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# MODEL OF MOBILE TRANSLATOR APPLICATION OF ENGLISH TO BAHASA INDONESIA WITH RULE-BASED AND J2ME

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**Abstract:** Along with the development of information technology in recent era, a number of new applications emerge, especially on mobile phones. The use of mobile phones, besides as communication media, is also as media of learning, such as translator application. Translator application can be a tool to learn a language, such as English to Bahasa Indonesia translator application. The purpose of this research is to allow user to be able to translate English to Bahasa Indonesia on mobile phone easily. Translator application on this research was developed using Java programming language (especially J2ME) because of its advantage that can run on various operating systems and its open source that can be easily developed and distributed. In this research, data collection was done through literature study, observation, and browsing similar application. Development of the system used object-oriented analysis and design that can be described by using case diagrams, class diagrams, sequence diagrams, and activity diagrams. The translation process used rule-based method. Result of this research is the application of Java-based translator which can translate English sentence into Indonesian sentence. The application can be accessed using a mobile phone with Internet connection. The application has spelling check feature that is able to check the wrong word and provide alternative word that approaches the word input. Conclusion of this research is the application can translate sentence in daily conversation quite well with the sentence structure corresponds and is close to its original meaning.

**Keywords:** translator application; English; Bahasa Indonesia

## INTRODUCTION

The development of information technology in recent era makes a growing number of new applications emerge, especially on mobile phones. Selection of mobile phone as one of the application developments, besides it is easier in operating, the flexible trait in mobile phone becomes one of the reasons. Now, mobile phone seems to become one of people's main needs. Mobile phone is not only used by adult, but also by children.

The use of mobile phones besides as communication media, they can also be used as media of learning, such as translator application. Translator application can be a tool of learning a language. There are many things we can know through a translator application.

At this time, technology development on mobile phone has been developed by using Java 2 Platform Micro Edition (J2ME) technology that allows mobile phone users make Java program that can run on mobile phone supported by J2ME platform. J2ME technology is platform developed by Sun Microsystems Inc., which allows mobile phone users to make and install Java program application on their phone. By J2ME technology, mobile phone users can do their own creation or download Java program to be used on their mobile phones.

One of the examples of translator application that can be accessed online is Google Translate. To access it, it needs Internet connection. If there is no Internet connection, then the application cannot run.

Goals of research are (a) modeling a translator application of English to bahasa Indonesia based on Rule-based and J2ME; (b) helping people in translating English to bahasa Indonesia with system mobile computing. So that, this research preparation is not out from the main problem defined, and then the scope of discussion limits on: (a) word division separated with space, dot, comma, question mark and exclamation mark so in each string that is obtained from words that have been separated is considered as a token; (b) sentence form does not only limit

to positive or negative sentence, but also question sentence and sentence that has clause; (c) sentence that may consist of shortened to be like I'm; (d) it can translate idiom correctly; (e) using American grammar; (f) the amount of input character is maximally 160 characters; (g) it can't translate slang or abbreviation like brb; (h) it can translate the use of double meaning words, if the meaning for word and mark of type of word of that word is different, but if the meaning for word and mark of type of word of that word is same, then that word can't be translated well according to its sentence context. (i) it can translate 16 tenses; (j) if the tenses are correct, then they will be translated correctly, but if the tenses are wrong, then they will be still translated without checking the grammar; (k) the vocabulary is up to 2000 words; (l) if there is unknown word, then it will show an alternative word approaching word entered; (m) architecture of application that will be built is using client-server computing, which is a network technique, which the computing process is on server side, while client side running application that has been installed on server side.

## LITERATURE REVIEW

### J2ME

According to Ref. [1], Java 2 Micro Edition or what is usually called as J2ME is development environment that is designed to put Java software in electronics along with its supporting tools. In J2ME, if software can function well in a tool, then it isn't certain to function well in other tools. J2ME is usually used on mobile phone, pager, Personal Digital Assistants (PDA) and the likes.


Fig. 1: J2ME Stack

### Configuration

A configuration portrays minimal feature from complete environment of Java runtime. A J2ME configuration portrays a minimum complement of Java technology. Configuration portrays: subset of Java programming language, Java Virtual Machine (JVM) ability, core platform libraries, and safety and network feature.

### Profile

A profile portrays additional sets from API and features for a certain market, tool or industry category. While, configuration portrays basic library, profile portrays important library to make application effective. This library enters user interface, network, and API storage.

