

Google Glass Translator

*Massolihen Dasuki¹, Mohd Yazid Idris*²*

*Department of Software Engineering, Faculty of Computing, Universiti Teknologi Malaysia,
81310 UTM SKUDAI Johor, Malaysia*

¹massodasuki@gmail.com, ²yazid@utm.my

Abstract

According to Wikipedia In the world we have roughly about 65000 difference language and every language are differentiate by their races. Other country will use other kind of language to communicate to each other. The most language use by our world population firstly is Mandarin, Spanish, English, Hindi/Urdu and Arabic. This diversity of language makes our world look very colourful and beautiful. Unfortunately when an individual from other country come to foreign country they are found difficulties to adapt in new country because of language factor. Then a person might have problem to read the map, signage and signboard. Hence, engine called Optical Character Recognition (OCR) will be implementing in Google Glass to help people understand another language. OCR is a process by which specialized engine is used to convert scanned images of text to electronic text so that that digitized texts can be searched, indexed and retrieved. OCR refers to a computer's ability to recognize printed letters, numerals, or symbols (optical characters) as discrete entities rather than as simply an image containing lines, curves, and shading. After the OCR done the process of character recognition, the word sequence will be translate to another language. Hence, Google Glass Translator Application makes people easy translate one word to another word in other language.

Keywords: Google Glass, Optical Character Recognition, Scanned Image,

1.0 Introduction

This application is designed for communication. It can help user during travelling and other activity that involve communication. The application capable to translate a word to another word that can be understood the meaning by the user. This application is built for wearable device such Google Glass which its help the user to wear and easily use.

This paper discuss about methodology of development of the Google Glass Translator. Methodology is very important because it will determine the robustness of development phase and also help application in improvement phase. Furthermore, result and analysis design are also being discuss which it give us understanding of fundamental aspect of the application.

This project will benefit many people to have their own translator and it is very important for people to who love to travel overseas. Hence this application can solve the barrier

of language, and then help to improve person productivity. Afterward this application will save time because we don't need to open a big dictionary.

For the conclusion, this application will increase our productivity by saving time especially while we are in foreign country that has different language. This application will integrate with new technology which is easy to use. Furthermore the device is light and wearable, and hence this will reduce an individual load.

The objectives of this project is to design and develop a mobile application that can help people to understand foreign language by translate the word. Next is to implement Optical Character Recognition in Google Glass a method to detect image word and Dictionary Software translate it. Last, is to develop application for Google Glass that use same architecture as the existing mobile application that detecting word and translate the word.

2.0 Methodology

OCR is the main engine that used in this application development. According to Rajeswari (2011) the OCR software then processes these scans to differentiate between images and text and determine what letters are represented in the light and dark areas. Older OCR systems match these images against stored bitmaps based on specific fonts. The hit-or-miss results of such pattern-recognition systems helped establish OCR's reputation for inaccuracy. Figure 1, show simple architecture on how Tesseract engine functioning.

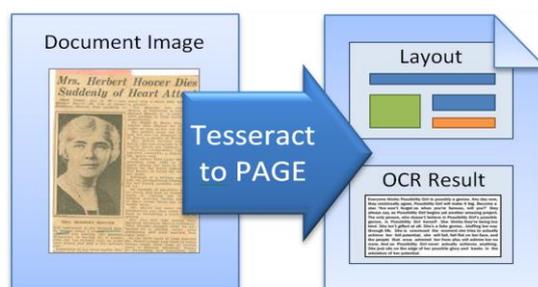


Figure 1 Tesseract OCR Simple Architecture

Lais (2002) explain that OCR engines add the multiple algorithms of neural network technology to analyze the stroke edge, the line of discontinuity between the text characters, and the background. Allowing for abnormalities of printed ink on paper, each algorithm averages the light and dark along the side of a stroke, matches it to known characters and makes a best guess as to which character it is.

