Integrating IQ Engines Smartcamera and Google API for Android to Find Books through Google Books

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Keywords:	ABSTRACT
Image Recognition IQ Engines SmartCamera Google Books Android Book Readers	Today, it is basically impossible to live without the help of technology. Technology makes everything simpler and faster. For example, the appearance of e-books. People make e-books, to help readers all over the world to continue reading without the need to carry books around. Some people find the idea amusing, but some don't. It is proven by people who still read books from printed books. These particular people find it classy and elegant to read from books, and they choose not to give in their hobby to technology. In this research, the author gives support to these people by giving accessibility using technology, without replacing their precious books. Although the idea of replacing books with e-books was not accepted by all readers, the idea of smartphones is globally accepted. Almost everyone uses smartphone. The idea of this research is to help these people to find books titles for them to read. In the process of turning this idea into reality, the author uses an image recognition application for Android to provide simplicity and provide the application with Google Books, which has a large books database. By the end of the research, integrating the two components is possible and the application is created, but strictly only to Android smartphones, excluding Android tablet PCs. The application can be used to find books strictly only those similar in title.

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1. INTRODUCTION

The innovation of smartphones has been really significant in this era. Today, almost every citizen in every country's population use smartphones, especially the citizens in the developed country. The number of companies running on smartphones development is growing rapidly. Today, there are tons of companies selling varieties of smartphones. There are 2 types of platforms that are currently leading the market share of smartphones, Android [1], iOS [2]. Over the years, iOS has been leading the market of smartphones. In recent years, Android has been developing rapidly to compete with iOS. Android market has been growing rapidly until today. Based on the statistic from Times, worldwide, all those companies making Android phones sell a lot more units than Apple sells of the iPhone, says IDC. In the fourth quarter of 2012, Android had more than 70 percent share, vs. 21 percent for the iPhone.

Android is also a form of mobile operating system. Unlike iOS, Android is an open-source mobile OS. The technology of Android has made worldwide known mobile phones companies to use Android as their products' operating system. One of the reasons of the popularity of iOS is that Apple provides numerous of applications to entertain its users. On the other hand, Android also has applications. However, the number

of application provided by Android is still incomparable to iOS. There are still many applications that might be demanded by Android users but are not provided.

Nowadays, the population of the world is aware with the existence of e-books. E-books is the alternative way to read books in an easy way. The concept is to provide the content of printed books in the form of pdf to be accessed from computers, mobile phones, tablets, and any other gadgets. The idea is to provide books in a more convenient way. Almost every printed book is available in the Internet today in the form of e-book. Educational books, novels, comic books, newspapers, and magazines are all available in the form of e-book.

Some people like the idea of e-books; however, there are still people who love printed books. People who like novels prefer to read them from printed books. Some adults who still prefer to read newspapers. There are also people who agree with both ideas but find it tiring to continuously reading from a screen. In term of accessibility, it is easier to find other books using e-books. Websites that provide e-books will most likely provide a service for its users to find e-books while finding other books title related to a book owned by a person requires the person to find them through Internet or libraries. In this case, a mobile application can help people to find other books without having to go to the Internet and type books information on it or go to library.

A technology known as Image Recognition [3] can be applied to help finding the related books. The idea is to improve the accessibility in finding books since reading is a major hobby. Google Books [4] is a website known to help readers find books. It is a search engine made strictly to find books from all over the world. Over time, Google Books has been very useful to find every information about any books. By using the completeness of Google Books combined together with image recognition technology, finding books will be easier and more convenient.

2.   RESEARCH METHOD

The proposed system is created to integrate image recognition technology on Android [5] with Google Books. The idea is to provide higher accessibility for book readers to find books. This proposed system helps user to save time for accessing Google and typing by simply taking a picture of the book cover. There three are components to this system:

1.   Image recognition application (IQ Engines SmartCamera [6])
2.   Android devices
3.   Google Books

The output of this study is an Android application. Therefore, the development of the application requires the utilization of Android components using Android library. The Android Support Library package is a set of code libraries that provide backward-compatible versions of Android framework APIs as well as features that are only available through the library APIs. Each Support Library is backward-compatible to a specific Android API level. This design means that your applications can use the libraries' features and still be compatible with devices running Android 1.6 (API level 4) and up. [7]

In this system, the author uses an existing image recognition application. The application is IQ Engines SmartCamera. It is an open source application. By using the SDK library given by IQ Engines, a sample program is modified to meet the requirement of the system. The environment has been set up to become available for the latest version of Android Jelly Bean 4.2. Google Books is implemented using Google API [8] provided by Google. The API helps author to use Google elements as resources in integrating and building the system. Google API allows the system to search for books from author's application.

