DEVELOPMENT APPLICATIONS TRACKING INCOME AND EXPENDITURE FINANCE UTILIZES THE OCR TECHNOLOGY BLINKRECEIPT MOBILE SDK

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ABSTRACT

BlinkReceipt OCR technology is a Software Development KIT (SDK) can be used to perform different types of scanning an invoice. Advanced neural networks and deep learning techniques used to process the introduction text of the fastest and most accurate locally on your mobile device. Non-digital text must first be processed using the scanner. In my research this time using OCR technology BlinkReceipt to change non-digital texts into digital text. The activities of the financial expenses write back of invoice expenditures proved to be troublesome. Especially if manually, based on the results of the survey required an Android technology can process invoices and create a financial shopping is fast and practical. In building an application using the method waterfall and data collection activities with the study of literature, questionnaire. Interview, the library and experiment. This application will assist users in performing the financial record-keeping, as do recording financial expenses of an invoice shopping, browse through the settings and the financial infusion, and manage income and expenses Finance.

Keywords: Financial Entry and Expenditure Tracking, Waterfall, Optical Character Recognition (OCR), BlinkReceipt Mobile SDK.

1. INTRODUCTION

Text information is one important component in people's lives in terms of communicating. Text information can be obtained in the form of a digital text can be recognized by computers as well as text as text on a non digital newspapers, magazines and books. The digital text can be easily processed by humans because it is in a format recognized by your computer so that it can be easily copied and dipaste. If a non-text digital must first be processed using the scanner. But the text of the non-digital that has been entered into the system android is not recognized as text but recognized as an image. Therefore need to further process to turn this into a non-text digital digital text. Techniques to change the text of the non-digital digital text being called Optical Character Recognition (OCR) or literally can be translated as optical character recognition [1] .

Often the activities of private financial records proved troublesome and complicated. What if logging is still done manually in paper or books. There are a variety of obstacles, namely among others forgot to record the income and expenditure of financial calculations, less precise due to the limited precision level, the difficulty of viewing usage and allocation of income each month and limitations others.

The existence of such difficulties, then the recording is done by making use of some people's personal financial record-keeping applications. However, based on the results of a survey of 31 respondents who have been writers do, as much as 90% stated that they use application still works manually, 77.4% stated the difficulties in the financial records of a stroke 77.4%, expenditure declared the difficulty of tracing the funds that go into a bank account, 58.1% know about OCR technology and 90.3% declared wanted the presence of an application that can process automatically shopping invoice.

Based on the results of a survey conducted the author needed a technology Android smartphone that can create a personal finance and can perform calculations against income and expenditure financial. Of the things above, so the author is interested in conducting research with the title "development Applications Tracking Income and expenses Finance utilizes the OCR Technology Mobile SDK BlinkReceipt".

1.1 Optical Character Recognition

Optical Character Recognition (OCR) is an application that is used to identify the image of the letters as well as numbers for conversion into a form of filetulisan [2]. The system identifier of this font can increase flexibility or the ability and intelligence computer systems. The letter identifier astute system very helpful massive efforts currently undertaken many parties i.e. information digitization efforts and knowledge.

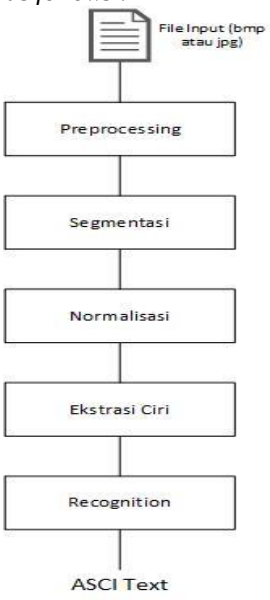
1.2 *Android*

Android is an operating system for linux-based mobile devices that includes an operating system, middleware and applications. Android provides an open platform for developers to create their applications. Initially, Google Inc. bought Android Inc. that is a newcomer that makes software for mobile phones or smartphones [4].

1.3 *BlinkReceipt SDK*

BlinkReceipt is an SDK (Software Development Kit) that can be used to perform various types of invoice scanning pembelajaan and do the extraction of all the data in the invoice. BlinkReceipt running locally on the device (no server-side processing), having high accuracy, scale indefinitely. The way it works is similar to OCR (Optical Character Recognition) a detection techniques from a digital image [5] .

