TEXT RECOGNITION APP USING JAVA

INDUSTRIAL PROJECT REPORT

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR

Six Month Industrial Training

at

Innerwork Solution Pvt. Ltd., Bangalore

(from Aug. 2020 to Dec. 2020)

SUBMITTED BY

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BACHELOR OF TECHNOLOGY

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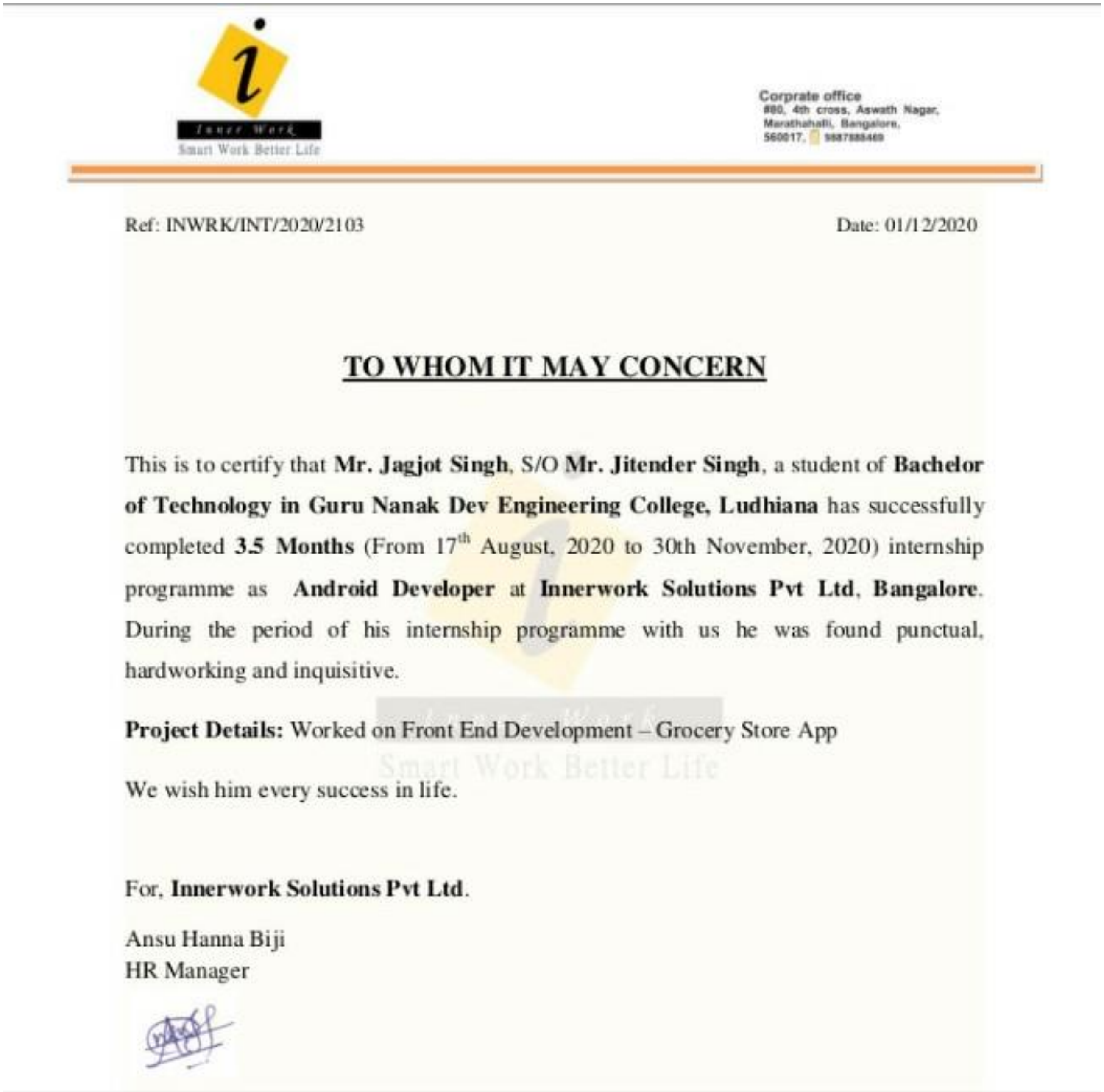
ABSTRACT

