

# Implementation of Optical Character Recognition in Android Based Library Application

Muhammad Kevin  
Department of Informatics  
Widyatama University  
Bandung, Indonesia

Iwa Ovyawan Herlistiono  
Department of Informatics  
Widyatama University  
Bandung, Indonesia

**Abstract:- Book data management in a library is still stored in an information system that uses a computer as a medium. The use of computer as information system has very low mobility because the computers only stay in certain places, so the process of searching book is less efficient because visitors must go to where the computers are located. When borrowing books, visitors are also required to help maintain the condition of the books they borrow. Most visitors come to the library to find and take notes the important things that are in the book which they are looking for. It causes not a few visitors who do damage to the book by making notes on the book they borrowed or marking the parts that are considered important by using a highlighter. This problem can be solved with a mobile application that can search and write notes using only the smartphone's camera. This application is created using optical character recognition (OCR) technology. This technology can extract text from image and convert it into editable text. With this application, visitors can search for books easily, other than that visitors can also take notes without having to use a highlighter which can damage the book.**

**Keywords:-** *Android, Information System, Library, OCR.*

## I. INTRODUCTION

Library is a place, building, or a space that is provided for maintaining and use of collection of books, magazines and other library materials that are stored to be read, studied, discussed. Library as a place for reading media needs facilities that take part in following technological developments in order to facilitate visitors in using library facilities for reading or other things.

Book data management in a library is still stored in an information system that uses a computer as a medium. The use of computer as information system has very low mobility because the computers only stay in certain places, so the process of searching book is less efficient because visitors must go to where the computers are located.

When borrowing books, visitors are also required to help maintain the condition of the books they borrow. Most visitors come to the library to find and take notes the important things that are in the book which they are looking for. It causes not a few visitors who do damage to the book by making notes on the book they borrowed or marking the parts that are considered important by using a highlighter.

Based on the problems that have been mentioned, we made a mobile application as a solution to overcome these problems. This application is made by implementing optical character recognition (OCR) technology in it. OCR is a technology that can extract text in an image and convert it into an editable text. The use of OCR in this application is embedded in a search feature and note taking feature. The use of OCR in this application is embedded in a search feature and note taking feature. With this application made, visitors can be facilitated in searching books and noting important things in books without having to damage the book with a highlighter.

## II. RELATED WORKS

There have been several studies using OCR technology in various fields such as banks which are used to recognize bank card numbers [1] and data entry forms automatically [2], automatic number plate recognition in the police [3] [4], or used to detect the text of the book that we are going to do at the moment. Several studies on the use of optical character recognition to detect text in books have been carried out, such as research conducted by Nana Ramadjanti, Achmad Basuki and Agrippina G.J.W in using OCR to retrieve book information used in bookstores [5], research conducted by Dr. S.Vasavi who used OCR to search for books using MATLAB [6], and utilization of OCR to retrieve book data using Tesseract-OCR by Priyanka S. Kawale et al [7].

In the research mentioned above, several libraries and methods are used in making applications such as Tesseract, MATLAB and Neural Network Algorithms. In this research, we use ML Kit by Firebase that uses Google Cloud Vision API, Tensorflow lite and Conventional Neural Network to get maximum and efficient results.

### III. OPTICAL CHARACTER RECOGNITION

Optical character recognition (OCR) is a process of classification of optical patterns contained in digital images in accordance with alphanumeric or other characters. OCR technology is used to convert various types of documents such as scanned documents, PDF files, or images taken from a digital camera that are converted into an editable text.

There is five stages in how OCR works, Text Detection, Direction Identification, Script Identification, Text Recognition and Layout Analysis. Text detection is the first step to detect lines of text and bounding boxes using Conventional Neural Networks (CNN). Direction identification is to classifies the direction per bounding box. If necessary, some bounding box will be filter out as it is erroneously detected as text. Script identification will identifies script per bounding box. It is assumes that there is one 1 script per bounding box but allowing multiple scripts per image. Text recognition is the core part of OCR which is recognizing text from image. It does not only include character-based language model but also inception style optical model and custom decoding algorithm. The last part

is layout analysis which is to determine reading of order and distinguishing title, headers etc.

