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Mobile Device Interfaces Illiterate

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Abstract—The development of Graphical User Interface (GUI) is meant to significantly increase the ease of usability of software applications so that they can be used by users from different backgrounds and knowledge level. Such a development becomes even more important and challenging when the users are those that have limited literacy capabilities. Although the progress of development for standard software interface has increased significantly, similar progress has not been available in interface for illiterate people. To fill this gap, this paper presents our research on developing interface of software application devoted to illiterate people. In particular, the proposed interface was designed for mobile application and combines graphic design and linguistic approaches. With such features, the developed interface is expected to provide easy to use application for illiterate people.

Keywords— illiterate, interface, graphics, linguistic, android

I. INTRODUCTION

An interface is one of the most crucial parts of human-machine interaction system because it serves as a medium that bridge the interaction between human (as a user) and computer machine (as a system). In this regard, the design of a good interface should be done in such a way that it meets the golden rule of eight indicators, namely strive for consistency, maintain a common usability (e.g. it enables frequent users to use shortcuts), provide feedback behind information (i.e. it offers informative feedback), provide a design to cover dialogues (i.e. dialogue that yields closure), provide simple error handling mechanism (e.g. to handle errors), simplify the process of returning to the previous action (i.e. it permits simple repeatable actions), support internal control center (i.e. support internal locus of control), and reduce the burden of short-term memory load [1]. As of today, the ease of usability of an interface design has improved significantly due to the rapid development of advanced technologies for various applications in mobile devices such as smart phones.

Rapid technological developments, however, are not always followed by fast societal development. This is especially true in many developing countries such as Indonesia. Particularly in Indonesia, the number of illiterate people (i.e. those that are not familiar with letters) is still very high. Such a high number of illiterate people is quite surprising when we consider how technological developments have penetrated into almost every aspects of Indonesian people. For example, in 2012 there were still about 6.4 illiterate people in Indonesia. This number shows how serious

the illiteracy problem in Indonesia and indicates the needs to use current technological developments to help create tools or means of communication for those who are still not familiar with letters [2].

This paper illustrates how advanced technological features in android based smart phones [1-7] can be used to develop a communication tool for illiterate people. We describe how such tools can be developed in software tool Eclipse by combining graphic design (that replace text media with informative image) and linguistic (i.e. using command language as a means of communication). Since Indonesia is one of the largest agricultural countries and because most of the illiterate people in Indonesia are farmers, the early features of the developed tool were designed to reflect rice farming/cultivating activities. We believe that such an approach to design the tool's appearance by incorporating subjects/images that are familiar to the users will be useful to improve the tool's efficiency. Clearly the current appearance of the tools can be modified later on to adapt other aspect of users' interests or needs. With the mentioned features, we believe that the developed tool can be easily used by the users even during their mobile activities.

The remainder of this paper is structured as follows. Section II briefly describes the chronology of Android's technological developments and how it has been improved to support the development of easy to use interface for mobile applications. In section III, we discuss the characteristic of good interface system based on the eight golden rules set forth in [1]. Section IV then presents detailed description and important features of the tool that we developed during this research. Section V concludes the paper with remarks.

II. ANDROID BASED INTERFACE

Android is an operating system for mobile devices such as smart phones and tablets [1-4]. It is developed under Linux and various open source software tools [5-7]. Although relatively new, Android is very competitive and does not require long time to set aside the other established operating systems for mobile devices applications such as Symbian, Windows mobile, Blackberry and the Apple's iOS [2-7]. Perhaps the main reason for this Android's competitiveness is due to huge support from its owner, Google, Inc. The fast development of Android's capability eventually motivated Google to form a consortium that engages in developing and improving technologies related to operating system for mobile devices such as smart phones. This consortium has since

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grown rapidly and consists of a large number of companies from all around the world. Today, this consortium is known as the Open Handset Alliance (OHA) [9].

Since its first release, Android has grown very rapidly and further developed and improved into various versions. A unique feature of Android's development is that its versions are named based on different types of food or dessert, which then sorted by alphabet. This unique feature made android versions are easy to remember [10].