Text recognition in images is an active research area which attempts to develop a computer application with the ability to automatically read the text from images. Nowadays there is a huge demand of storing the information available on paper documents in to a computer readable form for later use. One simple way to store information from these paper documents in to computer system is to first scan the documents and then store them as images. However, to reuse this information it is very difficult to read the individual contents and searching the contents form these documents line-by-line and word-by-word. The challenges involved are: font characteristics of the characters in paper documents and quality of the images. Due to these challenges, computer is unable to recognize the characters while reading them. Thus, there is a need of character recognition mechanisms to perform document image analysis which transforms documents in paper format to electronic format. In this paper, we have reviewed and analyzed different methods for text recognition from images. The objective of this review paper is to summarize the well-known methods for better understanding of the reader.



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TO WHOM IT MAY CONCERN

This is to certify that **Mr. Jagjot Singh**, S/O **Mr. Jitender Singh**, a student of **Bachelor of Technology in Guru Nanak Dev Engineering College, Ludhiana** has successfully completed **3.5 Months** (From 17th August, 2020 to 30th November, 2020) internship programme as **Android Developer** at **Innerwork Solutions Pvt Ltd**, **Bangalore**. During the period of his internship programme with us he was found punctual, hardworking and inquisitive.

Project Details: Worked on Front End Development – Grocery Store App

We wish him every success in life.

For, **Innerwork Solutions Pvt Ltd**.

Ansu Hanna Biji
HR Manager

ACKNOWLEDGEMENT

We are highly grateful to the Dr. Sehijpal Singh, Principal, Guru Nanak Dev Engineering College (GNDEC), Ludhiana, for providing this opportunity to carry out the Major project work at Text Recognition App. The constant guidance and encouragement received from Dr. Kiran Jyoti, H.O.Ds., IT Department, GNDEC Ludhiana has been of great help in carrying out the project work and is acknowledged with reverential thanks. We would like to express a deep sense of gratitude and thanks profusely to Pankaj Bhambri, without his wise counsel and able guidance, it would have been impossible to complete the project in this manner. We express gratitude to other faculty members of Information Technology Department of GNDEC for their intellectual support throughout the course of this work. Finally, we are indebted to all whosoever have contributed in this report work.

LIST OF FIGURES

TABLE OF CONTENT

1. Introduction

1.1 Introduction to The Organization

Innerwork provides full-range human resources and IT solutions to help businesses improve hiring and digital infrastructure for the effective functioning of the company. Founded with a purpose to find the right balance of quality hiring and smooth on-boarding, Innerwork believes in understanding the business inside-out and be a strategic partner in the business journey. Their team, comprising of experienced human resource and IT professionals, works single-mindedly to offer customized HR solutions to enterprises so that perfect skill-to-work match could be achieved most cost-effectively.

In short-span of just 2-years, InnerWork has established itself as a trusted recruiting and selection service provider by offering a perfect job "aspiration to position" match through a smart hiring system. Their dedicated team works meticulously to ensure that good people get an excellent job for all types of profiles. Visualizing the challenges startups face in hiring quality talents, they have devised a smart full-service solution to help them remain free of human resource management worries and dedicate quality time in the core business operation. Innerwork HR and IT solutions are all about "workability," "applicability," "affordability," and, of course, the "flexibility."

Their extensive network of experienced HR professionals is in-sync with the contemporary business realities and offers custom solutions suitable to specific business requirements. They have a robust system in place to ensure quality service to make businesses flourish in competitive space. Their team pays special attention to understanding business and offer tailored solutions to meet the desired objectives. Their start-to-finish approach, along with warm hand-holding, helps us win hearts. This is what they value the most. They leave no stone unturned to strengthen the relationship and help businesses move to the next level.

