNsiVing",3,"PreNSntcPropPros"

2807,"PreDetNsiAdvProsIsVingNsiVing",3,"PreNSntcPropPros"

1638,"PreDetNsiProsIsVing",3,"PreNSntcPropPros"

2792,"PreDetNsiProsIsVing",3,"PreNSntcPropPros"

1681,"PreDetNsiProsVpl",3,"PreNSntcPropPros"

2835,"PreDetNsiProsVpl",3,"PreNSntcPropPros"

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1037,"PreNplProsDet",2,"Phrase"

1831,"PreNplProsDet",2,"Phrase"

1173,"PreNsi",2,"Phrase"

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2777,"PreNsi",2,"Phrase"

3018,"PreNsi",2,"Phrase"

1724,"PreNsiDetNplPreNsi",2,"Phrase"

2761,"PreNsiDetNplPreNsi",2,"Phrase"

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2890,"PreNsiNsiVplDetNsi",3,"PreNSntcNplNsi"

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1929,"PreNsiProsVplDetNsiPreDetNplWhVplVplDetNsi",2,"VedVplNsiNpl"

1981,"PreNsiProsVplDetNsiPreDetNplWhVplVplDetNsi",2,"VedVplNsiNpl"

1234,"PreNsiProsVplToDetNsiToVplToBeDet",2,"ProsVpl"

3079,"PreNsiProsVplToDetNsiToVplToBeDet",2,"ProsVpl"

1402,"PreProo",2,"PreProo"

2850,"PreProo",2,"PreProo"

1234,"PreThatProsVplToDetNsiToVplToBeDet",2,"ProsVpl"

3079,"PreThatProsVplToDetNsiToVplToBeDet",2,"ProsVpl"

116,"ProoIsDetNsi",1,"N/A"

1384,"ProoNsiHaveAdjNpl",2,"AdjNsiNpl"

2923,"ProoNsiHaveAdjNpl",2,"AdjNsiNpl"

1384,"ProoNsiVplAdjNpl",2,"VedVplNsiNpl"

2923,"ProoNsiVplAdjNpl",2,"VedVplNsiNpl"

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3232,"ProoVplAdvDoPropHaveDetNsi",5,"DoProp"

3232,"ProoVplAdvDoPropVplDetNsi",5,"DoProp"

3232,"ProoVplAdvVplProoHaveDetNsi",2,"VplProo"

3232,"ProoVplAdvVplProoVplDetNsi",2,"VedVplNsiNpl"

3232,"ProoVplAdvVplPropVplDetNsi",2,"VedVplNsiNpl"

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3232,"ProoVplNsiVplPropVplDetNsi",2,"VedVplNsiNpl"

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3167,"PropAreDetNsi",2,"ProsPropIsAre"

2361,"PropAreNpl",2,"ProsPropIsAre"

2367,"PropAreNpl",2,"ProsPropIsAre"

2543,"PropAreNpl",2,"ProsPropIsAre"

3259,"PropAreNpl",2,"ProsPropIsAre"

3166,"PropAreNplAdv",2,"ProsPropIsAre"

1143,"PropAreVingDetAdjNsiVingPropAreVingWhIsProsPre",4,"IsPros"

1886,"PropAreVingDetAdjNsiVingPropAreVingWhIsProsPre",4,"IsPros"

1143,"PropAreVingDetAdjNsiVingPropAreVingWhIsProsVpl",4,"IsPros"

1886,"PropAreVingDetAdjNsiVingPropAreVingWhIsProsVpl",4,"IsPros"

2672,"PropDontVedProo",2,"DontDidnt"

2672,"PropDontVplProo",5,"PropDontDidntWont"

2672,"PropDontVppProo",2,"DontDidnt"

1852,"PropDoVplProoAdjNsiPropNsiToNplPreProoAdjNpl",2,"AdjNsiNpl"

1109,"PropDoVplProoAdjNsiPropNsiToNplPreProoNplNpl",2,"AdjNsiNpl"

1852,"PropDoVplProoAdjNsiPropVplToNplPreProoAdjNpl",2,"AdjNsiNpl"

1109,"PropDoVplProoAdjNsiPropVplToNplPreProoNplNpl",2,"AdjNsiNpl"

116,"PropIsDetNsi",1,"N/A"

2328,"PropNplNsi",2,"Pronoun"

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3155,"PropNplPreDetNsiPreAdjNsiAdjNsi",2,"AdjNsiNpl"

3148,"PropNplPreDetNsiPreNsiNsiAdjNsi",2,"AdjNsiNpl"