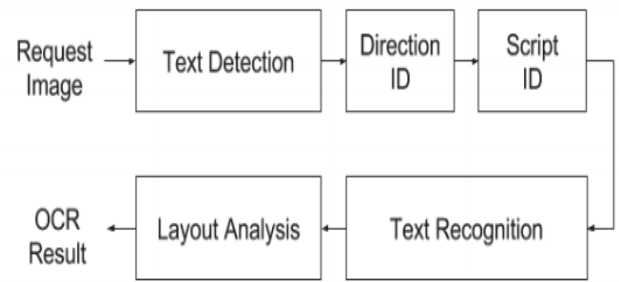


Fig. 1.How OCR works [8]

### IV. PROPOSED METHODS

#### A. System Design

To implement this system requires a system design to facilitate the development of applications. This application has 2 features that use OCR, book searching and note maker. Here is a picture of the system design for searching a book.

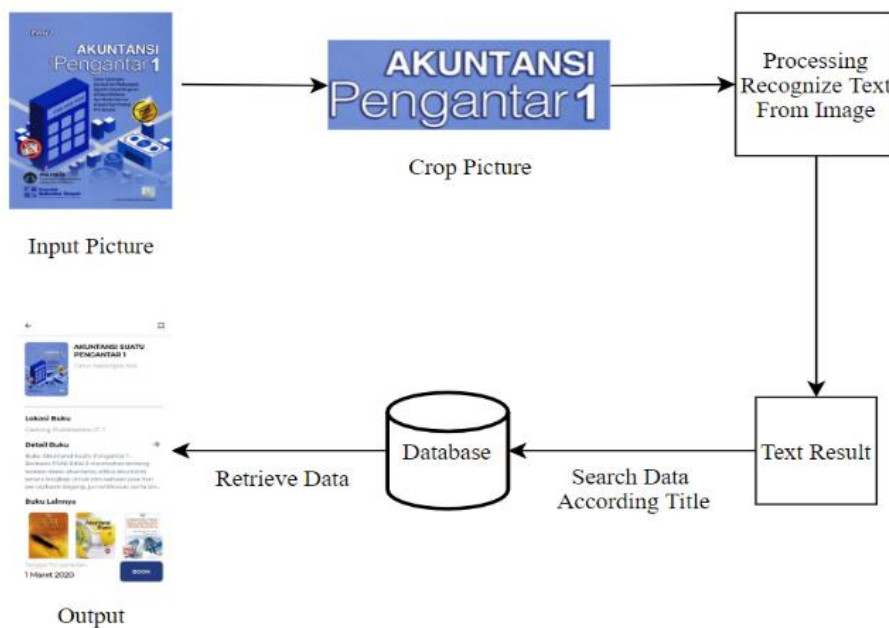


Fig. 2.System design of searching using OCR

This feature was created to make it easier for users to search for books. Based on fig. 2, the user will take pictures using a phone camera. After that, the system will bring up an image crop feature that can be used to select the text you want to extract. Images that have passed the cropping step will be processed by OCR. OCR will search for text contained in images and convert it into an editable text. Text extracted from OCR will be processed into the database to be adjusted according to the title of the book in the database.

After finding matching data, the system will display all book titles based on the output from the database. To display the detail information of the book , users are required to press the book that is want to see and the system will switch the layout into book information detail screen.

The main feature that uses OCR in this application is note maker. The following is a system design for note maker.