They believe that the success of a business depends on “action,” and it is the quality of the hiring and workforce management that brings ideas in action. Their work-process has been designed to help you hire suitable candidates so that business ideas could be executed smoothly. Their robust system helps businesses develop the right HR protocols for stable, safe, and productive functioning of the workforce. We are fully equipped with quality professionals and advanced technologies to work with companies of all sizes and scales. They are here to show you the right path, walk with you on the path with a focus on productivity improvement and effective functioning.

1.2 Introduction to The Project

Now-a-days, there is a growing demand for the software systems to recognize characters in computer when information is scanned through paper documents as we know that there are number of historical, mythological books and newspapers which are in printed format. Day by day due to atmospheric changes or due to improper handling they get damaged. Therefore, nowadays there is a huge demand in “storing the information available in these paper documents in to a computer storage disk and then later reusing this information by searching process”. One simple way to store information in these paper documents in to computer system is to first scan the documents. Whenever we scan the documents through the scanner, the documents are stored as images in the computer system. These images contain text that cannot be edited by the user. But to reuse this information it is very difficult for the computer system to read the individual contents and search the contents form these documents line-by-line and word-by- word. The reason for this difficulty is the font characteristics of the characters in paper documents are different to font of the characters in computer system. As a result, computer is unable to recognize the characters while reading them. This concept of storing the contents of paper documents in computer storage place and then reading and searching the content is called document processing. Sometimes in this document processing we need to process the information that is related to languages other than the English in the world. This process is also called Document Image Analysis (DIA). To handle DIA in recent years many approaches have been proposed by researchers, each approach has its own advantages and limitation which is discussed in detail in forthcoming section of this paper.

1.3 Project Category (Application based)

Application based: Text detection is a technology that falls under the broader domain of Computer Vision. It deals with identifying and recognizing text present in images. Text detection has multiple applications such as google lens, In airports, for passport recognition and information extraction.

The major objective of text recognition include:

- To identify all text present in an image

In this article, you will see how to perform Text Recognition in Java using Android Studio.

A text recognition system receives an input in the form of image which contains some text information. The output of this system is in electronic format i.e., text information in image is stored in computer readable form. The text recognition system can be divided in following modules: (A) pre-processing (B) text recognition (C) post processing.

1.4 Objective

The objective of OCR software is to recognize the text and then convert it to editable form. Thus, developing computer algorithms to identify the character in the text is the principal task of OCR.

1.5 Problem Formulation

The trend of development in technology is rising all over the world. People have to type the whole lot of text from one hard copy to get a soft copy of the document.

The time taken for this work and the expenses to hire a data entry operator is not favourable for a person or an organization. The Recognition process involves the detection of text written on the image. Here we introduce an android app in Java to recognize text on any image.

1.6 Existing System

1. Text Fairy

Text Fairy OCR android app is without a doubt one of the best OCR apps available in the market today. It does exactly what it is built for. This is one of the few free OCR software apps that come without any ads. It has one thing that Office Lens lacks; the feature to correct image perspective.

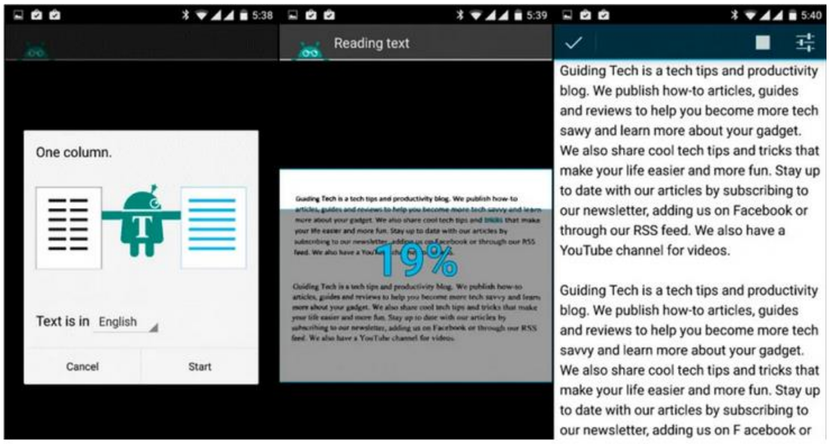

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Figure 1: Text Fairy App

1.7 Proposed System

An android app is developed in java using android studio which will click an image on which some text is written. The image clicked will be processed and cropping of the textual part will be done by the user. As a result, the text of the textual image will be obtained in an editable form.