### CLDC

According to Ref. [1], CLCD or Connected Limited Device Configuration is basic tool of J2ME that is basic specification like library and API implemented in J2ME, which is used in mobile phone, pager, and PDA. Those tool are limited by memory limitation, source and processing ability. CLCD specification in J2ME is minimal specification of package class and half of the function of Java Virtual Machine is reduced so it can be implemented with limitation of those tools. The JVM used is called as KVM (Kilobyte Virtual Machine).

CLCD tool has characteristics like these: limited memory between 160-512 kb for Java platform, processor with 16 or 32 bit, consuming little power, and is limited to temporary network connection by bandwidth limitation (usually wireless). CLCD doesn't portray installation or cycle of a user interface and even handling application. Portraying this area is work of profile that is below CLCD. Specifically, MIDP specification portrays MIDP cycle application (MIDlet), library of user interface and even handling (Javax microedition lcdui*).

### CDC

Connected Device Configuration (CDC) is super set of CLCD. SDC provides wider environment of Java runtime than CLCD and closer to environment of J2ME.

C Virtual Machine (CVM) supports Java Virtual Machine (JVM) fully. CDC consists of all API of CLCD. CDC provides a bigger subset than all J2SE class.

### MIDP

The Mobile Information Device Profile (MIDP) is above CLCD. Mobile application can't be written by only using CLCD API. MIDP must still be utilized to define user interface. MIDP specification is mostly like other CLCD and API that have been portrayed through Java Community Process (JCP). JCP involves a group of experts coming from more than 50 companies, which consist of mobile tools factory and software developer. MIDP continues to develop with future versions that have passed tight process of JCP.

According to Ref. [1], MIDP specification portrays a MID tool that has characteristics, like these:

Display:

- Screen size: 96x54
- Display Depth (minimum): 1 bit
- Pixel sharpness: about 1:1

Input:

- A or several mechanisms of user-input: one-handed keyboard, two handed keyboard or touch screen.

Memory:

- 256 kilobytes of non-volatile memory to implement MIDP and CLCD need
- 8 kilobytes of non-volatile memory for data application
- 128 kilobytes for Java runtime (like the Java heap)

Network:

- Two lanes, wireless, limited bandwidth

Sound:

- Ability to play tones

**MIDlets**

Application that runs in a tool supporting MIDP is called as MIDlets or shorter is MIDlet is application that is made using Java 2 Micro Edition with profile Mobile Information Device Profile (MIDP). MIDP is specified to be used in handset with limited ability of CPU, memory, keyboard, and layer, like mobile phone, pager, PDA and others.

According to Ref. [2], cycle of a MIDlet is handled by Application Management Software (AMS). AMS is environment of cycle from a MIDlet, it can be to be created, run, stopped or even omitted. AMS is usually called as Java Application Manager (JAM). MIDlet has several states, which are: Pause, Active, and Destroy. When each state is called, several methods that are corresponding called. Those methods are default of J2ME.

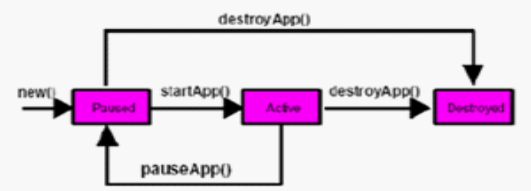


Fig. 2: MIDlet process in Java Application Manager (JAM)

**MYSQL**

According to Ref. [3], MySQL is a management system based on relational data that is open source and multithread created by Michael "Monty" Widenius in 1995. Actually MySQL has two types of license. The first one is open source by using GNU Public License (GPL). The second one is standard commercial license that can be bought from MySQL AB, which is commercial company funded by MySQL developer.

According to Ref. [4], MySQL can be defined as database management system. We need database management system like MySQL server to add, access and process data stored in a computer database. MySQL is also client-server server consisting of multithread of SQL server that supports different client and library software.

The main feature is written in C and C++ language, it can work in various platforms, provide transaction and non-transaction storage machine, have library that can be used in stand-alone application, and can handle big scale database.

**Parsing Method**

According to Ref. [5], parsing method can be divided into three, which are as follows.

Top-down parsing can be viewed as an attempt to find leftmost derivation from an input circuit. Leftmost derivation is in each derivation step, the leftmost variable is changed. In top-down parsing, it is known two methods, which are (a) recursive descend parsing: one of methods of top-down parsing using number of recursive procedure; (b) predictive parsing: a kind of recursive descend parsing that depends on information about first terminal symbol that can be generated by body of a production. Information about this first symbol is given by function FIRST().