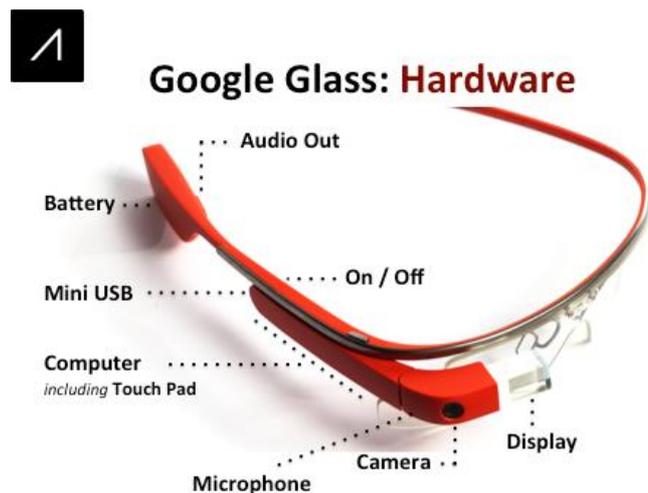


Figure 2 Google Glass Device

Afterward device that use for this system development is Google Glass as shown at Figure 2. Google Glass is a type of wearable technology with an optical head-mounted display. It was developed by Google with the mission of producing a mass-market universal computer. Google Glass displays information in a smartphone look alike. Miller (2013) claim that user use Google Glass to communicate with the Internet via natural language voice commands.

Furthermore, Erik Butow and Robert Stepisnik (2014) said users can interact with the devices in two ways, first by using touchpad at the right side. By using fingertip, user can slide frontward, backward, downward and upward to interact with the devices. Furthermore, voice recognition also enables to help the user make application to respond to any activity.

Android Studio is the official Integrated Development Environment (IDE) from the Android team. It is built on the popular IntelliJ IDEA (Community Edition) Java IDE.



Figure 3 Android Studio IDE

Based on JetBrains' IntelliJ IDEA software, Android Studio is designed specifically for Android development. It is available for download on Windows, Mac OS X and Linux, and replaced Eclipse Android Development Tools (ADT) as Google's primary IDE for native Android application development.

Honig (2013) state that new features are expected to be rolled out with each release of Android Studio. The following features are provided in the current version:- 1) Live Layout: WYSIWYG Editor -Live Coding - Real-time App Rendering, 2) Gradle-based build support, 3) Android-specific refactoring and quick fixes, 4) lint tools to catch performance, usability, version compatibility and other problems, 5) ProGuard and app-signing capabilities. 6) template-based wizards to create common Android designs and components. 7) a rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations, 8) support for building Android Wear apps and 9) built-in support for Google Cloud Platform, enabling integration with Google Cloud Messaging and App Engine.

Next, in the development of system, selection methodology is an important aspect. Selection of the appropriate methodology to project must be made carefully because it will involve time, cost and energy. This is because to ensures the implementation of the project in order to achieve development goals.

RUP has provided a platform to see any changes that occur. RUP can be defined as well as the safety of workspaces that allow a programmer to assure the changes that occur in other systems and the changes had no impact on the system. West (2002) define that RUP is an additional process whereby the whole project is separated into phases and iterations.

Among the advantages of using Rational Unified Process methodology as one of the development system are 1) RUP makes the process more practical because it can help carry out preliminary project planning effectively, can find a lot of software and put all the process to be adopted for the action, 2) RUP methodology to the standards in software development and has also become a subject of hundreds of university worldwide, 3) the prototype was implemented at the end of iterations and make decisions on whether to proceed with the project or not at all phases, 4) RUP helps to identify whether risks and problems to be faced and continue with the procedures that must be followed as a solution to the case at hand and lastly 5) focus on the early development and have a timeline about software architecture.

3.0 Analysis Design

Use case describes the functionality of the software products that would be developed. It describes all the functionality of the system in general.