2. Requirement Analysis and System Specification

2.1 Feasibility Study

1. Economic Feasibility: The project requires just one-time investment, and thus later on will help increase the profits
2. Technical Feasibility: All the hardware required are basic security devices like cameras and sensors available in almost every store. These devices can be found anywhere and everywhere.
3. Market Feasibility: Play Store is the best source and people can easily install it.

2.2 System Requirements

Since our project works on Text Recognition, it is recommended to have a Windows or Linux Operating System with pre-installed Android Studio.

Table 1: Software Requirement

OS	**Windows 10 Home / Ubuntu 20.04**
Java	**openjdk version "1.8.0_275"**
Android Studio	**4.1.1 for OS 64 Bit**
RAM	**8 GB**

2.3 Expected Hurdles

- Scene complexity: In natural environments, numerous man-made objects, such as buildings, symbols and paintings appear, that have similar structures and appearances to text. Text itself is typically laid out to facilitate legibility. The challenge with scene complexity is that the surrounding scene makes it difficult to discriminate text from non-text.
- Blurring and degradation: With flexible working conditions and focus-free cameras, defocusing and blurring of text images occur. Image/video compression and decompression procedures also degrade the quality of text, in particular, graphical video text. The typical influence of defocusing, blurring and degradation is that they reduce characters' sharpness and introduce touching characters, which makes basic tasks such as segmentation difficult.

2.4 SDLC Model to Be Used

Software Development Life Cycle (also called SDLC Models) is a workflow process which defines the core stages and activities of development cycles or A framework that describes the operations performed at each phase of a software development project.

Iteration Waterfall Model

• Iterative Waterfall Model is the extension of the Waterfall model.

• This model is almost same as the waterfall model except some modifications are made to improve the performance of the software development.

- The iterative waterfall model provides customer's feedback paths from each phase to its previous phases.
- There is no feedback path provided for feasibility study phase, so if any change is required in that phase then iterative model doesn't have scope for modification or making corrections.
- Iterative waterfall allows going back on the previous phase and change the requirements and some modification can be done if necessary.
- This model reduces the developer's effort and time required to detect and correct the errors.

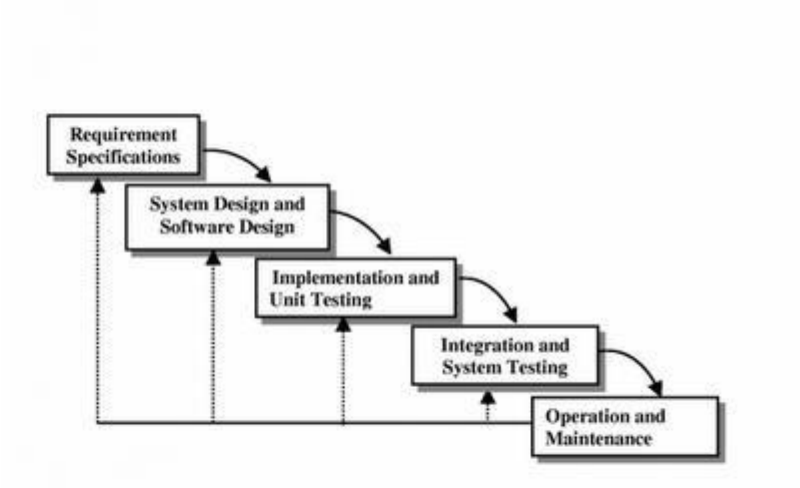

Requirement Specifications
System Design and Software Design
Implementation and Unit Testing
Integration and System Testing
Operation and Maintenance

Figure 2: Iterative Waterfall Model

3 System Design

3.1 Design Approach

We analyze two commonly used methodologies in complete text detection and recognition systems: stepwise and integrated. Stepwise methodologies have separated detection and recognition modules, and use a feed- forward pipeline to detect, segment and recognize text regions. Integrated methodologies, by contrast, have a goal of recognizing words where the detection and recognition procedures share information with character classification and/or use joint optimization strategies. Some stepwise approaches utilize a feedback procedure from text recognition to reduce false detections, and some integrated approaches use a pre-processing step to localize regions of interest. The key difference lies in the fact that the latter uses recognition as a key focus.