3149,"PropNplPreDetNsiPreNsiNsiAdjNsi",2,"AdjNsiNpl"

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3273,"ProsAdvVsiDetNplPreVing",5,"ProsNsiVsi"

3265,"ProsAreNpl",2,"ProsPropIsAre"

1397,"ProsAux",2,"Pronoun"

2845,"ProsAux",2,"Pronoun"

1362,"ProsAuxAdv",2,"Pronoun"

2901,"ProsAuxAdv",2,"Pronoun"

1147,"ProsAuxBeAdvNplPreAdjNsi",2,"AdjNsiNpl"

1890,"ProsAuxBeAdvNplPreAdjNsi",2,"AdjNsiNpl"

1611,"ProsAuxPreNsi",2,"Pronoun"

2854,"ProsAuxPreNsi",2,"Pronoun"

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1611,"ProsAuxVplNsi",2,"VedVplNsiNpl"

2854,"ProsAuxVplNsi",2,"VedVplNsiNpl"

3240,"ProsAuxVsiAdv",2,"Pronoun"

1156,"ProsDetNsi",2,"Pronoun"

3001,"ProsDetNsi",2,"Pronoun"

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2689,"ProsDidntVpl",5,"ProsDidntVpl"

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2887,"ProsDidntVplAdjNsi",5,"ProsDidntVpl"

2963,"ProsDidntVplAdv",5,"ProsDidntVpl"

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2921,"ProsHaveDetAdjNpl",2,"AdjNsiNpl"

89,"ProsIsAdvNp",2,"ProsIs"

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2587,"ProsIsAdvNpl",2,"ProsIs"

2968,"ProsIsAdvNpl",2,"ProsIs"

1445,"ProsIsConjNplNsiNpl",2,"ProsIs"

2893,"ProsIsConjNplNsiNpl",2,"ProsIs"

1356,"ProsIsDetAdjNsi",2,"AdjNsiNpl"

2996,"ProsIsDetAdjNsi",2,"AdjNsiNpl"

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2991,"ProsIsDetNplNsi",2,"ProsIs"

3239,"ProsIsDetNsi",2,"ProsIs"

3256,"ProsIsDetNsi",2,"ProsIs"

1355,"ProsIsDetProo",2,"ProsIs"

2995,"ProsIsDetProo",2,"ProsIs"

89,"ProsIsDisNp",2,"ProsIs"

3224,"ProsIsNotAdj",2,"ProsIs"

1587,"ProsIsNpl",2,"ProsIs"

1671,"ProsIsNpl",2,"ProsIs"

1678,"ProsIsNpl",2,"ProsIs"

2365,"ProsIsNpl",2,"ProsIs"

2697,"ProsIsNpl",2,"ProsIs"

2825,"ProsIsNpl",2,"ProsIs"

2832,"ProsIsNpl",2,"ProsIs"

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1673,"ProsIsNplDetNsiThatProsVsi",5,"ProsVsi"

2827,"ProsIsNplDetNsiThatProsVsi",5,"ProsVsi"

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2773,"ProsIsNplNsi",2,"ProsIs"

1628,"ProsIsNplVingNsiToNsi",2,"ProsIs"

2782,"ProsIsNplVingNsiToNsi",2,"ProsIs"

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2836,"ProsIsVingAdjNplDetNsiVpp",2,"AdjNsiNpl"

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2779,"ProsIsVingDetNpl",2,"ProsIs"

1621,"ProsIsVingDetNsi",2,"ProsIs"

1663,"ProsIsVingDetNsi",2,"ProsIs"

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2775,"ProsIsVingDetNsi",2,"ProsIs"

2817,"ProsIsVingDetNsi",2,"ProsIs"

2820,"ProsIsVingDetNsi",2,"ProsIs"

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2811,"ProsIsVingDetNsiToWh",2,"ProsIs"

1665,"ProsIsVingDetVplAdv",2,"ProsIs"

2819,"ProsIsVingDetVplAdv",2,"ProsIs"

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2783,"ProsIsVingNsiWhAreDetNsiProsVsiVsi",6,"ProsIs"

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2861,"ProsIsVingPreDetNsiPreAdjNpl",2,"AdjNsiNpl"

1654,"ProsIsVingVingDetVplConjVingNpl",2,"ProsIs"

2808,"ProsIsVingVingDetVplConjVingNpl",2,"ProsIs"

1183,"ProsNotAdjToVplPossNsi",3,"PossNsiNpl"

3028,"ProsNotAdjToVplPossNsi",3,"PossNsiNpl"

1246,"ProsNpl",2,"Pronoun"