Bottom-up parsing is more using shift-reduce parsing. Shift-reduce parsing try to make parser tree of an input started from bottom (leaf) and moved to above towards peak (root). In each derivation step, the rightmost variable is changed, that step is called as rightmost derivation.

Universal parsing, this method uses Cocke-Younger-Kasami algorithm and Early algorithm that can outline all types of grammar, but this method is not efficient to be used in compiler making so this method is rarely used.

**UML**

According to Ref. [6], UML (Unified Modeling Language) is one of the very reliable helping tools in system development world. This is because UML provides visual modeling language that allows system developer to make blue print of their vision in standard, easy to understand form, and is equipped by effective mechanism to share and communicate their design with others. UML is a unity of modeling language developed by Booch, Object Modeling Technique (OMT) and Object Oriented Software Engineering (OOSE).

UML diagram in general can be classified into two groups. They are as follows. Structure diagram, it stresses on object structure in a system, concerning classes, interface, attribute and relation between components. Structure diagram consists of: (a) class diagram, showing relation between classes and detail explanation of each class in model planning of a

system, (b) component diagram, portraying allocation of all classes and objects in components in physic design of software system, (c) composite structure diagram, showing decomposition hierarchically of a class in a internal structure, (d) deployment diagram, showing layout of a system physically, showing software parts that run in hardware parts, (e) object diagram, showing configuration example of objects, (f) package diagram, classifying construction that allows to obtain that construction in UML and classifying those elements altogether to become higher level.

Behavior diagram, it stresses on object trait in a system, including method, interaction, collaboration, and state history. Behavior diagram consists of: (a) activity diagram, modeling work lane in a business process and activity series in a process, (b) use case diagram, showing functionality of a system or class and how system interacts with the outside world, (c) state machine diagram, showing state that is through an activity object that causes a transition from a state or activity to the others and action that causes to change in state and activity, (d) interaction diagram, consisting of (1) sequence diagram explaining object interaction that is arranged in a time order, specifically related to use case, (2) communication diagram, stressing to data link like various participants in interaction between objects, (3) interaction overview diagram, transplanting altogether between activity diagram and sequence diagram, (4) timing diagram, the other form of interaction diagram, which the main focus is time.

## METHOD

Research methods conducted are: Collecting data by (a) literature review from several literatures and documents that support the research, especially that is related to translation application of English to Indonesian; (b) observation related to translation application of English to Indonesian in language translating process; (c) browsing many websites and desktop application on the Internet that provide relevant information in making translator application of English to bahasa Indonesia. Analyzing data collected; in this stage, writer makes data analysis from the previous main problem that has been obtained so writer can get relevant data. Planning and designing application; in this stage, writer makes application planning according to the previous main problem and implements it in application design. Making application; in this stage, writer makes and develops the previous main problem, so it can get suitable application with planning and design by using Java and MySQL language programming as its database. Testing and evaluating; in this stage, writer tests all structure specifications and the application thoroughly and evaluates the lacks, so the application designed meets the expectation.

**System Planning**

Mobile translator application is a client server application, so its system planning includes an actor in client side, that is user; meanwhile from server side is admin.


Fig. 3: Use case diagram of mobile translator application system

**System Implementation**

Mobile translator application can run if the Internet on mobile phone is already adjusted according to the operator. When the application runs, it will show login page (Fig. 4). Admin has to login first to use mobile translator application for admin. While, mobile translator for user doesn't need to login.


Fig. 4: Display of login page


Fig. 5: Display of English-Indonesian page

When translating unknown word, then it will show spelling check page (see Fig. 6) that gives alternative word from input word in English.

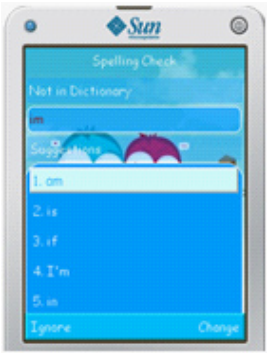


Fig. 6: Display of spelling check page

## RESULTS AND DISCUSSION

The example of application test result that has been made can be seen on Appendix page. The test was done on type of single sentence, complex sentence, passive sentence, 16 tenses and paragraph.

Then, the ability of the application which was made is as follows. The application can translate into 16 tenses correctly. It can translate idiom until five levels. It can translate active sentence, passive sentence, question, imperative sentence, and complex sentence. It can translate shortened word. If there is unknown word, then it will show alternative word approaching the word entered. It can translate the use of double meaning words; if the meaning for word and the mark type of the word is different, yet if the meaning for word and the mark type of the word is same, then that word can't be translated well according to its sentence context.