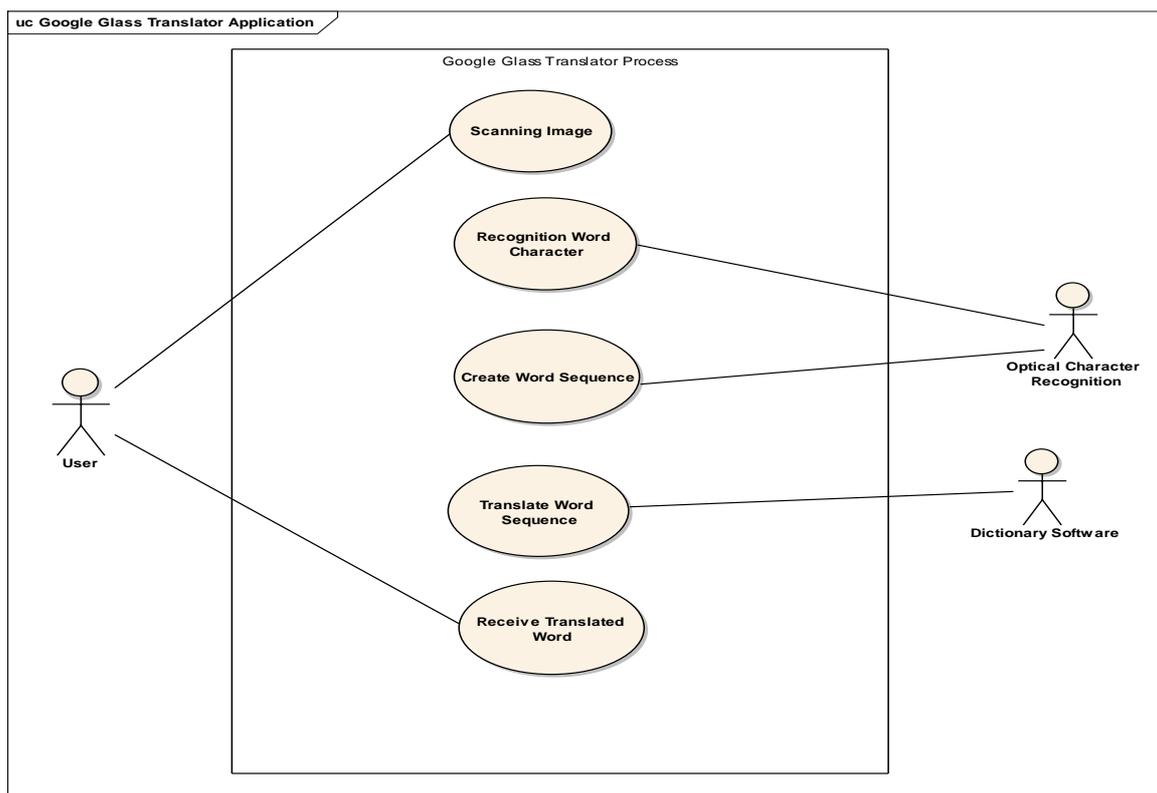


Figure 4 Use Case of Application

Figure 4 show use case of the system which three actors is involved. User responsibility is to insert an input to the application by scanning any image that contains word. User actor also receives word which is translated to another language from the application.

Next, Optical Character Recognition act as the major process for the application which this process will make the application functioning. This actor will receive input from the user, which is in the form of image. Then this actor will make the process to extract any character in the image. Eventually this actor will create a word sequence as the result of the process to be sent to dictionary software.