1330,"ProsNpl",2,"Pronoun"

1925,"ProsNpl",2,"Pronoun"

Auto Profiling

1977,"ProsNpl",2,"Pronoun"

2970,"ProsNpl",2,"Pronoun"

1674,"ProsNplDetNsiNsiAdjNsi",2,"AdjNsiNpl"

2828,"ProsNplDetNsiNsiAdjNsi",2,"AdjNsiNpl"

1674,"ProsNplDetNsiVplAdjNsi",2,"VedVplNsiNpl"

2828,"ProsNplDetNsiVplAdjNsi",2,"VedVplNsiNpl"

1573,"ProsNplNotNpl",1,"N/A"

2683,"ProsNplNotNpl",1,"N/A"

3271,"ProsNplToNsiNsi",2,"Pronoun"

3271,"ProsNplToVplNsi",2,"VedVplNsiNpl"

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2781,"ProsNplVedConjProsIsVingDetNplPreDetNsi",2,"ProsIs"

1627,"ProsNplVppConjProsIsVingDetNplPreDetNsi",2,"ProsIs"

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1167,"ProsNsi",2,"Pronoun"

3012,"ProsNsi",2,"Pronoun"

3227,"ProsNsiAdjNsi",2,"AdjNsiNpl"

1656,"ProsNsiNpl",2,"Pronoun"

2810,"ProsNsiNpl",2,"Pronoun"

3236,"ProsNsiNsi",2,"Pronoun"

1247,"ProsNsiNsiToPoss",2,"Pronoun"

1926,"ProsNsiNsiToPoss",2,"Pronoun"

1978,"ProsNsiNsiToPoss",2,"Pronoun"

1247,"ProsNsiNsiToProo",2,"ToProo"

1926,"ProsNsiNsiToProo",2,"ToProo"

1978,"ProsNsiNsiToProo",2,"ToProo"

964,"ProsNsiPreDetNplPreDetNplConjVedDetNplPreDetNsiProsVingDetNplWsNplDetNp
lVplPreNpl",2,"VedVplNsiNpl"

988,"ProsNsiPreDetNplPreDetNplConjVedDetNplPreDetNsiProsVingDetNplWsNplDetNp
lVplPreNpl",2,"VedVplNsiNpl"

964,"ProsNsiPreDetNplPreDetNplConjVplDetNplPreDetNsiProsVingDetNplWsNplDetNp
lVplPreNpl",2,"VedVplNsiNpl"

988,"ProsNsiPreDetNplPreDetNplConjVplDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"VedVplNsiNpl"

964,"ProsNsiPreDetNplPreDetNplConjVppDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"ProsVing"

988,"ProsNsiPreDetNplPreDetNplConjVppDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"ProsVing"

1380,"ProsNsiPreDetNsiNsi",2,"Pronoun"

2919,"ProsNsiPreDetNsiNsi",2,"Pronoun"

990,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreAdvAdjNsiVplDetNsiPreDetNsiPrePreAdjNpl",3,"AdvNsiNpl"

990,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreAdvAdjNsiVplDetNsiPreDetNsiPrePreNsiNpl",3,"AdvNsiNpl"

990,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreAdvNsiNsiVplDetNsiPreDetNsiPrePreAdjNpl",2,"VedVplNsiNpl"

990,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreAdvNsiNsiVplDetNsiPreDetNsiPrePreNsiNpl",2,"VedVplNsiNpl"

966,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvAdjNsiVplDetNsiPreDetNsiPrePreAdjNpl",3,"AdvNsiNpl"

966,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvAdjNsiVplDetNsiPreDetNsiPrePreNsiNpl",3,"AdvNsiNpl"

966,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvNsiNsiVplDetNsiPreDetNsiPrePreAdjNpl",2,"VedVplNsiNpl"

966,"ProsNsiPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvNsiNsiVplDetNsiPreDetNsiPrePreNsiNpl",2,"VedVplNsiNpl"

1676,"ProsNsiToDetNsiToNsiAdjNplProsVsi",5,"ProsVsi"

2830,"ProsNsiToDetNsiToNsiAdjNplProsVsi",5,"ProsVsi"

1676,"ProsNsiToDetNsiToVplAdjNplProsVsi",5,"ProsVsi"

2830,"ProsNsiToDetNsiToVplAdjNplProsVsi",5,"ProsVsi"

1418,"ProsPreDetNsi",2,"Pronoun"

2866,"ProsPreDetNsi",2,"Pronoun"

3223,"ProsPreToVplNpl",2,"VedVplNsiNpl"

