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Android Mobile Phone based Syntactic Analysis System to Support English-Myanmar Translation for Tourists

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Abstract: Nowadays, the language barrier among tourists was one of the major difficulties when travelling. The tourists can rely on mobile phone for travelling purposes. Mobile phone is necessary part of the people's life. Mobile language translation system is used for a better travelling guide. So, this system is proposed as the syntactic analysis system to support English-Myanmar translation for tourists guide. The proposed system is also implemented on the android operated mobile phones because the android platform makes it easier for travellers to get and use applications on their mobile phones. The entire system is implemented by using Android SDK, SQLite and Java-based Android API.

Keywords: Android, Syntactic Analysis, Top-Down Parsing Technique.

I. INTRODUCTION

Today, tourism is the strongest and largest industry in the global economy world. In the tourism industry, tourist information is obtained mainly through newspaper, magazines, radio and other simple ways those are available easily. But problem is that tourists are not able to get travel information timely when they are on the move. In this situation, mobile devices are becoming more intelligent. The mobile phone application permitted users to get tour guidance information that they need anytime and anywhere. The rapid growth of mobile phones has lead to a renaissance for mobile services. Go-anywhere applications support a wide array of social, financial, and enterprise services for any user with a cellular data plan. Mobile devices are increasingly becoming an essential part of human life as the most effective and convenient communication tools not bounded by time and place.

So, this system is proposed for convenient for tourism industry. This system is implemented as the android mobile phone based syntactic analysis system to support about translation from the English language to Myanmar language. In order to understand natural language, the syntactic analysis is important for extracting meaning from text language. In the syntactic analysis, the syntax of a sentence is determined by a program called parser that breaks the sentences into various parts of speech by using lexicon. In this system, the top-down parsing technique is used for the syntactic analysis. This system used the SQLite database as the lexicon. The rest of the paper is organized as follows: related work is described in section 2. Aim and objectives are proposed in section 3. Section 4 represents about Android operating system (OS) in mobile phones. Natural language processing is described in section 5. In section 6, the proposed system design is presented. Finally, conclusion gives in section 7.

II. RELATED WORK

Dadape Jinendra R[2] described the design and implementation of a mobile application called Smart Travel Guide, with which mobile users can get tourism guidance information they need anytime and anywhere. By Smart Travel Guide, users can get an attraction's detailed information, including text, picture and video. In particular, Smart Travel Guide can provide users with location-based information, which can be browsed or queried through a map. User can search the nearby attractions after he or she configures the distance between the current location and the view spots. When the user moves out of the current location, the mobile phone will automatically send its new position to the server side, and the corresponding attraction list will be received by the user.

A. A. Tayade [3] proposed the Chinese-English translation which are useful for tourists. Optical Character Recognition is used for extracting text from signboard images. The accuracy of Optical Character Recognition depends on Segmentation phase.

III. AIM AND OBJECTIVES

Aim and objectives of the system are as follows:

- To implement the syntactic analysis system on the android mobile phone.
- To support the English-Myanmar language translation system.
- To support the Tourists who visit to Myanmar for translation.

- To study the natural language processing theory and android theory.

IV. ANDROID OS IN MOBILE PHONES

Android is an operating system (OS) based on the Linux kernel, and designed primarily for touchscreen mobile devices such as smartphones and tablet computers. Android has become a need rather than luxury these days, and its popularity has increased rapidly among the smart phones. Android App Development is nowadays has become an important tool for developing mobile applications. There are lots of OS which are available these days but among all of them android is the best one, as it can be handled easily and also it is very easy to implement because of its open source nature. The (SDK) facilitated by the Android assists the developers to start developing and working on the applications instantaneously and the app can be implemented faster. Android is a product of Google and it is owned by open handset alliance group [6]. The android mobile platform constitutes of an operating system (OS), the middle ware, main applications, and a (SDK). The SDK facilitates the developers with the APIs and tools needed for Development. The distribution platform is of an open nature which allows the android developers to develop the applications and freely distribute them over the internet. Figure 1 shows the Android architecture [1].