Lastly, the Dictionary Database actor responsible for translate the word to another language. First this actor will receive a word sequence form the Optical Character Recognition. Then this actor search in the database to matched with the word sequence. Lastly it will send the result to User actor

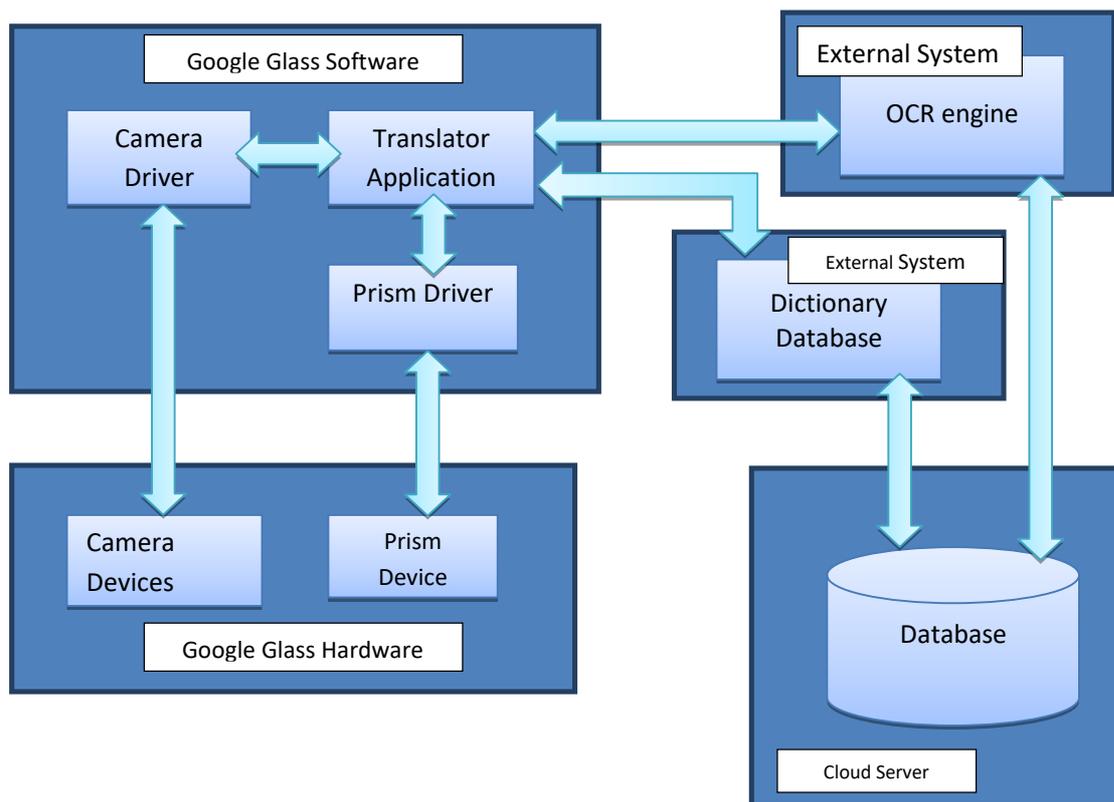


Figure 5 System Environment

Figure 5 show the system environment for the *Google Glass Translator* project. The Google Glass Translator Application communicates with the Optical Character Recognition (OCR) engine in order to extract character from the image input. Then information about word or character will be search in the database in order to get the information about it.

The communication between the database, OCR engine and Dictionary software of operation concerning both searching and refining the data, while the communication between the user and the application consists of only inserting input and display output operations.

After OCR engine completed process of recognition character, the OCR afterward creates a word sequence. This word sequence then sends to Dictionary software, where the Dictionary software will play another role. Dictionary software will translate the word sequence that made from OCR engine.

The Google Glass application has some restrictions about the resource allocation. To avoid problems with overloading the operating system the application is only allowed to use 40 megabytes of memory while running the application. The maximum amount of memory space is also 40 megabytes.

Hence to solve the problem of memory storage the information to running the OCR engine and Dictionary software will be place on cloud computing or cloud database.

4.0 Implementation and Result

Application layer development is tools that used and source code implementation for user interface. This project development is using Android SDK, which is Glass Development Kit (GDK) has been used as tools in this application development. Then source code that implement for user interface is using framework of Extensible Markup Language (XML) in Android Studio. The part of the source code in application layer is shown in Figure 6 and Figure 7 below.