The workings of the OCR BlinkReceipt with explanations as follows :



Picture 1 The Process of OCR BlinkReceipt

a. *File Input*
   The input file is in the form of a digital image file formats bmp and jpg.
b. *Preprocessing*
   Preprocessing is a process to remove the parts that are needed on the input image to the next process.
c. *Segmentation*
   Segmentation is the process of separating observation area (region) for each character that is detected.
d. *Normalization*
   Normalization is the process of changing the dimensions of the region of each character and the character's girth.
e. *Characteristic*
   Characteristic extraction is the process of taking certain traits of character is observed.
f. *Recognition*
   Recognition is a process to recognize characters that are observed by means of comparing character traits are obtained with the traits of the characters exist in the database.

1.4 *Convolutional Neural Network*

Convolutional Neural Network (CNN) is a development of MultiLayer Perceptron (MLP) that is designed to process data two-dimensional. CNN is included in the kind of Deep Neural Network, because of the high network depth and a lot of image data is applied to the [6].

1.5 *Machine Learning*

Machine learning is a branch of artificial intelligence that focuses on the development and study of a system in order to be able to learning from data acquired, according to Arthur Samuel, machine learning is a field of study that provide the ability to learn a computer program without explicitly in the program [9].

1.5.1 *The Workings of The Machine Learning*

First, the image is inputed into CNN to extract image features. The next step is applying a Recurrent Neural Network to these features, then go into the process of decoding algorithms. The extraction algorithm is LSTM output from taking any time and produce the final labeling.

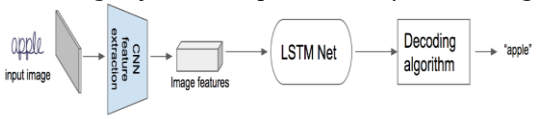


Image 2 Process Image That is Being Extracted Through CNN

*The image has the following form: height = width = 128, 64, the number of channel = 3. Pictures that have been through the process of CNN changed to form a tensor 4 * 8 * 4. So now the images have a high form = 4, width = 8 (this is the spatial dimension) and the number of channels = 4. Here there is a change of number of channel images from 3 to 4.*

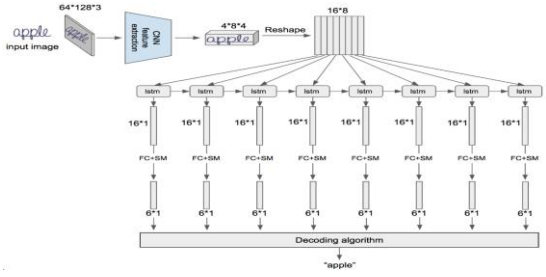


Image 3 The process of Image by CNN

Next do reshape operations (re-establishment). After it was retrieved from the vector sequence 8 of 16 elements. After that input 8 this vector to the LSTM

network and get the output-also a vector of 16 elements.

1.5.2 *The Workings of Decoding Algorithm*

In Figure 2 there are 8 probability vector at each time step is LSTM. Take the most possible symbols at each step the time. As a result, will acquire a string of eight characters-one possibility the most letters on each step the time. The process of further aggravate a recurring character sequence into one. In this example, two letters "e" attached on that one. Empty special character allows it to separate the symbols are repeated in the original label. Added an empty symbol to the alphabet to teach the neural network to predict the blank between the symbols of such cases. Then delete all the empty symbol.

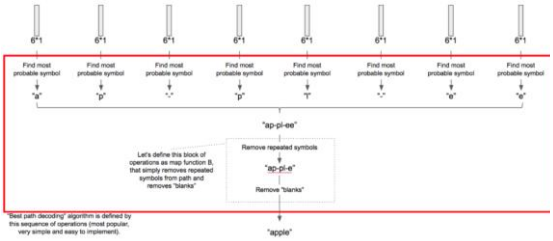


Image 4 How It Works Alogritma Decoding

When testing this network by replacing the algorithms decode with CTC layer Loss. The architecture of the CNN complex used in the implementation. Its architecture is as follows, but the main principle is still the same.