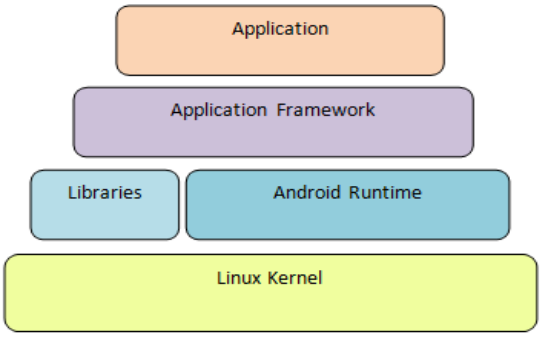

Figure1. Android Architecture

A. Benefits of Using Android OS in Mobile Phones

Benefits of using Android OS in Mobile Phones are as follows [6]:

- Android is based on Linux. This facilitates easy accessibility to rich development environment and core functionality of the mobile device.
- It allows quick information gathering. It provides the accurate information sought.
- The cycle is drastically reduced.
- The development tools are easy to use.
- All the information and services are provided to the developers without any biasness.
- It provides rich browser facilities as well. This facilitates developer to provide enhanced services.

V. NATURAL LANGUAGE PROCESSING

Natural languages are those spoken by people. Natural language processing(NLP) encompasses anything a computer needs to understand natural language (typed or spoken) and also generate the natural language. NLP is a subfield of Artificial Intelligence and linguistic, devoted to make computers "understand" statements written in human languages [5].

A. Steps of Natural Language processing

Natural Language Processing usually involves several steps. They are:

- Morphological and lexical analysis
- Syntactic analysis
- Semantic analysis
- Discourse integration
- Pragmatic analysis

Among them, this system proposed the first two steps among them [5].

B. Morphological and Lexical Analysis

The lexicon of a language is their vocabularies that include its words and expressions. Morphology is the identification, analysis and description of structure of words. The words are generally accepted as being the smallest unit of syntax [5]. Lexical analysis is the process of converting a sequence of characters into a sequence of tokens that is meaningful character strings. A program or function that performs lexical analysis is called a lexical analyzer, lexer and tokenizer. Tokenization is the process of breaking a sequence into words, punctuations and other symbols. These words and expression sequences are called tokens, and the tools performing such tokenization are tokenizer. A lexer is generally combined with a parser, which together analyze the syntax of the language [7].

C. Parser

A parser is a software component that takes input data (frequently text), and builds some kind of parse tree, abstract syntax tree or other hierarchical structure that are giving a structural representation of the input and checking for correct syntax in the process. The parsing may be preceded or followed by other steps, or these may be combined into a single step. The parser is often preceded by a separate lexical analyser, which creates tokens from the sequence of input characters.

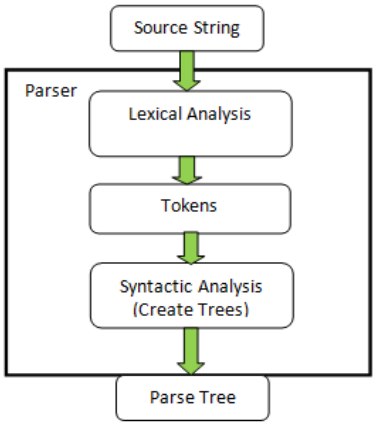

Figure2. Process Flow of Parser.

Parsing is the process of converting a sentence into a tree that represents the sentence's syntactic structure. There are two types of parsing process. These are:

- Top-down parsing
- Bottom-up parsing

Among them, the proposed system used the top-down parsing technique [8].