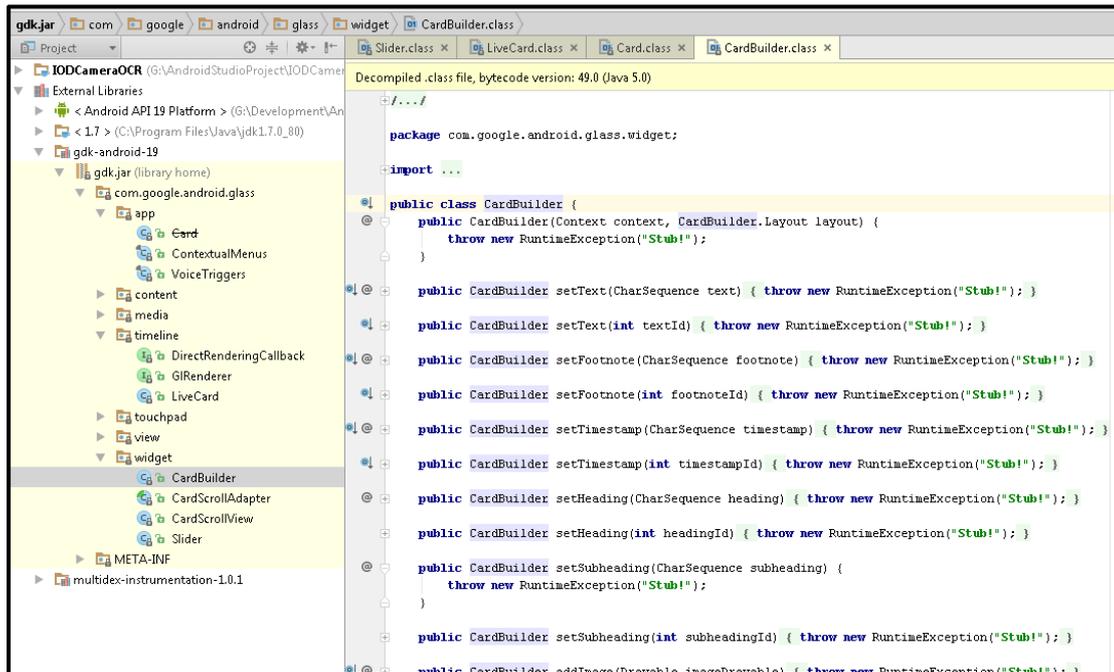


Figure 6 Glass Development Kit Library

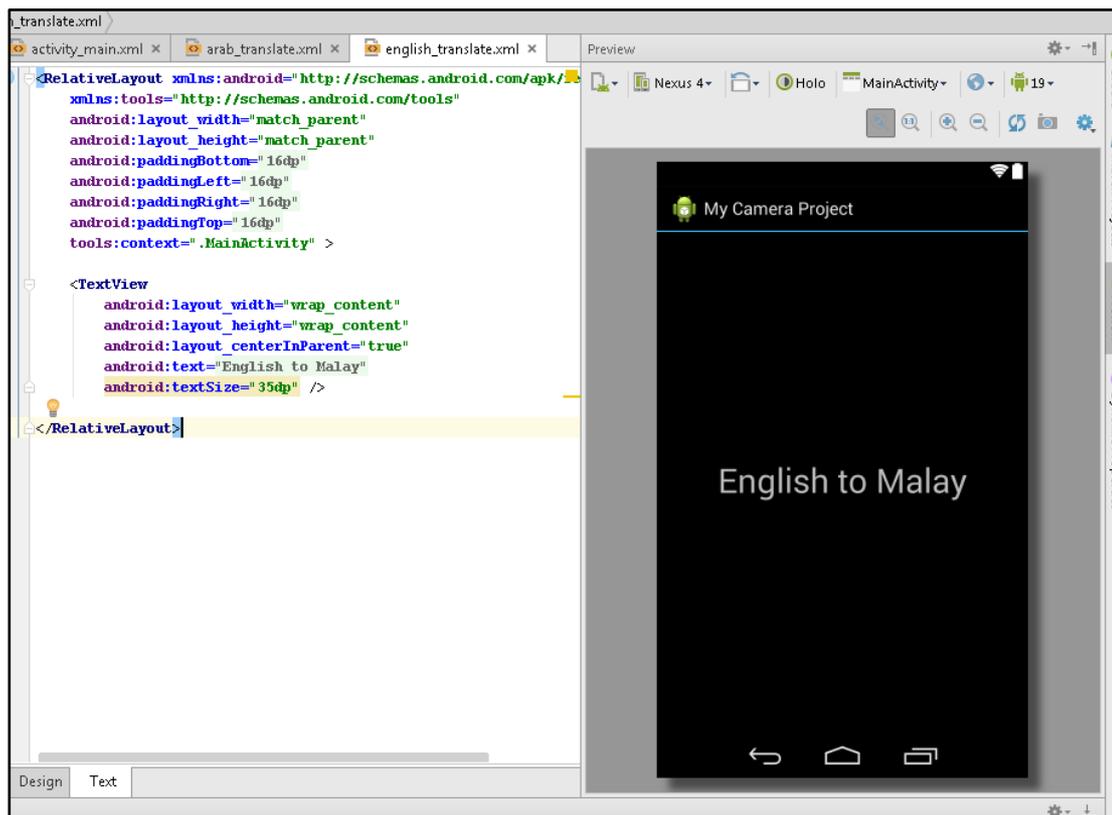


Figure 7 Android Studio XML Editor

To make the user interface more attractive and easily to design, implementation of user interface in Android Studio using is XML. XML easily to code and understand, furthermore XML also can be view in website design.

Business logic layer development is logical background and algorithms for application layer processing user input. To do this in Android Studio development, JAVA language environment is used. Java is a general-purpose computer programming language, based on the class, object -oriented, and designed to have little dependence as possible. The example in Figure 8 below showed the function of thread process of Optical Character Recognition in the application.



```

EasyOcrScanner.java x ImageProcessingThread.java x
@Override
protected void onPreExecute() {
    super.onPreExecute();
    mOcrScannerListener.onOcrScanStarted(this.filePath);
    Log.i("IPThread", "onPreExecute");
}

@Override
protected void doInBackground(Void... params) {