Providing a book key title to Google API, can results in multiple books returned by Google Books. This concept is used in this application. To obtain information about the books that may be similar or related in title, JSON [9] is used to create JSON File from an URL.

2.1. Proposed System Overview

The proposed system will integrate IQ Engines SmartCamera with Google Books. The idea is to create boundary to IQ Engines application to create an image recognition application with a smaller scope. The application workflow will be modified according to the purpose of the proposed system. It will run similar to IQ Engines SmartCamera default application. IQ Engines application uploads every image to IQ Engines server to process the case matching process. In default, the application will retrieve the result and show the title of the matching object. In this proposed system, the information retrieved from the IQ Engines server will be processed again to Google Books to find related books using Google API.
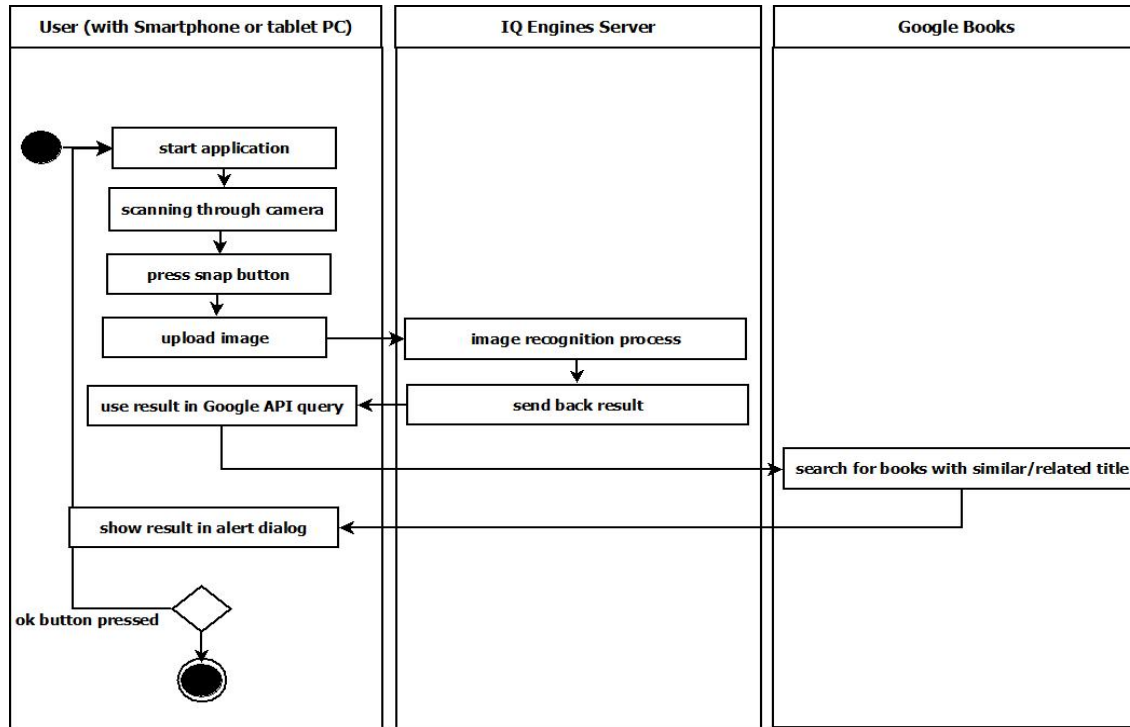
Figure 1. Proposed System Activity Diagram

In the figure 1, the difference between the default application from IQ Engines and the modified application is clear. The modified program provide connection to Google Books which does not require users to go to browser.

2.2. Proposed System Requirements

The In order for the system to run, the user is required to have an Android device with Android version higher that Android 2.2 Froyo. It is the minimum requirement made for the system. The device has to have Internet connection either wireless or from mobile data. During the use of application, taking the picture requires sufficient lightning and take focus image for the recognition process to take place. The angle of the image must be taken into consideration for the recognition process to succeed. The image taken must provide certain distance to be able to take a full image of the object.

3. RESULTS AND ANALYSIS
3.1. Result Overview

By the end of the research, the result shown that the image recognition application provided by IQ Engines is able to integrate with Google to create a new Android application to search books from Google Books using image recognition technology. The research showed the flexibility of image recognition technology to be applied to all type of application and also the simplicity of Google API to integrate other applications to Google services.

Before the research, the goal of the research is to complete several aspects which may affect the output of the research. The first aspect would be to find the best image recognition application in terms of accuracy. IQ Engines proves the quality of the computer vision technology developed by the company. The completeness and flexibility of IQ Engines library also gives wide range of application development. Second, Google provides high accessibility for developers to develop applications while using Google as the reference to use Google services.