However, research found some weaknesses on the mobile translator application. The weaknesses of application made are as follows. The amounts of vocabularies that can be translated are limited to only 2000 words. It can't translate the use of double meaning words well if the meaning of the word has the same mark of type of word. It can't translate adjective well if there is more than one adjective used consecutively, like: red, green, and blue balloon, it will be translated into merah, hijau dan balon biru. It needs Internet connection to run the application.

## CONCLUSION

Based on research conducted, then it can be concluded as follows. Mobile translator application can translate sentences in daily conversation quite well with suitable translated sentence structure and is close to its original meaning. Mobile translator application can translate 16 tenses correctly. Mobile translator application has spelling check feature that can check word mistake entered and can give alternative word to the word entered. Mobile translator application needs GPRS (General Packet Radio Service) connection to run the application. Mobile translator application has been tested and can run well in Java emulator and on Nokia N73 mobile phone with 240x320 pixel display resolution and Java MIDP 2.0.

### Suggestion

Here are suggestions that can be given for further development based on the result of research conducted. It needs further development so it can translate in two ways (English-Indonesian or Indonesian-English). It needs grammar checker feature to check grammatical mistake on the sentence entered. It needs further development so this application can run in almost all types of mobile phones.

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## APPENDIX

Table 1: The result of test based on tenses

| No. | Tenses | English sentence | Indonesian Sentence |
|---|---|---|---|
| 1 | Simple Present Tense | • He studies English everyday.<br>• I get up at 8 o'clock every morning. | • Dia belajar Inggris setiap hari.<br>• Saya bangun pada jam 8 setiap pagi. |
| 2 | Present Continuous Tense | • We are going to Jakarta tomorrow.<br>• You are singing now. | • Kami (kita) akan ke Jakarta besok.<br>• Kamu sedang menyanyi sekarang. |
| 3 | Present Perfect Tense | • I have done it.<br>• She has already gone to Jakarta for ten days | • Saya telah melakukan itu.<br>• Dia sudah pergi ke Jakarta selama sepuluh hari. |
| 4 | Present Perfect Contiuous Tense | • The students have been singing since this morning.<br>• He has been studying for two hours. | • Siswa telah sedang menyanyi sejak pagi ini.<br>• Dia telah sedang belajar selama dua jam. |

| | | | |
|---|---|---|---|
| 5 | Simple Past Tense | • I went to school yesterday.<br>• I studied English last night | • Saya pergi ke sekolah kemarin.<br>• Saya belajar Inggris semalam. |
| 6 | Past Continuous Tense | • I was studying when the man went to my bedroom.<br>• She was cooking rice when Tom came yesterday. | • Saya sedang belajar ketika pria pergi ke kamar tidurku.<br>• Dia sedang memasak nasi ketika Tom datang kemarin. |
| 7 | Past Perfect Tense | • She had waited me.<br>• They had eaten before I got back. | • Dia telah menunggu saya.<br>• Mereka telah makan sebelum saya kembali. |
| 8 | Past Perfect Continuous Tense | • We had been being very busy after we received many orders.<br>• He had been going to the party. | • Kami (kita) telah sedang sangat sibuk setelah kami (kita) menerima banyak pesanan.<br>• Dia telah sedang pergi ke pesta. |
| 9 | Simple Future Tense | • My parents will go to Alaska.<br>• Maria will play badminton tomorrow. | • Orang tuaku akan pergi ke Alaska.<br>• Maria akan bermain bulu tangkis besok. |
| 10 | Future Continuous Tense | • You will be going to school at seven o'clock tomorrow morning.<br>• They will be working in this garden tomorrow. | • Kamu akan sedang pergi ke sekolah pada jam tujuh besok pagi.<br>• Mereka akan sedang bekerja di kebun ini besok. |
| 11 | Future Perfect Tense | • He will have helped me.<br>• We will have arrived in Jakarta tomorrow afternoon. | • Dia akan telah membantu saya.<br>• Kami (kita) akan telah tiba di Jakarta besok sore. |
| 12 | Future Perfect Continuous Tense | • They will have been studying since this morning.<br>• The president will have been waiting for election. | • Mereka akan telah sedang belajar sejak pagi ini.<br>• Presiden akan telah sedang menunggu untuk pemilihan. |
| 13 | Simple Past Future Tense | • I would come if you invited me.<br>• Tom would travel if he had more money. | • Saya akan datang jika kamu mengundang saya.<br>• Tom akan bepergian jika dia punya lebih banyak uang. |
| 14 | Past Future Continuous Tense | • They would be going home when we came.<br>• We would be building the house at that time. | • Mereka akan sedang pulang ketika kami (kita) datang.<br>• Kami (kita) akan sedang membangun rumah pada waktu itu. |
| 15 | Past Future Perfect Tense | • We would have arrived on time if we walked faster.<br>• She would have passed the exam if she had studied more seriously | • Kami (kita) akan telah tiba tepat waktu jika kami (kita) berjalan lebih cepat.<br>• Dia akan telah lulus ujian jika dia telah belajar lebih serius. |
| 20 | Past Future Perfect Continuous Tense | • The meeting would have been starting since this morning if Mayor had come on time.<br>• I would have been swimming for 30 minutes When You called me yesterday. | • Rapat akan telah sedang mulai sejak pagi ini jika walikota telah datang tepat waktu.<br>• Saya akan telah sedang berenang selama 30 menit ketika kamu menelepon saya kemarin. |