1632,"ProsVedDetNplPreProoPreNpl",2,"VedVplNsiNpl"

2786,"ProsVedDetNplPreProoPreNpl",2,"VedVplNsiNpl"

1303,"ProsVedDetNsi",2,"VedVplNsiNpl"

1633,"ProsVedDetNsi",2,"VedVplNsiNpl"

2787,"ProsVedDetNsi",2,"VedVplNsiNpl"

2943,"ProsVedDetNsi",2,"VedVplNsiNpl"

1639,"ProsVedDetNsiAdvVpl",2,"VedVplNsiNpl"

2793,"ProsVedDetNsiAdvVpl",2,"VedVplNsiNpl"

1639,"ProsVedDetNsiConjVpl",2,"VedVplNsiNpl"

2793,"ProsVedDetNsiConjVpl",2,"VedVplNsiNpl"

1599,"ProsVedDetNsiPreDetNsiPreProo",2,"VedVplNsiNpl"

2709,"ProsVedDetNsiPreDetNsiPreProo",2,"VedVplNsiNpl"

1679,"ProsVedVplNplToVedNsi",2,"VedVplNsiNpl"

2833,"ProsVedVplNplToVedNsi",2,"VedVplNsiNpl"

1679,"ProsVedVplNplToVplNsi",2,"VedVplNsiNpl"

2833,"ProsVedVplNplToVplNsi",2,"VedVplNsiNpl"

1679,"ProsVedVplNplToVppNsi",2,"VedVplNsiNpl"

2833,"ProsVedVplNplToVppNsi",2,"VedVplNsiNpl"

1655,"ProsVing",2,"ProsVing"

2809,"ProsVing",2,"ProsVing"

1667,"ProsVingAdjNsiToDetNsi",2,"AdjNsiNpl"

2821,"ProsVingAdjNsiToDetNsi",2,"AdjNsiNpl"

1287,"ProsVingDetNplConjPossNsi",3,"PossNsiNpl"

1969,"ProsVingDetNplConjPossNsi",3,"PossNsiNpl"

2018,"ProsVingDetNplConjPossNsi",3,"PossNsiNpl"

1252,"ProsVingDetNsiPreNsi",2,"ProsVing"

1931,"ProsVingDetNsiPreNsi",2,"ProsVing"

1983,"ProsVingDetNsiPreNsi",2,"ProsVing"

1672,"ProsVingPossWhAreDetNsiProsVplToNsi",2,"ProsVing"

2826,"ProsVingPossWhAreDetNsiProsVplToNsi",2,"ProsVing"

1672,"ProsVingPossWhAreDetNsiProsVplToVpl",2,"ProsVing"

2826,"ProsVingPossWhAreDetNsiProsVplToVpl",2,"ProsVing"

1672,"ProsVingProoWhAreDetNsiProsVplToNsi",2,"ProsVing"

2826,"ProsVingProoWhAreDetNsiProsVplToNsi",2,"ProsVing"

1672,"ProsVingProoWhAreDetNsiProsVplToVpl",2,"ProsVing"

2826,"ProsVingProoWhAreDetNsiProsVplToVpl",2,"ProsVing"

1658,"ProsVingVingVing",2,"ProsVing"

2812,"ProsVingVingVing",2,"ProsVing"

1695,"ProsVplAdjNsi",2,"VedVplNsiNpl"

2732,"ProsVplAdjNsi",2,"VedVplNsiNpl"

3227,"ProsVplAdjNsi",2,"VedVplNsiNpl"

1647,"ProsVplAdjNsiToNsi",2,"VedVplNsiNpl"

2801,"ProsVplAdjNsiToNsi",2,"VedVplNsiNpl"

3241,"ProsVplAdv",2,"ProsVpl"

1382,"ProsVplDetAdjNpl",2,"VedVplNsiNpl"

2921,"ProsVplDetAdjNpl",2,"VedVplNsiNpl"

1363,"ProsVplDetNpl",2,"VedVplNsiNpl"

1631,"ProsVplDetNpl",2,"VedVplNsiNpl"

2785,"ProsVplDetNpl",2,"VedVplNsiNpl"

2902,"ProsVplDetNpl",2,"VedVplNsiNpl"

1258,"ProsVplDetNplPreAdv",2,"VedVplNsiNpl"

1937,"ProsVplDetNplPreAdv",2,"VedVplNsiNpl"

1989,"ProsVplDetNplPreAdv",2,"VedVplNsiNpl"

1258,"ProsVplDetNplPreNsi",2,"VedVplNsiNpl"