1. Top-down Parsing: Top-down parsing can be viewed as an attempt to find left-most derivations of an input-stream by searching for parse trees using a top-down expansion of the given formal grammar rules. Tokens are consumed from left to right. Inclusive choice is used to accommodate ambiguity by expanding all alternative right-hand-sides of grammar rules. The rules of a grammar are used to define a special kind of string substitution. This substitution is accomplished by replacing a specific non-terminal in some given string of terminals and non-terminals with the right-hand side of a production, which has the specified non-terminal as its left had side [8].

For example, consider the following grammar with starting non-terminal <S>.

1. <S> → <X> <Y>
2. <X> → x <X>
3. <X> → x
4. <Y> → y <Y>
5. <Y> → y

If we are given the sentence "x x x y y", the left most derivation will get from given grammar. The left most derivation is as follows:

<S>⇨<X> <Y>
⇨ x <X> <Y>
⇨x x <X> <Y>
⇨x x x <Y>
⇨x x x y <Y>
⇨x x x y y

2. Bottom-up Parsing: A parser can start with the input and attempt to rewrite it to start symbol. Intuitively, the parser attempts to locate the most basic elements, then the elements containing these, and so on [8].

D. Syntactic Analysis

Syntactic analysis is the analysis of words in a sentence to know the grammatical structure of the sentence. The words are transformed into structures that show how the words relate to each others. Some word sequences may be rejected if they violate the rules of the language for how words may be combined. Syntactical analysis is the application of the languages grammar to the application's input. This information is used to develop a parse tree for the sentence which will later be used to uncover the meaning of the sentence in the semantic analysis. The syntactic analyzer identifies the noun phrase and verb phrase and further breaks them down into other elements [4]. A sentence is made up of a subject (S) or noun phrase (NP) and a predicate or verb phrase (VP) as described below.

$$S = NP + VP$$

The noun phrase could be a single known, but it can usually be broken down further into several additional parts of speech such as an article (ART) or determiner (D), and adjective (ADJ) or two, and the main noun:

$$NP = D + ADJ + N$$

The noun phrase may even be a prepositional phrase (PP) made up of a preposition (P) such as of or with and another determiner and noun:

$$PP = P + D + N$$

The verb phrase (VP) is made up of the verb (V) and often the object of the verb, which are usually another noun (N) and its determiner (D). A prepositional phrase (PP) may also be associated with the verb phrase:

$$VP = V + D + N + PP$$

As an example, the parse tree using syntactic analysis of the sentence "Jack ate a frog" is shown in Figure 3.

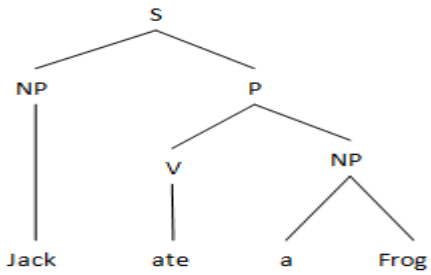

Figure3. Parse Tree using Syntactic Analysis.

VI. PROPOSED SYSTEM DESIGN

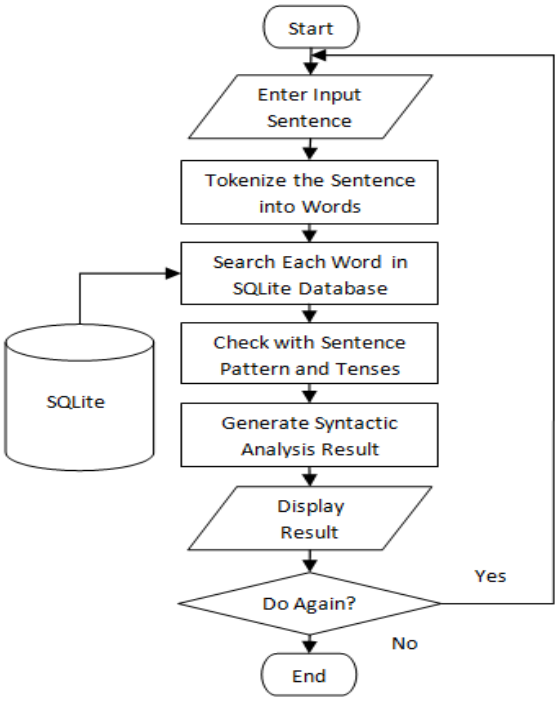

Figure4. Proposed System Design.