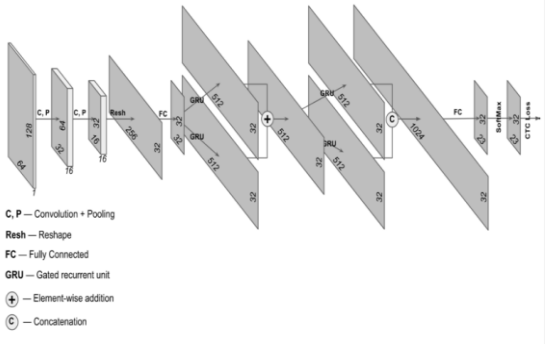


Image 5 The CNN Architecture

2. *The Content of Research*

2.2 *Analysis of The Problem*

Analysis of the problems discussed about the problems that existed before the founding of applications and aims to assist user in mentracking spending and financial revenue by using technology of Optical Character Recognition (OCR). Analysis of the existing problems include such things as follows:

a. *User difficulty in noting the financial expenditures of the invoice, because shopping should be done manually.*
b. *User difficulties in recording and searching the incoming funds.*
c. *Users create difficulties of financial expenditure and income.*

2.2 System Analysis

System analysis is used to elaborate on the problems that exist on the system to determine the needs of the systems built. The system analysis includes an analysis of the workings of the application to be built and analysis technology that will be built with the intention to evaluate the problems and obstacles that occur to obtain the expected solution.

2.2.1 *Analysis of How The Application Works*

Analysis of the business processes of the system to be built as follows:

a. *To take down a stroke shopping using a technology called Optical Character Recognition (OCR) was completed by BlinkReceipt Mobile SDK.*
b. *Library functions as a store of data and create a financial.*
c. *The system can display the revenue and expenditure of the financial suitable category.*

2.2.2 Analysis Technology BlinkReceipt

Blink Receipt SDK for Android is a SDK that allows to add the function of OCR in real time with the application for the purpose of scanning stroke shopping. With the provided camera management, can easily create an application that scans the stroke or proof of expenditures. Use Blink on the application Receipt requires a valid License Key. To get the License Key it is necessary to register as a developer on the site www.microblink.com.Berikut adalah cara untuk mendapatkan License Keys secara gratis pada situs www.microblink.com :

a. *Open the site www.microblink.com then select "for developers".*
b. *Then we register your account.*
c. *Once we have your account on the site www.microblink.com, we have own dashboard where the dashboard functionality that will be useful for our purposes for accessing these sites. To get the license keys for free on the website www. microblink. compada dashboard we select "SDK license key" and then "generate demo license key.*
d. *We will ask for the license keys for the Blinkreceipt SDK and will be used in the making of applications for Android then we select "BlinkInput" and "Android", fill in the form that has been prepared according to the desired purposes.*

e. After we filed the lisence keys, we'll get the lisence key contains a formberikut that we can use for 30 days. Can be seen in image 6:



Image 6 License keys

2.2.3 *Project Integration and Initialization*

To add the SDK to the android project, add the following to the dependencies in the application:

```
dependencies {
implementation
'com.android.support:appcompat-
v7:27.1.1'
implementation
'com.android.support.constraint:co
nstraint-layout:1.0.2'

implementation project(':blink-
receipt-1.0.5')

implementation
'com.squareup.okhttp3:okhttp:3.10.
0'
implementation
'com.squareup.okhttp3:logging-
interceptor:3.10.0'

implementation
'com.squareup.retrofit2:retrofit:2
.4.0'
implementation
'com.squareup.retrofit2:converter-
gson:2.4.0'
implementation
'com.squareup.retrofit2:converter-
scalars:2.4.0'

implementation
'com.squareup.okio:okio:1.14.0'
}
```

Although there are many different ways to initialize SDK, the recommended way is through the AndroidManifest .Xml. In this file add the following configuration:

```
AndroidManifest.xml
<meta-data
android:na
me="com.microblink.LicenseKey"
android:value="BLINK RECEIPT
LICENSE KEY" />
```

```
@Override
protected void
onActivityResult(int requestCode,
int resultCode, Intent data) {
super.onActivityResult(requestCode
, resultCode, data);

if ( requestCode ==
SCAN_RECEIPT_REQUEST && resultCode
== Activity.RESULT_OK ) {
        ScanResults brScanResults
= data.getParcelableExtra(
IntentUtils.DATA_EXTRA );

        Media media =
data.getParcelableExtra(
IntentUtils.MEDIA_EXTRA );
    }
 }
```