1937,"ProsVplDetNplPreNsi",2,"VedVplNsiNpl"

1989,"ProsVplDetNplPreNsi",2,"VedVplNsiNpl"

1418,"ProsVplDetNsi",2,"VedVplNsiNpl"

1420,"ProsVplDetNsi",2,"VedVplNsiNpl"

1626,"ProsVplDetNsi",2,"VedVplNsiNpl"

2780,"ProsVplDetNsi",2,"VedVplNsiNpl"

2866,"ProsVplDetNsi",2,"VedVplNsiNpl"

2868,"ProsVplDetNsi",2,"VedVplNsiNpl"

1256,"ProsVplDetNsiDetNsiPreNsi",2,"VedVplNsiNpl"

1935,"ProsVplDetNsiDetNsiPreNsi",2,"VedVplNsiNpl"

1987,"ProsVplDetNsiDetNsiPreNsi",2,"VedVplNsiNpl"

1599,"ProsVplDetNsiPreDetNsiPreProo",2,"VedVplNsiNpl"

2709,"ProsVplDetNsiPreDetNsiPreProo",2,"VedVplNsiNpl"

1648,"ProsVplDetNsiPreNsi",2,"VedVplNsiNpl"

2802,"ProsVplDetNsiPreNsi",2,"VedVplNsiNpl"

1191,"ProsVplDisVplPoss",2,"ProsVpl"

3036,"ProsVplDisVplPoss",2,"ProsVpl"

1191,"ProsVplDisVplProo",2,"VplProo"

3036,"ProsVplDisVplProo",2,"VplProo"

1656,"ProsVplNpl",2,"VedVplNsiNpl"

2810,"ProsVplNpl",2,"VedVplNsiNpl"

1575,"ProsVplNsi",2,"VedVplNsiNpl"

2685,"ProsVplNsi",2,"VedVplNsiNpl"

3236,"ProsVplNsi",2,"VedVplNsiNpl"

1261,"ProsVplNsiDetNplToDetNsi",2,"VedVplNsiNpl"

1940,"ProsVplNsiDetNplToDetNsi",2,"VedVplNsiNpl"

1992,"ProsVplNsiDetNplToDetNsi",2,"VedVplNsiNpl"

1695,"ProsVplNsiNsi",2,"VedVplNsiNpl"

2732,"ProsVplNsiNsi",2,"VedVplNsiNpl"

1344,"ProsVplNsiPreAdjNsi",2,"VedVplNsiNpl"

2984,"ProsVplNsiPreAdjNsi",2,"VedVplNsiNpl"

1257,"ProsVplNsiPreDetNplWhVplVplDetNpl",2,"VedVplNsiNpl"

1936,"ProsVplNsiPreDetNplWhVplVplDetNpl",2,"VedVplNsiNpl"

1988,"ProsVplNsiPreDetNplWhVplVplDetNpl",2,"VedVplNsiNpl"

1266,"ProsVplNsiPreNsi",2,"VedVplNsiNpl"

1945,"ProsVplNsiPreNsi",2,"VedVplNsiNpl"

1997,"ProsVplNsiPreNsi",2,"VedVplNsiNpl"

1344,"ProsVplNsiPreNsiNsi",2,"VedVplNsiNpl"

2984,"ProsVplNsiPreNsiNsi",2,"VedVplNsiNpl"

1247,"ProsVplNsiToPoss",2,"VedVplNsiNpl"

1926,"ProsVplNsiToPoss",2,"VedVplNsiNpl"

1978,"ProsVplNsiToPoss",2,"VedVplNsiNpl"

1247,"ProsVplNsiToProo",2,"VedVplNsiNpl"

1926,"ProsVplNsiToProo",2,"VedVplNsiNpl"

1978,"ProsVplNsiToProo",2,"VedVplNsiNpl"

964,"ProsVplPreDetNplPreDetNplConjVedDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"VedVplNsiNpl"

988,"ProsVplPreDetNplPreDetNplConjVedDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"VedVplNsiNpl"

964,"ProsVplPreDetNplPreDetNplConjVplDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"VedVplNsiNpl"

988,"ProsVplPreDetNplPreDetNplConjVplDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"VedVplNsiNpl"

964,"ProsVplPreDetNplPreDetNplConjVppDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"ProsVpl"

988,"ProsVplPreDetNplPreDetNplConjVppDetNplPreDetNsiProsVingDetNplWsNplDetNplVplPreNpl",2,"ProsVpl"

1278,"ProsVplPreDetNsi",2,"ProsVpl"

1376,"ProsVplPreDetNsi",2,"ProsVpl"