    processImage();
    makeTessdataReady();
    scannedText = scanImage();
    Log.d(Config.TAG, "IPThread: " + scannedText);
    return null;
}

// ScannedText Sent From Here - Masso
// To Listener mOcrScannerListener.onOcrScanFinished
@Override
protected void onPostExecute(Void aVoid) {
    super.onPostExecute(aVoid);
    Log.d("Check Global 1", String.valueOf(mBitmap));
    Log.d("Check Global 2", String.valueOf(scannedText));
    mOcrScannerListener.onOcrScanFinished(mBitmap, scannedText);
    Log.i("IPThread", "onPostExecute");
}

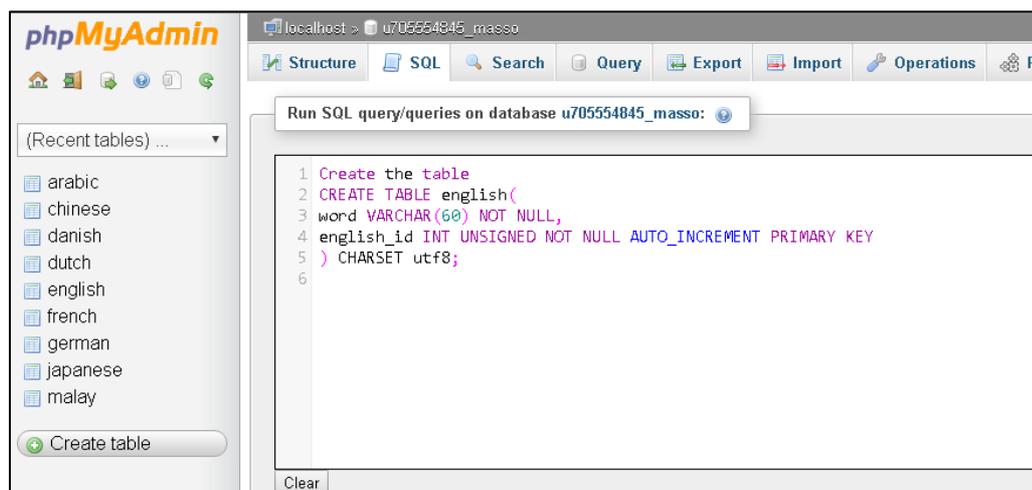
private void processImage() {
    int imageOrientationCode = getImageOrientation();
    Bitmap rawBitmap = getBitmapFromPath();
    // Getting the bitmap in right orientation.
    this.mBitmap = rotateBitmap(rawBitmap, imageOrientationCode);
    Log.i("IPThread", "processImage");
}

private Bitmap getBitmapFromPath() {
    BitmapFactory.Options bmOptions = new BitmapFactory.Options();
    bmOptions.inSampleSize = 4;
    Bitmap bitmap = BitmapFactory.decodeFile(String.valueOf(this.filePath), bmOptions);
}