The different versions of android from its first release to its current version are summarized below:

1). **Android 1.0:** In October 2008 android version 1.0 was first introduced to the public. Some of the early features available in this Android OS version 1.0 are: QWERTY keypad, camera button, home button, back button, and various Google Apps that offer a wide range of applications.

2). **Android 1.5 Cupcake:** this version was released in April 2009 and was the first version that uses dessert naming. Some features that were provided in this version include support for keyboard applications and third-party dictionaries, ability to play and record videos in MPEG-4 format, complete widget support as well as an application that support direct video uploads to YouTube.

3). **Android 1.6 Donut:** this version was released six (6) months after the 1.5 cupcake appears. Additional features provided in this version include support for CDMA networks, improved camera performance and search engine service.

4). **Android 2.0 - 2.1 Éclair:** this version's release marked the transformation of Android. With a single-core 600MHz processor and 256 MB of RAM support, this version came with a modern interface and supported with GPS features.

5). **Android 2.2 Froyo (Frozen Yoghurt):** this version was released in May 2010 and came with supports for SD card that serves as a storage media applications.

6). **Android 2.3 - 2.3.7 Gingerbread:** Gingerbread was first introduced in December 2010. This version was particularly developed to maximize gaming features. It also supported WXGA screen and NFC connectivity.

7). **Android 3.0 - 3.2.6 Honeycomb:** this version was released in February 2011 and was developed to support tablet PC. A unique feature of this version is that the status bar of its display was relatively easy to customize.

8). **Android 4.0 - 4.0.4 Ice Cream Sandwich:** this version was released in October 2011 and it came with a very modern and friendly interface.

9). **Android 4.1 Jelly Bean:** this version was released in July 2012 together with the release of Nexus 7. A unique feature provided in this version was the Google Now search application. This application works with voice commands and provides weather and traffic information.

10). **Android 4.4 KitKat:** this version was released in October 2013 with a renewed interface in which the

navigation and status bars are transparent. This version may also work optimally on devices with low specifications [11].

11). **Android 5.0 Lollipop:** released in June 2015, this version introduces a new design language, provides longer lifetime, and offers more satisfactory performance [12].

In addition, an Android SDK (Software Development Kit) was also released in November, 2007. SDK is a tool for to support programmer's development. Both SDK and API (Application Programming Interface) can be used to create a variety of android applications using the Java programming language [13].

III. EIGHT GOLDEN RULES

As stated in [1], the design of a good interface should be done in such a way that it meets the golden rule of eights indicators. These eight golden rules for guidelines in designing an interface are discussed below

1). Strive for consistency, is a form of maintaining consistency throughout the whole interface. Examples include consistency in menu's appearance, font usage, color distribution, etc.

2). Enable frequent users to use shortcuts: a good interface should maintains general usability such as the use of common terms or abbreviations to perform well known functionality or create special keys to perform certain commands.

3). Offer informative feedback: in this case the interface should be able to provide response to user's feedbacks. The user feedback is most important from an interface manufacture by reducing uncertainty and always shows the changes that occur when a user interacts with the interface.

4). Design dialogue to yield closure: in other words, an interface must have an initial section (introduction), a middle section (contents), and a final section (cover).

5). Offer simple error handling: the interface must be equipped with error handler system that can provide signals for any error the readers might made. One example implementation of an error handler is the change of the application's appearance into grey whenever there is an error made by the user.

6). Permit easy reversal of action: this feature greatly relieves user's anxiety. It allows them to undo an error. The reversibility units can be a single action, a data entry, or a complete group of actions.

7). Support internal locus of control: an interface must be able to support the internal control center such as: the interface can respond to the actions of the user, the interface is designed to make the user can become an initiator and not merely as a respondent.

8). Reduce short-term memory load: the limitation of human that can only process information within short-term memory requires that the display be kept simple, can be consolidated into multiple pages displays, may reduce window-motion frequency. Furthermore, sufficient training

time should be allotted for codes, mnemonics, and sequences of actions.