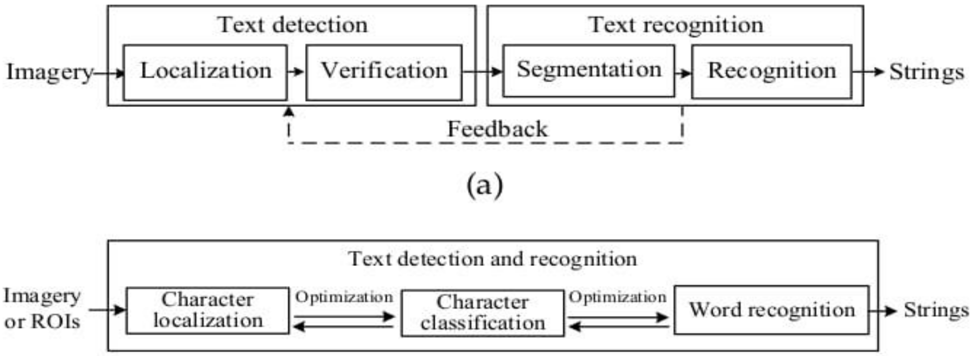


Figure 3: Design Approach

3.2 Detail Design

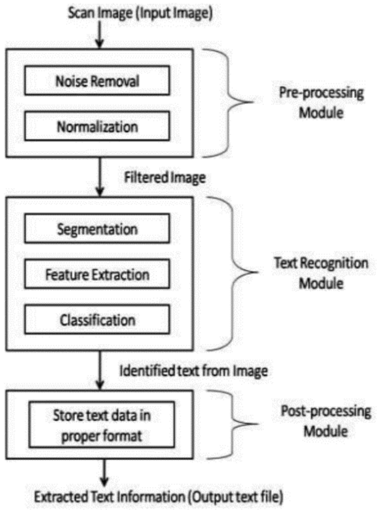


Figure 4: Detail Design

1) Noise Removal: Noise removal is one of the most important process. Due to this quality of the image will increase and it will affect recognition process for better text recognition in images. And it results in generation of more accurate output at the end of text recognition processing. There are many methods for image noise removal such as mean filter, min-max filter, Gaussian filter etc.

2) Normalization: Normalization is one of the important pre-processing operation for text recognition. The normalization is applied to obtain characters of uniform size, slant and rotation.

Modules used for binarization are as under:

1. Segmentation: In text recognition module, the segmentation is the most important process. Segmentation is done to make the separation between the individual characters of an image.

2. Feature Extraction: Feature extraction is the process to retrieve the most important data from the raw data. The most important data means that's on the basis of that's the characters can be represented accurately. To store the different features of a character, the different classes are made. There are many techniques used for feature extraction like Principal Component Analysis (PCA), Linear Discriminate Analysis (LDA), Independent Component Analysis (ICA), Chain Code (CC), zoning, Gradient Based features, Histogram etc.
3. Classification: The classification is the process of identifying each character and assigning to it the correct character class, so that texts in images are converted in to computer understandable form. This process used extracted feature of text image for classification i.e., input to this stage is output of the feature extraction process. Classifiers compare the input feature with stored pattern and find out best matching class for input. There are many techniques used for classification such as Artificial Neural Network (ANN), Template Matching, Support Vector Matching (SVM) etc.