I*n a class project or application provider unit, please add the following code:*

```
@Override
public void onCreate() {
super.onCreate();

ReceiptSdk.sdkInitialize( context
);
```

2.2.4 *Scanning Receipt*

The easiest way to start scanning the invoice shopping is using internal Scan Activity in the aar:

```
ScanOptions scanOptions =
ScanOptions.newBuilder()

.retailer( Retailer.UNKNOWN )

.frameCharacteristics(
FrameCharacteristics.newBuilder()

.storeFrames( true )

.compressionQuality( 100 )

.externalStorage( false )

.build() )

.edgeDetectionConfiguration(
EdgeDetectionConfiguration.defaults
() )

.scanBarcode( true )

.logoDetection( true )

.build();

Intent intent =
IntentUtils.cameraScan( this,
scanOptions );

startActivityForResult( intent,
SCAN_RECEIPT_REQUEST );
```

The result is developed through 2 object, which can be taken denganmendapatkan parcelable extras ScanResults and Media. ScanResults object contains the results of a scan session

2.2.5 *Retrieving Results*

The interface RecognizerCallback is the way to take the results and status of the scanning progress.

```
public interface
RecognizerCallback {

    // Called when scan
results are compiled and
saved images are processed.
void onRecognizerDone(
@NonNull ScanResults
results, Media media );

    // Called in the case
there is an exception while
scanning the captured
frame.
void
onRecognizerException(@NonN
ull Throwable throwable );

    // The callback invoked
whenever a step within the
scanning process is
returned.
void
onRecognizerResultsChanged(
@NonNull RecognizerResult
result );

}
```

public interface
CameraRecognizerCallback

```
// The callback invoked if
while utilizing the
RecognizerView the confirm
frame is called saving the
image. This callback
provides the location of the
saved frame.
void onConfirmPicture(
@NonNull File file );

    // As of Android
Marshmallow (API 24) Runtime
permissions are required to
access hardware features
like the camera. This
callback will be invoked if
proper permissions have not
been granted for camera use.
void onPermissionDenied();
```

```
//Notifying the user of any
issue while using camera
preview as well as when
preview is started and
ended.
void onPreviewStarted();

void onPreviewStopped();

void onException( @NonNull
Throwable throwable );
}
```

The RecogizerCallback also provides the raw results.

```
@Override
public void
onRecognizerResultsChanged(@
NonNull RecognizerResult
result) {

if ( result instanceof
OcrRawResult ) {
            OcrRawResult
ocrRawResult =
(OcrRawResult) result;
        }
    }
```

2.2.6 Direct API

BlinkReceipt SDK is able to scan an image in bitmap form. This Use the API directly accessible through the Instance of the Recognizer. Identifier is a single when calling recongnBitmap (bitmap Bitmap, @NonNull @NonNull CameraOrientation, @NonNull RecognizerCallback final orientation callbacks) will scan the image bitmap. Based on the configuration of the ScanOption and return the callback result to you is provided.

2.2.7 *Product Intelligence*

If you wish to place the function of intelligence products in the project, add the license key to a file .XML AndroidManifest, similar to the arrangement for this SDK. AndroidManifest.xml.

```
<meta-data
android:name="com.microblink
.ProductIntelligence"
android:value="PRODUCT
INTELLIGENCE KEY" />
```

2.2.8 *Google Places*

If you want to incorporate the functionality of Google Places in the project, add the license key file to the AndroidManifest .Xml. similar to the arrangement for this SDK. AndroidManifest .Xml.

```
<meta-data
android:name="com.microblink.Go
oglePlacesKey"
android:value="GOOGLE PLACES
KEY"/>
```

3. *Cover*

3.1 *Testing and Results*

The test is done to find out the results of OCR technology BlinkReceipt in recognition shopping stroke. Here is a device used in testing:

Tabel 1 Test Devices

No	*Hardware*	*Description*
1	Processor	1.0 Ghz Dual Core
2	RAM	1GB
3	Storage	1GB
4	Kamera	5MP
5	Versi Android	5.0 Lollipop

Below is a picture of the test results from the BlinkReceipt SDK OCR technology



Image 6 An Exmple of a Invoice

From Image 6, next select the "Finish" button to see the results of a scan of a invoice by OCR technology BlinkReceipt.