The result of this research shows that technology does not always replace classic and vintage stuffs. In this case, technology supports printed book readers to keep reading while they can get more information about the books they love with the help of technology.

3.2. Accuracy Test Result
Here are the results of the test:

Table 1. Application Accuracy on Entrepreneuship Books

Book Type	Book Key Title	Number of Books related (out of 5)	Accuracy
Entrepreneurship Books	The High Performance Entrepreneur	5	100%
	The Dilbert Principle	5	100%
	The Fire Starter Session	2	40%
	Startup, Indonesia!	2	40%
	The Payoff	1	20%

In Table 1, the classification of the testing set is determined by the genre of the outputs. If the output has the same genre as the testing set it is counted as related.

Table 2. Application Accuracy on Novel Books

Book Type	Book Key Title	Number of Books related (out of 5)	Accuracy
Novel	Harry Potter	5	100%
	Eragon	5	100%
	Anna Dressed in Blood	2	40%
	Ashfall	0	0%
	Twilight	0	0%

In Table 2, the classification is determined by the type of the output. If the output is not a novel, then it will not be counted as related. It is obvious that classifying using title has a big impact in accuracy. Although Twilight is a very famous novel, the title Twilight is too global and too mainstream, resulting in mismatches of the outputs.

Table 3. Application Accuracy on Educational Books

Book Type	Book Key Title	Number of Books related (out of 5)	Accuracy
Educational Books	Java Concepts	5	100%
	Business and Administrative Communication	5	100%
	Immunocytochemistry	5	100%
	Engineering Drawing	5	100%
	Design of Steel Structures	5	100%

Educational books title are all similar one to another, this is why all the testing set data have perfect outcomes.

Table 4. Application Accuracy on Entrepreneuship Books

Book Type	Book Key Title	Number of Books related (out of 5)	Accuracy
Magazines	Men's Health	5	100%
	New York Magazine	5	100%
	National Geographic	5	100%
	Cosmopolitan	0	0%
	NYLON	0	0%

The number of magazines registered in Google Books is very limited, that is why even famous magazine such as cosmopolitan returns 0%.

Table 5. Application Accuracy on Comic Books

Book Type	Book Key Title	Number of Books related (out of 5)	Accuracy
Comic Books	Naruto	5	100%
	Detective Conan	5	100%
	Spiderman	5	100%
	Superman	5	100%
	Doraemon	0	0%

Most of the comic books return perfect outputs except Doraemon. It seems the reason is because Doraemon is an old comic book which no longer produced. In the case of detective conan, even though not all of the outputs returns comic books, but the output consists of detective novel such as Sherlock Holmes which is still related to the genre of Detective Conan.

a. Compatibility Test Result

The compatibility test was performed using 2 different smartphones and a tablet PC. Here are the list of the devices used in this test:

1. HTC One X
   - 134.36 x 69.9 x 8.9 mm
   - 4.7-inch super LCD 2
   - 1280 x 720 (HD, 720p)
   - 1.5 GHz, quad-core
   - Android™ 4.0 with HTC Sense™ 4
   - 1GB RAM
   - 8MP Camera with auto focus, Smart LED flash, and BSI sensor for low-light capture
2. Sony Xperia Z
   - 5.47 x 2.79 x 0.31 inches
   - 16 million colours, 1920 x 1080 pixels
   - 1.5 GHz Qualcomm APQ8064+MDM9215M Quad Core
   - 2.2 MP, Exmor R, front facing camera (1080p)
   - Android OS, v4.1.2 (Jelly Bean)
   - 2GB RAM
3. Samsung Galaxy Note 10.1
   - Android OS, v4.0.3 (Ice Cream Sandwich)
   - Quad-core 1.4 GHz Cortex-A9
   - 262 x 180 x 8.9 mm (10.31 x 7.09 x 0.35 in)
   - 800 x 1280 pixels, 10.1 inches
   - 5 MP, 2592x1944 pixels, autofocus, LED flash
   - 2 GB RAM

Based on the compatibility result using 2 smartphones and a tablet PC, it has been shown that the application ran perfectly on 2 different smartphones from 2 different companies. However, the application could not run on a tablet PC.

4. CONCLUSION

By the end of this study, it has been proven that IQ Engines application can be integrated with Google Books using Google API. IQ Engines for Android is developed using Java programming language, and Google API also support Java programming language and provide services for Android to develop application using Google as the application resources. In the compatibility test, the result shows that the application is compatible with both smartphones used as media for the test. However, the tablet PCs, on the other hand, can only recognize the apk and install the application on the device, but the application itself cannot run on the device. In conclusion, the test result shows the application is compatible only to smartphones, not tablet PCs.

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