```

Figure 8 Object-Oriented in JAVA Environment

Figure 8 above show the background process of the application, as the Android Studio using JAVA environment language hence the thread process can be implement in application. Furthermore background process will reduce the process in the main activity class. This will make the application running in parallel



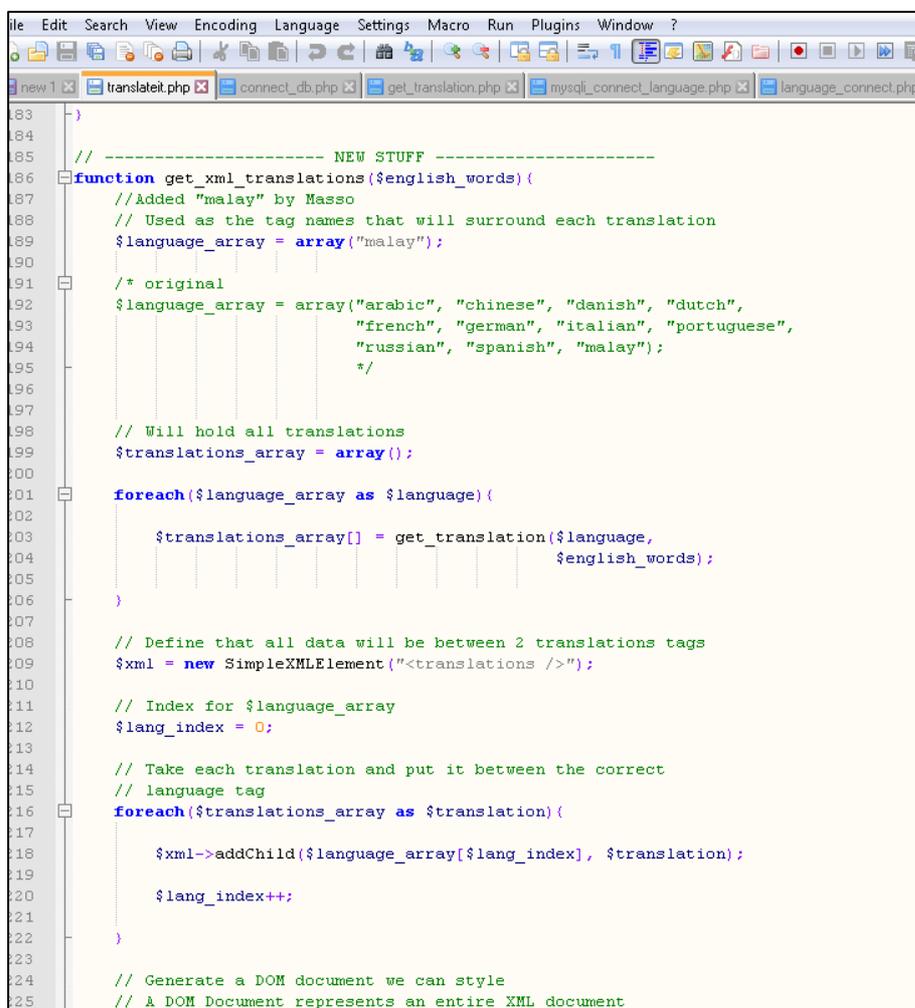
```

phpMyAdmin
localhost > u705554845_masso
Structure SQL Search Query Export Import Operations R
Run SQL query/queries on database u705554845_masso:
1 Create the table
2 CREATE TABLE english(
3 word VARCHAR(60) NOT NULL,
4 english_id INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY
5 ) CHARSET utf8;
6
Clear