3.3 System Design using various structured analysis and design tools

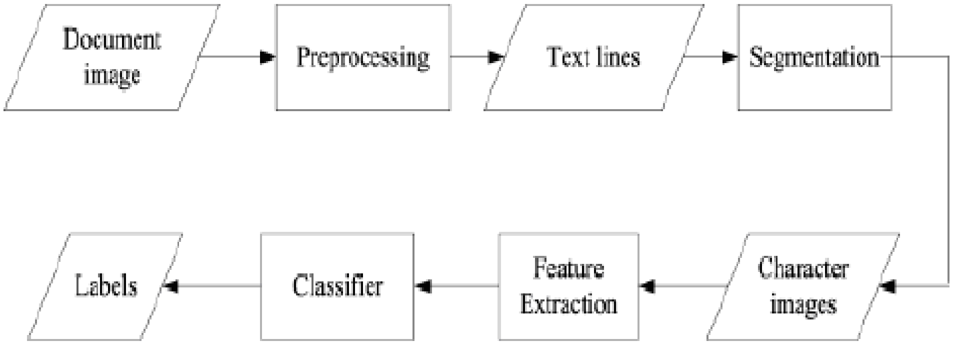


Figure 5: Flow Chart

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually “say” things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO.

Level 0 Data Flow Diagram

DFD Level 0 is also called a Context Diagram. It’s a basic overview of the whole system or

process being analyzed or modeled. It’s designed to be an at-a-glance view, showing the system as a single high-level process, with its relationship to external entities.

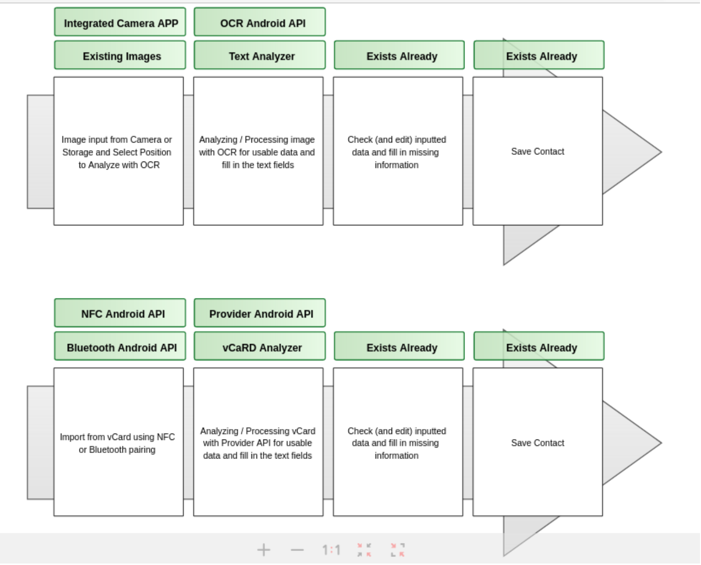

Integrated Camera APP
OCR Android API
Existing Images
Text Analyzer
Exists Already
Exists Already
Image input from Camera or Storage and Select Position to Analyze with OCR
Analyzing / Processing image with OCR for usable data and fill in the text fields
Check (and edit) inputted data and fill in missing information
Save Contact
NFC Android API
Provider Android API
Bluetooth Android API
vCaRD Analyzer
Exists Already
Exists Already
Import from vCard using NFC or Bluetooth pairing
Analyzing / Processing vCard with Provider API for usable data and fill in the text fields
Check (and edit) inputted data and fill in missing information
Save Contact
+
—
1:1

Figure 6: DFD Level 0

Flow Chart

A flowchart is a visual representation of the sequence of steps and decisions needed to perform a process. Each step in the sequence is noted within a diagram shape. Steps are linked by connecting lines and directional arrows. This allows anyone to view the flowchart and logically follow the process from beginning to end. A flowchart is a powerful business tool. With proper design and construction, it communicates the steps in a process very effectively and efficiently.

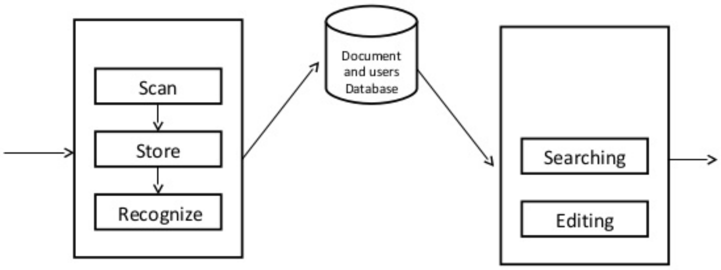


Figure 7: Flow Chart

3.4 Methodologies

For the development of front-end card-based layout, constraint Layout was used.