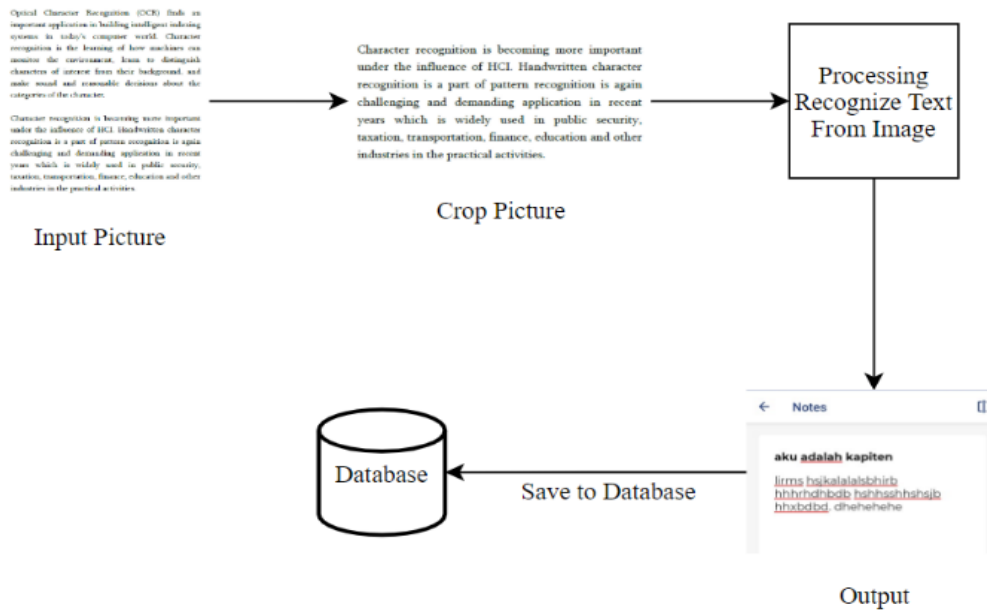


Fig. 3. System design of note maker using OCR

This feature is made to make it easier for users to note important parts of the book, besides this feature is also useful to reduce the level of damage of the book by using a highlighter. This system design is not much different from the system design for search feature that found in fig.2, the difference itself is after producing the OCR process text, the OCR result text will immediately appear in the input text. The storage process itself is done when the user exits the layout and data will be stored on the database.

**V. RESULTS**

*A. Login Page*

This layout serves as the initial display of the application, where users are required to enter their email and password to be able to use the application. Before logging in using email and password, users are required to log in using Google Play so that user data is recorded in the system. This login system uses firebase authentication as a third party authentication provider.

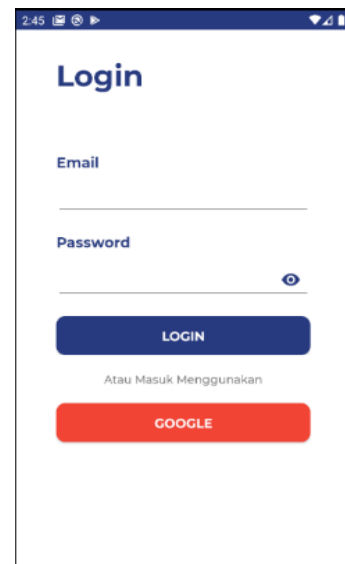


Fig. 4. Login Page

*B. Home Page*

After the user is authenticated by the system, the screen will be redirected to the home page. In this view the application bar section has a navigation bar that is useful for displaying menus, manual search buttons and search buttons using OCR. The main layout section is the recycler view which functions to store book data, there are two recycler view which stores the latest book data and book recommendations based on the system.



Fig. 5.Home Page

**C. Camera User Interface**

This view allows the user to be able to take a picture of the cover of the book which will then be processed OCR. The camera feature setting itself follows the camera embedded in the user's smartphone (for this study we used the Redmi Note 7). There are two menus contained in this feature, to capture images using the camera and use the gallery to take pictures.

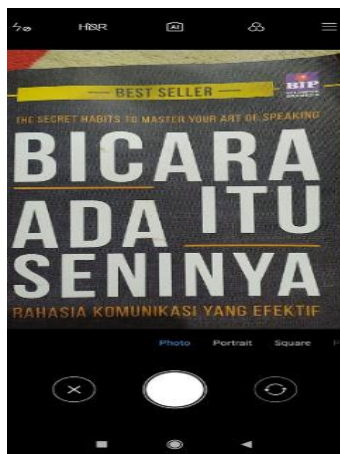


Fig. 6.Camera User Interface

**D. Validation User Interface**

After the user takes the picture, the system will switch to the validation display which allows the user to accept or reject the captured image. If the user presses the accept button, the system will call the intent crop to display user interface crop. But if the user presses the reject button, the system will switch back to the camera user interface and the user will take the picture again.



Fig. 7.Validation User Interface

**E. Crop User Interface**

The system allows users to crop images to get more specific and better text. Users can cut with a flexible scale depending on the width and height of the selected text. After determining the part to be cut, the user is required to press the crop button in the upper right corner of the screen, after that the image will be sent and processed by OCR.



Fig. 8.Crop User Interface

**F. Search Result User Interface**

After the image is processed by OCR, the system will be switched to the search result display. In this section, the system will display all books with titles that match the text produced in the OCR process. Users can tap the book display to display the detailed book information.



Fig. 9. Search Result User Interface

**G. Book Detail User Interface**

In this view, users can see the details of the selected book. There is a picture of the book at the beginning of the display along with the title and author, underneath there is the location of the book and book details and at the bottom display there is a recycler view that contains a list of books that are related to the book being viewed. In addition, there is a bottom bar that is used to select the date of borrowing the book and the book button if the user has chosen the date of collection.