```

Figure 9 MySql Implementation in Database

Figure 10 below show PHP source code in the process to retrieve in language data in MySql database. Kimutai (2013) implement PHP language enable developer to connect with database and run a query. Then, PHP also have ability to intergrate with other framework without difficulty. Hence, PHP used in the application to change the result to XML so that android application can show the result in XML.



```

183 }
184 }
185 // ----- NEW STUFF -----
186 function get_xml_translations($english_words){
187     //Added "malay" by Masso
188     // Used as the tag names that will surround each translation
189     $language_array = array("malay");
190
191     /* original
192     $language_array = array("arabic", "chinese", "danish", "dutch",
193                           "french", "german", "italian", "portuguese",
194                           "russian", "spanish", "malay");
195     */
196
197     // Will hold all translations
198     $translations_array = array();
199
200     foreach($language_array as $language){
201
202         $translations_array[] = get_translation($language,
203                                             $english_words);
204     }
205
206     // Define that all data will be between 2 translations tags
207     $xml = new SimpleXMLElement("<translations />");
208
209     // Index for $language_array
210     $lang_index = 0;
211
212     // Take each translation and put it between the correct
213     // language tag
214     foreach($translations_array as $translation){
215
216         $xml->addChild($language_array[$lang_index], $translation);
217
218         $lang_index++;
219     }
220
221     // Generate a DOM document we can style
222     // A DOM Document represents an entire XML document
223
224
225

```

Figure 10 PHP for Retrieve and Matching Data

Afterward, the application will through testing to validate the functionality. Figure 11, Figure 12 and Figure 13 show screenshot of the application testing.

To run the application user need to choose language that they want to recognize and translate. Figure 11 shows user interface before user can proceed to recognize and translate the word. Google Glass display the user-interface which this platform is place for user to insert the input. Then the method to insert the input is by capture image contain word or character as shown at Figure 11. Figure 12 show the user interface of image capture. Figure 13 show user interface of result output. This user interface is the process of word translation happen.



Figure 11 User Interface to English to Malay.



Figure 12 User Input Interface



Figure 13 Application Translating Input

5.0 Conclusion

Some ideas have been suggested for future enhancement of Google Glass Translator based on its limitations. For functionality enhancement, the application should on implement most desired language to be translated. To make the application more effective in memory usage, hence different version or build of application should be made base only desire of the user. This method can help the application to make do fast and smooth process of recognition and translation. Next is addition and improvement of web server database of language and words.

In conclusion, of future enhancements are 1) application development in Google Glass must choose the most desired word to translate or base on user desire, hence will reduce memory violation, 2) improvement in source code implementation for internal process and mechanism., 3) using OpenCV to recognize the character automatically and translate it in real-time, 4) using OpenCV to process the image such as increase threshold, hence egde of character will easily seen and 5) improve performance of Google Glass Translation in low specification device by carry out performance tuning.

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