Proposed system design is shown in Figure4. This system is proposed as the syntactic analysis system on the android mobile phone. This system supports the translation from English language to Myanmar language for Tourists. At first of the system, the user must input the sentence that the user wants to translate from English to Myanmar. And then, this system tokenizes this sentence into words and searches these words into the SQLite database. In the syntactic analysis process, this system checks the sentence pattern and tenses. Finally, the proposed system generates the syntactic analysis of the inputted sentence.

A. Flow Chart for the Syntactic Analysis System

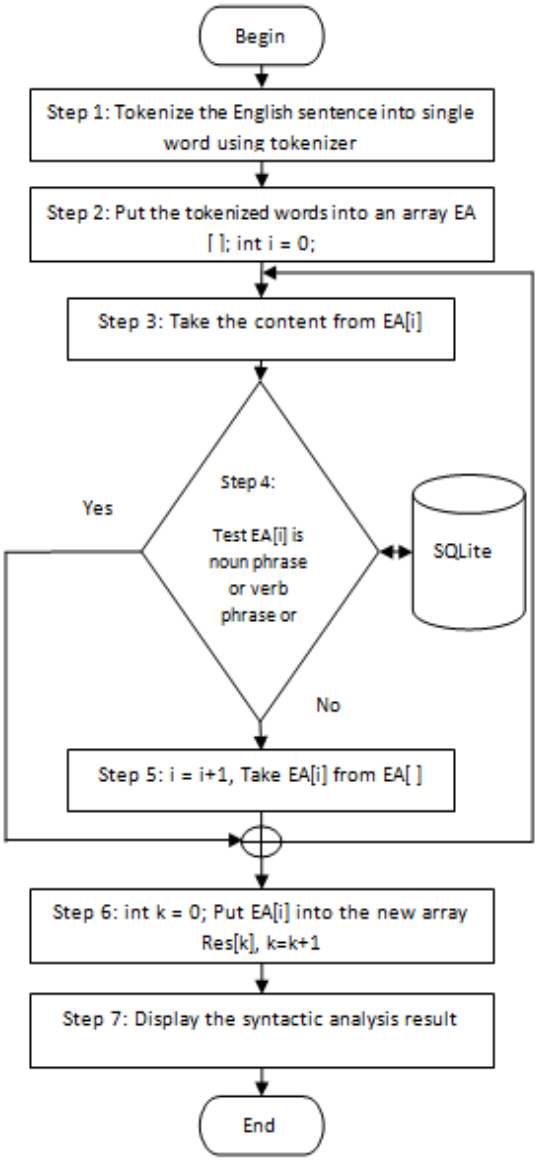

Figure 5. Flow Chart for the Syntactic Analysis System.

A. Sample Syntactic Analysis Process

This paper presents the syntactic analysis process with an example. In this example, the user input sentence is as follows:

"I would like to go to the pagoda"

After accepting the input sentence, this system tokenizes this sentence into each single word. And then, this system checks these tokenized words to define the noun phrase or verb phrase or time by using SQLite database. After checking, this system displays the syntactic analysis result. In this system, the grammar units are as follows:

1. <S> ⇨ Sentence
2. <NP> ⇨ Noun Phrase
3. <VP> ⇨Verb Phrase
4. <N> ⇨ Noun
5. <Det> ⇨ Determiner
6. <PP> ⇨ Preposition
7. <MlV> ⇨ Modal Verb
8. <MV> ⇨ Main Verb
9. <V> ⇨ Verb

The processing steps of the syntactic process about input sentence are as follows:

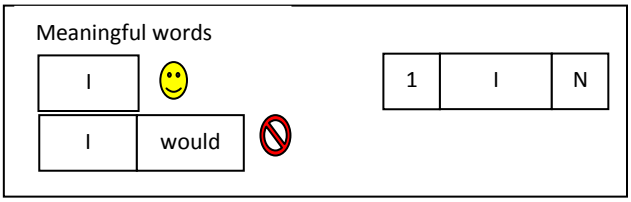

Figure 6. Analysis Step1

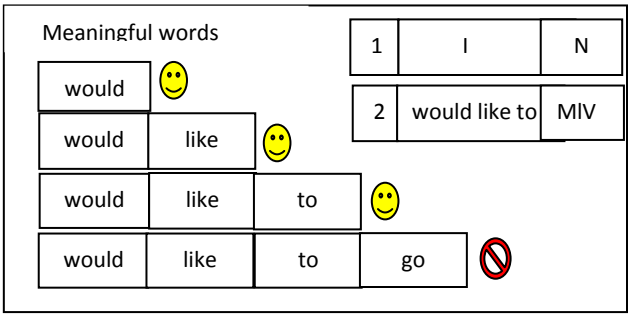

Figure7. Analysis Step2

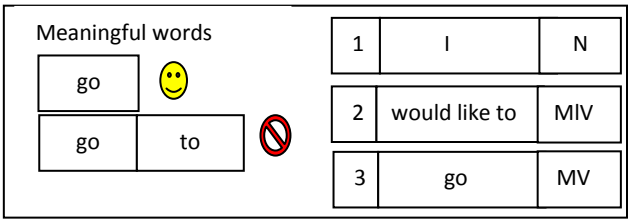

Figure8. Analysis Step3

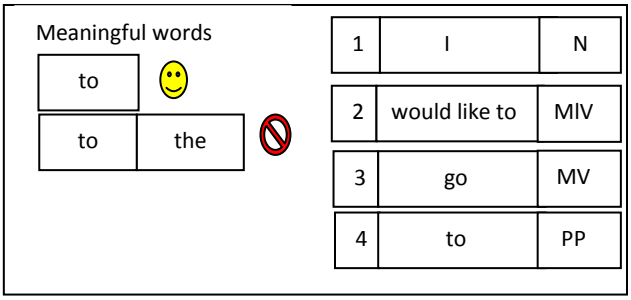

Figure9. Analysis Step4

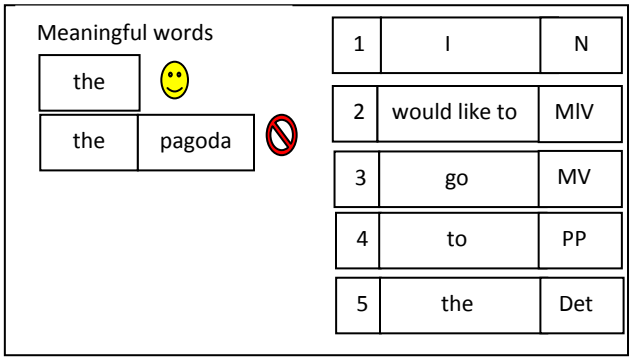

Figure 10. Analysis Step5.

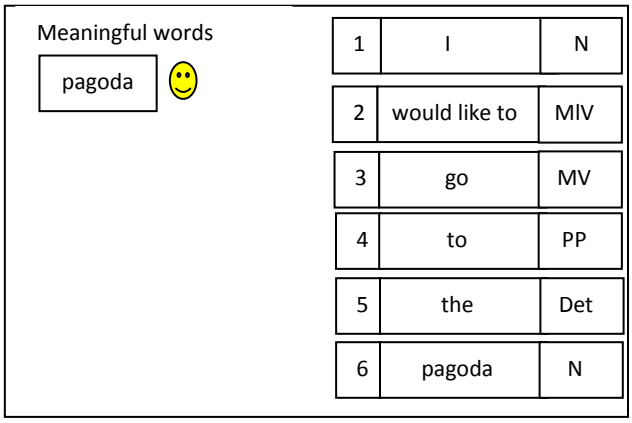

Figure 11. Analysis Step6.