IV. INTERFACE OVERVIEW

According to Indonesian Dictionary, illiteracy or better known as the illiteracy is a condition where a person cannot read or write. However, over the development, definition of illiteracy is experiencing a shift in meaning, where a person who cannot use the technology is also considered as an illiterate. One of the factors behind a person experiencing illiteracy is the low level of education.

The interface design discussed combines graphics design approach and linguistic knowledge. Thus, the interface is designed to cover not only the graphical content but also a user friendly linguistic dynamic.

On one hand, the graphic design approach emphasizes the process of visual communication using images to convey message or information. This approach can help illiterate people simplify the process of understanding information that is being conveyed. It also helps them to understand the purpose of an image being presented. On the other hand, linguistic approach uses language (through dialogue or conversation) as a communication media. The dialogue as a means of communication may takes the form of a command language, menu language, or natural language. The choice of command language was selected for the purpose of evaluating illiterate people that need guidance in understanding voice or language.

Figure 1 illustrates the design framework of the main menu of the developed application. The main menu was developed and implemented on android with a view as shown in Figure 2. Farmers who become users of this application will then listen to the sounds coming out of the application as a guide to go to the next menu. In order to continue to read the menu there will be voice prompts to select the picture, for example chicken. This application is very easy to use because all directions, instructions and explanations made by the interface sounds and images coming out of the application. For example, to recognize the letters A, then the sound will come out of the application and the form of the letter A is displayed as illustrated in Figure 3.

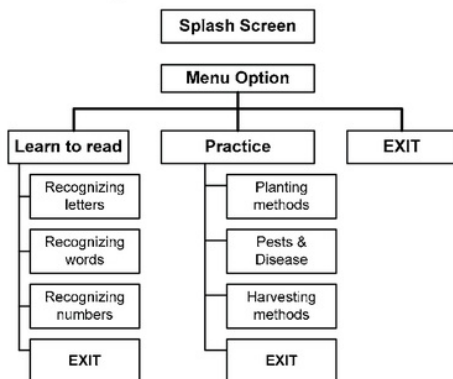


Figure 1. Main Menu Design



Figure 2. Main Menu Display.



Figure 3. Display recognize the letters A

To figure out if the farmers have started to recognize letters and capable to read or not, it is necessary to provide some exercise on this application will exit the voice prompts to select picture goat. The exercise will produce voices that describe the picture being displayed, and the user is prompted to type the word using the keyboard. A scoring formula to assess the user's level of literacy is shown in Figure 4.

$$S = 5T / N \quad (1)$$

where S denotes the user's score, T denotes the number of correct answers and N denotes the number of problems on the exercise. This formula only calculates the correct answer. At the end of the exercise, the following set of scores are provided to users:

1. Point 5 describes the interaction that exists 'Very Good'
2. Point 4 describes the interaction that exists 'Good'

3. Point 3 describes the interaction that exists 'Enough'
4. Point 2 describes the interaction that exists 'Less'
5. Point 1 describes the interaction that exists 'Very Less'

Users that got point 5, it means he has been able to recognize letters and or read.

If users get a score that is still under point 5, it must be reiterated to learn from the menu recognize letters, numbers and or recognize familiar words. Thus this application can be used over and over again for each menu as needed. If necessary, user can exit the application anytime without having to proceed to another menu.

This application requires a small storage capacity and can be installed easily on all mobile devices that use the Android operating system. Thus it can be taken anywhere so farmers as users can learn wherever they are.

V. CONCLUSION

The interface of computer applications for illiterate people should be designed with a special approach in order to ensure that the information is conveyed in a clear and proper manner. We have described how an android-based mobile device that combines graphics design and linguistics can provide added value to illiterate people. The combination of these two approaches has been shown can help illiterate users interact through the interface. Since this application was installed on mobile devices, it can then be used easily and inexpensively by illiterate people in Indonesia.

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