3.4.1 Card-Based Layout: Apps often need to display data in similarly styled containers. These containers are often used in lists to hold each item's information. The system provides the CardView API as an easy way for you show information inside cards that have a consistent look across the platform. These cards have a default elevation above their containing view group, so the system draws shadows below them.

3.4.2 Responsive UI with ConstraintLayout: ConstraintLayout allows you to create large and complex layouts with a flat view hierarchy (no nested view groups). It's similar to RelativeLayout in that all views are laid out according to relationships between sibling views and the parent layout, but it's more flexible than RelativeLayout and easier to use with Android Studio's Layout Editor.

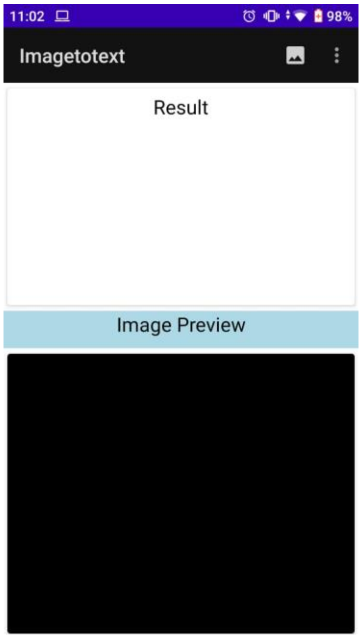
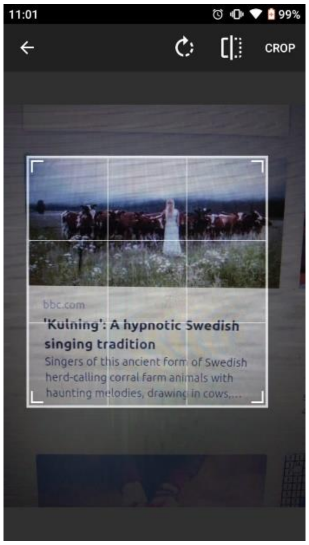


Figure 8: Card View

3.4.3 Image Cropper: Android Image Cropper is a powerful (Zoom, Rotation, Multi-Source), customizable (Shape, Limits, Style), optimized (Async, Sampling, Matrix) and simple image cropping library for Android.



bbc.com
'Kulning': A hypnotic Swedish singing tradition
Singers of this ancient form of Swedish herd-calling corral farm animals with haunting melodies, drawing in cows,...

Figure 9: Image Cropper

3.4.4 Text Recognizer: Recognition results are returned by detect(Frame). The OCR algorithm tries to infer the text layout and organizes each paragraph into TextBlock instances. If any text is detected, at least one TextBlock instance will be returned.

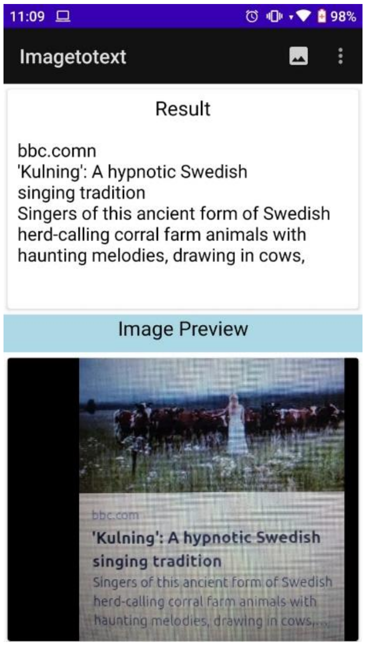


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Figure 10: Text Image to text

4 Implementation, Testing, and Maintenance

4.1 Introduction to Languages, IDE's, Tools and Technologies used for Implementation

Java: Java is a class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible. It is a general-purpose programming language intended to let application developers write once, run anywhere (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java applications are typically compiled to bytecode that can run on any Java virtual machine (JVM) regardless of the underlying computer architecture. The syntax of Java is similar to C and C++, but has fewer low-level facilities than either of them. The Java runtime provides dynamic capabilities (such as reflection and runtime code modification) that are typically not available in traditional compiled languages. As of 2019, Java was one of the most popular programming languages in use according to GitHub, particularly for client-server web applications, with a reported 9 million developers.