The parse tree about the sample syntactic analysis process is shown in Figure 12.

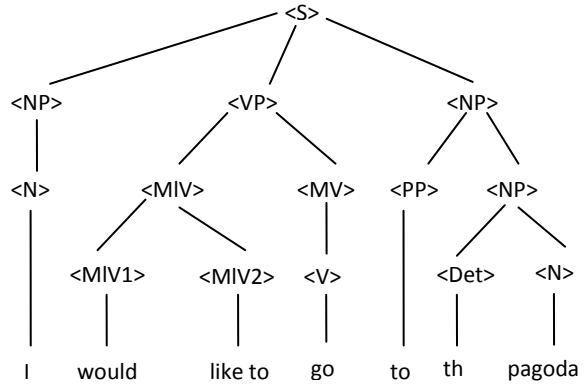

Figure12. Parse Tree of the Sample Syntactic Analysis Process.

B. Implementation of the System

This system is implemented to support the complete and reliable English-to-Myanmar translation system for smart phones by analyzing the syntactic about the input sentence. The Android mobile phone based syntactic analysis system is shown in Figure 13. At first of the system, if the user (tourist) wants to analyse the English sentence for supporting language translation, the user must use the "Start" button. The welcome screen of the proposed system is shown in Figure 14. And then, the user must input the English sentence by using the keypad on the mobile phone. After this system has received the input sentence from the user, this system performed the syntactic analysis. Finally, this system displays the analysis result of the input sentence to the user. Syntactic analysis result is shown in Figure 15.

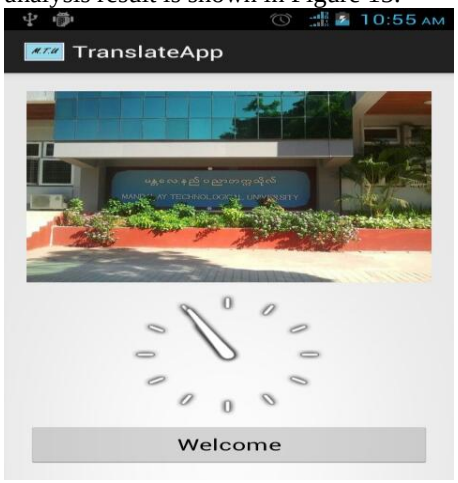

Figure13.Android Mobile Phone based Syntactic Analysis System

Figure14. Welcome Screen.

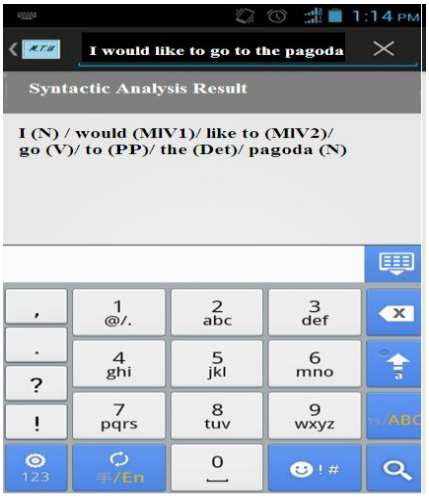

Figure15. Syntactic Analysis Result.

VII. CONCLUSION

Android mobile phones based applications are now being developed. The most frequent applications based on android mobile phones are the context-related access control, language translation and so on. So, this system is proposed the android mobile phones based syntactic analysis system to support language translation. According to the syntactic analysis process, this system analyzes the input English sentence by using grammatical rules. For Tourists, this system provides the easiest and smartest way to install and use this program on their android mobile phones.

VIII. ACKNOWLEDGMENT

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