Fig. 10. Book Detail User Interface

**H. Notes User Interface**

In addition to the search feature, there are also note features that use OCR. This menu can be accessed via the navigation bar found in the application bar. In this view there is a search field to find the title of the note that was already created, after that there is a list of notes that have been made. There is also a floating action button located in the lower right corner of the screen, the function of this button is to add a note where the user will be redirected to the display added note.

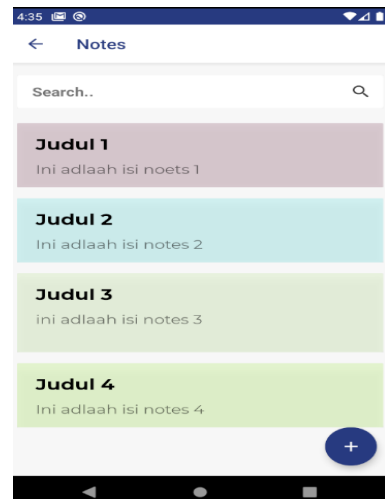


Fig. 11. Notes User Interface

**I. Add Notes User Interface**

In this view, the user can make a note. The display of this added note consists of an image scan button located at the top right of the screen. There is a display of the title and contents of the note in the middle of the screen. The process of saving notes is done when the user presses the back button at the bottom of the screen or that is at the top left of the screen.

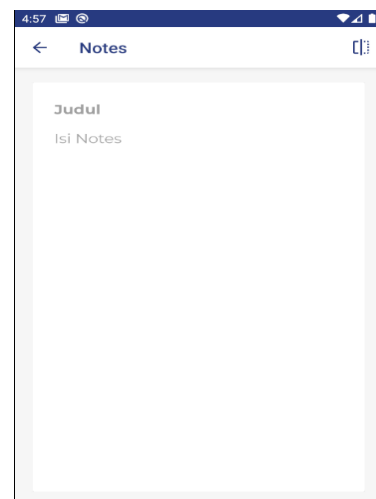


Fig. 12. Add Notes User Interface

**VI. DISCUSSION**

We conducted an experiment to find out the performance of the application that has been made. The conditions of our experiments included lighting, book covers, book contents and paper type. Table 1 shows the results of the experiment, which shows the input image, conditions, and results of text recognition by OCR.

#	Image	Condition	Output	Result
1		Book cover, high brightness		100%
2		Book cover, low brightness		96%
3		Frosted paper, high brightness		100%
4		Frosted paper, low brightness		100%
5		HVS paper, high brightness		100%
6		HVS paper, low brightness		100%

Table 1:- Light, book cover, book contents and paper type Experiment

From the test results, the brightness factor is not a significant problem. Of the six tests carried out, only one error occurred when testing using a book cover in which of the 27 letters expected to be detected, only 26 letters were detected. Letters that are not too exposed to lighting and noise in the image are a problem in this test. Noise is a problem because it can affect the quality of processing in OCR, because the system is confused and will produce other characters or not detecting the text in the image.

Tests based on paper type also did not experience significant problems. The test is carried out using one paragraph consisting of 100-200 letters. The results of this test resulted in 100% success both in low brightness conditions and in high brightness.

**VII. CONCLUSION**

The conclusion that can be drawn from this study is that the application is made to have good performance for detecting text in a book cover or in a document. The results of the lighting test produce a success rate of 96%, testing based on the type of paper produces a success rate of 100%. The application of OCR in this application also facilitates the user in the process of searching for books and the process of taking notes based on a survey conducted to 50 people with a rating scale of 1-5 resulting in 17 people giving a value of 4 and 33 people giving a value of 5.

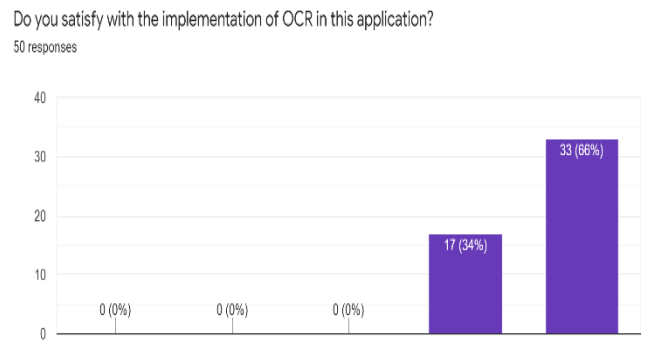


Fig. 13. Survey Result

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