1957,"ProsVplPreDetNsi",2,"ProsVpl"

2009,"ProsVplPreDetNsi",2,"ProsVpl"

2915,"ProsVplPreDetNsi",2,"ProsVpl"

1380,"ProsVplPreDetNsiNsi",2,"ProsVpl"

2919,"ProsVplPreDetNsiNsi",2,"ProsVpl"

990,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreAdvAdjNsiVplDetNsiPreDetNsiPrePreAdjNpl",3,"AdvNsiNpl"

990,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreAdvAdjNsiVplDetNsiPreDetNsiPrePreNsiNpl",3,"AdvNsiNpl"

990,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreAdvNsiNsiVplDetNsiPreDetNsiPrePreAdjNpl",2,"VedVplNsiNpl"

990,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreAdvNsiNsiVplDetNsiPreDetNsiPrePreNsiNpl",2,"VedVplNsiNpl"

966,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvAdjNsiVplDetNsiPreDetNsiPrePreAdjNpl",3,"AdvNsiNpl"

966,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvAdjNsiVplDetNsiPreDet

NsiPrePreNsiNpl",3,"AdvNsiNpl"
966,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvNsiNsiVplDetNsiPreDet
NsiPrePreAdjNpl",2,"VedVplNsiNpl"
966,"ProsVplPreDetNsiPreDetNplPreDetNplProsVplPreConjAdvNsiNsiVplDetNsiPreDet
NsiPrePreNsiNpl",2,"VedVplNsiNpl"
1366,"ProsVplProsVingDetNplNsi",2,"ProsVing"
2905,"ProsVplProsVingDetNplNsi",2,"ProsVing"
1676,"ProsVplToDetNsiToNsiAdjNplProsVsi",5,"ProsVsi"
2830,"ProsVplToDetNsiToNsiAdjNplProsVsi",5,"ProsVsi"
1676,"ProsVplToDetNsiToVplAdjNplProsVsi",5,"ProsVsi"
2830,"ProsVplToDetNsiToVplAdjNplProsVsi",5,"ProsVsi"
3171,"ProsVplToNsi",2,"ProsVpl"
3222,"ProsVplToVpl",2,"ProsVpl"
3223,"ProsVplToVplNpl",2,"VedVplNsiNpl"
1270,"ProsVplToVplToDetNsi",2,"ProsVpl"
1949,"ProsVplToVplToDetNsi",2,"ProsVpl"
2001,"ProsVplToVplToDetNsi",2,"ProsVpl"
1272,"ProsVplVpl",2,"ProsVpl"
1951,"ProsVplVpl",2,"ProsVpl"
2003,"ProsVplVpl",2,"ProsVpl"
1253,"ProsVplVplDetNpl",2,"VedVplNsiNpl"
1932,"ProsVplVplDetNpl",2,"VedVplNsiNpl"
1984,"ProsVplVplDetNpl",2,"VedVplNsiNpl"
1347,"ProsVplVplDetNsi",2,"VedVplNsiNpl"
2987,"ProsVplVplDetNsi",2,"VedVplNsiNpl"
1348,"ProsVplVplNsiPreDetNsi",2,"VedVplNsiNpl"
2988,"ProsVplVplNsiPreDetNsi",2,"VedVplNsiNpl"
1599,"ProsVppDetNsiPreDetNsiPreProo",2,"PreProo"
2709,"ProsVppDetNsiPreDetNsiPreProo",2,"PreProo"
1679,"ProsVppVplNplToVedNsi",2,"VedVplNsiNpl"
2833,"ProsVppVplNplToVedNsi",2,"VedVplNsiNpl"
1679,"ProsVppVplNplToVplNsi",2,"VedVplNsiNpl"

2833,"ProsVppVplNplToVplNsi",2,"VedVplNsiNpl"

1679,"ProsVppVplNplToVppNsi",2,"VedVplNsiNpl"

2833,"ProsVppVplNplToVppNsi",2,"VedVplNsiNpl"

1397,"ProsVsi",5,"ProsVsi"

2845,"ProsVsi",5,"ProsVsi"

1362,"ProsVsiAdv",5,"ProsVsi"

2901,"ProsVsiAdv",5,"ProsVsi"

3168,"ProsVsiDet",5,"ProsVsi"

3260,"ProsVsiDetNplPreNpl",5,"ProsVsi"

1642,"ProsVsiDetNplPreNsi",5,"ProsVsi"

2796,"ProsVsiDetNplPreNsi",5,"ProsVsi"

1659,"ProsVsiNpl",5,"ProsVsi"