Table 2: The result of positive statement test

| English sentence | Indonesian sentence |
|---|---|
| She goes to school every morning. | Dia pergi ke sekolah setiap pagi. |
| You have done your homework. | Kamu telah melakukan pekerjaan rumahmu. |
| I am playing badminton. | Saya sedang bermain bulu tangkis |

Table 3: The result of negative statement test

| English sentence | Indonesian sentence |
|---|---|
| She does not go to school every morning. | Dia tidak pergi ke sekolah setiap pagi. |
| You have not done your homework. | Kamu belum mengerjakan pekerjaan rumahmu. |
| I am not playing badminton. | Saya tidak sedang bermain bulu tangkis. |

Table 4: The result of question sentence test

| English sentence | Indonesian sentence |
|---|---|
| Do you go to school every morning? | Apakah kamu pergi ke sekolah setiap pagi? |
| Can you cook? | Dapatkah kamu memasak? |
| Is he a football player? | Apakah dia pemain sepak bola? |
| Where do you go? | Kemana kamu pergi? |
| Who are you? | Siapa kamu? |
| When will they arrive? | Kapan mereka akan tiba? |
| Which tree is the highest? | Pohon yang mana tertinggi? |
| Whose car is that? | Mobil punya siapa itu? |
| What book will she write? | Buku apa yang akan dia tulis? |

Table 5: The result of imperative sentence test

| English sentence | Indonesian sentence |
|---|---|
| Go to school! | Pergi ke sekolah! |
| Let's go! | Mari kita pergi! |
| No smoking! | Dilarang merokok! |

Table 6: The result of imperative sentence test

| English sentence | Indonesian sentence |
|---|---|
| Bali is a beautiful island and there are many visitors there. succeed. | Bali adalah pulau indah dan ada banyak pengunjung di sana. |
| Millions of people study English but only a few | Jutaan orang belajar Inggris tetapi hanya beberapa berhasil. |
| I will come to your house now or this evening. | Saya akan datang ke rumahmu sekarang atau malam ini. |

Table 7: The result of multilevel complex sentence test

| English sentence | Indonesian sentence |
|---|---|
| The students are studying because they have a test tomorrow. | Para siswa sedang belajar karena mereka punya ujian besok. |
| Upin and Ipin went to the campus mosque after they finished studying. | Upin dan Ipin pergi ke mesjid kampus setelah mereka selesai belajar. |
| The bag that the tourist buy is more expensive than this | Tas yang turis beli lebih mahal dari ini. |

Table 8: The result of mixed complex sentence test

| English sentence | Indonesian sentence |
|---|---|
| Toni playing with Kevin, and Rina reading a book in my room when I came to his house. | Toni bermain dengan Kevin, dan Rina membaca buku dalam kamarku ketika saya datang ke rumah dia. |

Table 9: The result of passive sentence test

| English sentence | Indonesian sentence |
|---|---|
| The book was written by me. | Buku ditulis oleh saya. |
| The house will not be bought by him | Rumah tidak akan dibeli oleh dia. |
| My car is not being repaired now. | Mobilku tidak sedang diperbaiki sekarang. |

Table 10: The result of paragraph test

| English sentence | Indonesian sentence |
|---|---|
| My dog is big. The dog never goes to my house. My dog always wait behind the gate. | Anjingku besar. Anjing tidak pernah pergi ke rumahku. Anjingku selalu menunggu di belakang gerbang. |