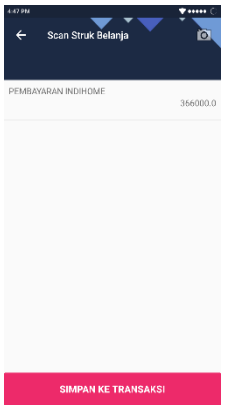


Image 7 Invoice Test Results

3.2 *Conclusion*

Based on the results of the implementation and testing of the system that has been done, then it can be inferred:

a. *Generated a mobile application that serves as a tracking expenses from a invoice shopping with OCR technology blinkreceipt.*

b. *The process of tracking expenditures by using OCR technology blinkreceipt more quickly and practical compared to manually process.*

c. *There are some points that cannot be performed by this application in OCR technology utilizing blinkreceipt, namely:*
   - *Unable to read there are nominal discounts or rebates.*
   - *Can not scan invoice shopping already worn or damaged.*
   - *Have to do it a few times the process of memindaian, if the number of lists in the stroke shopping too much.*

d. *With the building of this application, is expected to help the Indonesian people in financial income and expenses mentracking especially in terms of financial expenditure of shopping invoice.*

3.3 *Advice*

In development applications tracking income and expenses finance utilizes the OCR technology blinkreceipt mobile SDK that has been built is still far from perfect and there are still many shortcomings. Therefore, the need for further development and refinement in order to meet the needs of users who are increasingly high. As for the suggestions towards the development of this application as follows:

a. *To reduce the limitations of the conditions in the process of taking a picture (capture) using the smartphone's camera, need to be examined again with the addition of other methods so that the process of taking pictures is not limited to an optimum distance funds rah certain positions only.*

b. *To improve the accuracy of the detection process of the characters can be added a more complex segmentation algorithm in order to add up perfectly for each list.*

c. *Retail database in order to add the results of the extraction process may display the name and image of each product, so it's not just limited to the list found on the stroke of shopping.*

BIBLIOGRAPHY

[1] Rashid S.F, Shafit F, Breuel T, "Scanning Neural Network for Text Line Recognition", in The DFKI website 2010.

[2] Cheriet M, Kharma N., Liu C., Suen C.Y., 2006, "Character Recognition System A Guide for Student and Practioners", Jhon Willey & Sons.Inc. 2006.

[3] Sofani, Rachmah, Sistem OCR, *http://digilib.ittelkom.ac.id/index.php?option=com_content&view=article&id=413:sistem-cor&catid=15:pemrosesan-sinyal&Itemid=14*, 21 April 2019 12.30.

[4] Nazaruddin Safaat H. 2015. "Android Pemprograman Aplikasi Mobile Smartphone dan Tablet PC Berbasis Android". Bandung : Informatika. 2015.

[5] Microblink. 2018. *https://microblink.com/products/blinkreceipt*, 19 April 2018 20.20.

[6] I Wayan Suartika E.P, Yudhi Wijaya dan Rully Soelaiman, Klasifikasi Citra Menggunakan *Convolutional Neural Network* pada Caltech 101, Institut Teknologi Sepuluh November, 2016.

[7] K.Fukushima. "*Neocognitron: A Self-Organizing Neural Network Model for a Mechanism of Pattern Recognition Unffected by Shift in Position", Biological Cybernetics* ,1980.

[8] Y. LeCun, "*HandWritten Digit Recognition With a Back Propagation Nerwork*", 1980.

[9] Zulfa Afiq Fikriya, "Implementasi *Extreme Learning Machine* untuk Pengenalan Objek Citra Digital", Institut Teknologi Sepuluh November, 2017.

[10] M. Fowler, "*A brief guide to the standard object modeling language"*. Wesley, United States of Amerca: Addison. 2003.