2813,"ProsVsiNpl",5,"ProsVsi"

3270,"ProsVsiNplAdjNsi",5,"ProsVsi"

1407,"ProsVsiNsi",5,"ProsVsi"

2855,"ProsVsiNsi",5,"ProsVsi"

1882,"ProsVsiNsiAdjToDoAdv",5,"ProsVsi"

1139,"ProsVsiNsiAdjToDoNplNsi",5,"ProsVsi"

1882,"ProsVsiNsiAdjToVplAdv",5,"ProsVsi"

1139,"ProsVsiNsiAdjToVplNplNsi",5,"ProsVsi"

1165,"ProsVsiNsiPossNsi",5,"ProsVsi"

3010,"ProsVsiNsiPossNsi",5,"ProsVsi"

1839,"ProsVsiNsiPrePossNsi",5,"ProsVsi"

2544,"ProsVsiNsiPreProo",5,"ProsVsi"

1630,"ProsVsiPossNsiNsi",5,"ProsVsi"

2784,"ProsVsiPossNsiNsi",5,"ProsVsi"

1630,"ProsVsiPossVplNsi",5,"ProsVsi"

2784,"ProsVsiPossVplNsi",5,"ProsVsi"

2363,"ProsVsiPreAdj",5,"ProsVsi"

3226,"ProsVsiPreNsi",5,"ProsVsi"

3257,"ProsVsiPreNsi",5,"ProsVsi"

3253,"ProsVsiProo",5,"ProsVsi"

1630,"ProsVsiProoNsiNsi",5,"ProsVsi"

2784,"ProsVsiProoNsiNsi",5,"ProsVsi"

1630,"ProsVsiProoVplNsi",5,"ProsVsi"

2784,"ProsVsiProoVplNsi",5,"ProsVsi"

2303,"ProsVsiTo",5,"ProsVsi"

1140,"ProsVsiToNplNplNsiNplDetNsi",5,"ProsVsi"

1883,"ProsVsiToNplNplNsiNplDetNsi",5,"ProsVsi"

1203,"ProsVsiVedDetNsi",5,"ProsVsi"

3048,"ProsVsiVedDetNsi",5,"ProsVsi"

1205,"ProsVsiVedDetNsiNplPossNsiAdjNsi",5,"ProsVsi"

3050,"ProsVsiVedDetNsiNplPossNsiAdjNsi",5,"ProsVsi"

2363,"ProsVsiVplAdj",5,"ProsVsi"

1165,"ProsVsiVplPossNsi",5,"ProsVsi"

3010,"ProsVsiVplPossNsi",5,"ProsVsi"

1203,"ProsVsiVppDetNsi",5,"ProsVsi"

3048,"ProsVsiVppDetNsi",5,"ProsVsi"

1205,"ProsVsiVppDetNsiNplPossNsiAdjNsi",5,"ProsVsi"

3050,"ProsVsiVppDetNsiNplPossNsiAdjNsi",5,"ProsVsi"

1147,"ProsWillBeAdvNplPreAdjNsi",2,"AdjNsiNpl"

1890,"ProsWillBeAdvNplPreAdjNsi",2,"AdjNsiNpl"

1273,"ProsWillVplDetNsi",2,"VedVplNsiNpl"

1952,"ProsWillVplDetNsi",2,"VedVplNsiNpl"

2004,"ProsWillVplDetNsi",2,"VedVplNsiNpl"

3240,"ProsWillVsiAdv",2,"ProsPropVsiVpp"

1002,"SupNsi",1,"N/A"

1778,"SupNsi",1,"N/A"

1305,"SvNsi",2,"SvNsiNpl"

2945,"SvNsi",2,"SvNsiNpl"

1306,"SvProsHaveAdjNsi",2,"AdjNsiNpl"

2946,"SvProsHaveAdjNsi",2,"AdjNsiNpl"

1306,"SvProsVplAdjNsi",2,"VedVplNsiNpl"

2946,"SvProsVplAdjNsi",2,"VedVplNsiNpl"

1306,"SvProsVplNsiNsi",2,"VedVplNsiNpl"

2946,"SvProsVplNsiNsi",2,"VedVplNsiNpl"

89,"ThatIsAdvNp",1,"N/A"

89,"ThatIsDisNp",1,"N/A"

2331,"ToDoPropVplToNsiToNpl",5,"DoProp"

2331,"ToDoPropVplToVplToNpl",5,"DoProp"

2331,"ToVplProoPreToNsiToNpl",2,"VplProo"

2331,"ToVplProoPreToVplToNpl",2,"VplProo"

2331,"ToVplProoVplToNsiToNpl",2,"VplProo"

2331,"ToVplProoVplToVplToNpl",2,"VplProo"

1440,"VedAdjNsi",2,"VedVplNsiNpl"

1441,"VedAdjNsi",2,"VedVplNsiNpl"

2888,"VedAdjNsi",2,"VedVplNsiNpl"

2889,"VedAdjNsi",2,"VedVplNsiNpl"

1369,"VedDetNsi",2,"VedVplNsiNpl"

2908,"VedDetNsi",2,"VedVplNsiNpl"

1440,"VedNsiNsi",2,"VedVplNsiNpl"

1441,"VedNsiNsi",2,"VedVplNsiNpl"

2888,"VedNsiNsi",2,"VedVplNsiNpl"

2889,"VedNsiNsi",2,"VedVplNsiNpl"

1581,"VedProoNsi",2,"VedProo"

2691,"VedProoNsi",2,"VedProo"

2023,"VedProoNsiNsi",2,"VedProo"

2023,"VedProoVplNsi",2,"VedVplNsiNpl"

2023,"VedPropVplNsi",2,"VedVplNsiNpl"

1715,"Ving",2,"Ving"

2400,"Ving",2,"Ving"

2752,"Ving",2,"Ving"

1318,"VingWh",2,"Ving"

2958,"VingWh",2,"Ving"

1142,"Vpl",1,"Vpl"

1590,"Vpl",1,"Vpl"

Auto Profiling

1591,"Vpl",1,"Vpl"

1885,"Vpl",1,"Vpl"

2398,"Vpl",1,"Vpl"

2592,"Vpl",1,"Vpl"

2700,"Vpl",1,"Vpl"

2701,"Vpl",1,"Vpl"

1369,"VplDetNsi",2,"VedVplNsiNpl"

1662,"VplDetNsi",2,"VedVplNsiNpl"

2397,"VplDetNsi",2,"VedVplNsiNpl"

2816,"VplDetNsi",2,"VedVplNsiNpl"

2908,"VplDetNsi",2,"VedVplNsiNpl"

1411,"VplDetNsiConjNsi",2,"VedVplNsiNpl"

2859,"VplDetNsiConjNsi",2,"VedVplNsiNpl"

1411,"VplDetNsiConjVpl",2,"VedVplNsiNpl"

2859,"VplDetNsiConjVpl",2,"VedVplNsiNpl"

2396,"VplNsi",2,"VedVplNsiNpl"

2399,"VplNsi",2,"VedVplNsiNpl"

1325,"VplNsiConjAdjNsi",2,"VedVplNsiNpl"

2965,"VplNsiConjAdjNsi",2,"VedVplNsiNpl"

1325,"VplNsiConjNsiNsi",2,"VedVplNsiNpl"

2965,"VplNsiConjNsiNsi",2,"VedVplNsiNpl"

3146,"VplPrePropVplPreNplPreDetNsiConjVplPreDetNsi",1,"N/A"

3147,"VplPrePropVplPreNplPreDetNsiConjVplPreDetNsi",1,"N/A"

3150,"VplPrePropVplPreNplPreDetNsiConjVplPreDetNsi",1,"N/A"

3151,"VplPrePropVplPreNplPreDetNsiConjVplPreDetNsi",1,"N/A"

3154,"VplPrePropVplPreNplPreDetNsiConjVplPreDetNsi",1,"N/A"

3146,"VplPrePropVplPreNplPreDetNsiConjVplPreDetVpl",1,"N/A"

3147,"VplPrePropVplPreNplPreDetNsiConjVplPreDetVpl",1,"N/A"

3150,"VplPrePropVplPreNplPreDetNsiConjVplPreDetVpl",1,"N/A"

3151,"VplPrePropVplPreNplPreDetNsiConjVplPreDetVpl",1,"N/A"

3154,"VplPrePropVplPreNplPreDetNsiConjVplPreDetVpl",1,"N/A"

1055,"VplProoAdvPreDetNsi",2,"VplProo"

1049,"VplProoAdvPreToBeVplPreAdv",2,"VplProo"

1820,"VplProoAdvPreToBeVplPreNpl",2,"VplProo"

1049,"VplProoAdvPreToBeVplPreNsi",2,"VplProo"

1055,"VplProoAdvVplDetNsi",2,"VedVplNsiNpl"

1057,"VplProoAdvVplDetNsi",2,"VedVplNsiNpl"

1155,"VplProoAdvVplPreNpl",2,"VplProo"

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Auto Profiling

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Appendix D: User Sentences

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