Java was originally developed by James Gosling at Sun Microsystems (which has since been acquired by Oracle) and released in 1995 as a core component of Sun Microsystems' Java platform. The original and reference implementation Java compilers, virtual machines, and class libraries were originally released by Sun under proprietary licenses. As of May 2007, in compliance with the specifications of the Java Community Process, Sun had relicensed most of its Java technologies under the GNU General Public License. Oracle offers its own HotSpot Java Virtual Machine, however the official reference implementation is the OpenJDK JVM which is free open-source software and used by most developers and is the default JVM for almost all Linux distributions.

Why to learn Java?

1. It's the most commonly used programming language in the world. It's a de facto standard. According to Oracle, 3 billion devices run on Java. The TIOBE Programming Community Index is updated monthly and regularly lists Java as the most popular programming language.
2. It's a good precursor to learning other programming languages (like C, C#, and C++). Java is a solid core language. Web and non-web environments, all operating systems, all types of devices...you'll find Java everywhere. For those in favor of learning Java first, a key factor is that it teaches you to think like a programmer. You'll learn the language, but you'll also learn some key underpinnings of programming as well. It's also an object-oriented programming (OOP) language. Learning OOP requires students to master a certain level of logic.
3. It prepares you for many open, well-paying developer jobs. A recent search on gooroo.io shows the average U.S. salary for jobs requiring Java in January 2017 is $95,864. It also shows 11,611 monthly advertised jobs in the U.S. Java is pervasive. It powers Android apps, server apps, financial apps, Big Data tech, and so much more. It's a skill that should serve programmers well in the job market for years to come.

Characteristics of java:

1. Object Oriented

   In Java, everything is an Object. Java can be easily extended since it is based on the Object model.

2. Platform Independent

   Unlike many other programming languages including C and C++, when Java is compiled, it is not compiled into platform specific machine, rather into platform-independent byte code. This byte code is distributed over the web and interpreted by the Virtual Machine (JVM) on whichever platform it is being run on.

3. Simple

   Java is designed to be easy to learn. If you understand the basic concept of OOP Java, it would be easy to master.

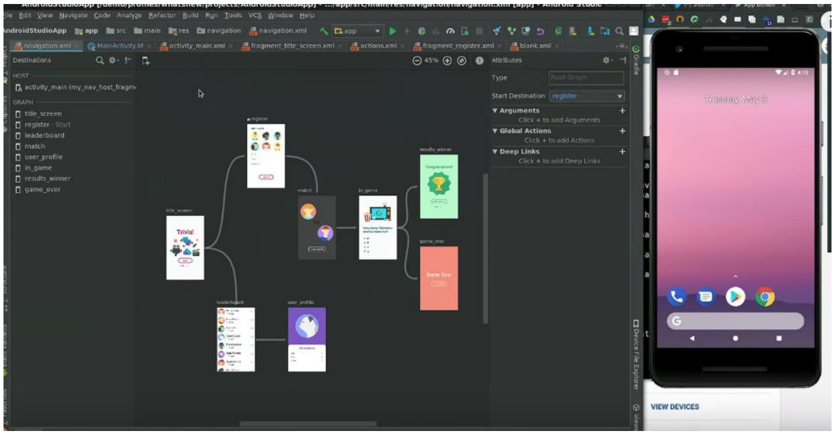
4. Secure

   With Java's secure feature it enables to develop virus-free, tamper-free systems.

5. Architecture-neutral

   Java compiler generates an architecture-neutral object file format, which makes the compiled code executable on many processors, with the presence of Java runtime system

Android Studio for Java:



Type: Root Graph
Start Destination: register

Figure 16: Android Studio

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems or as a subscription-based service in 2020. It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development.

Android Studio was announced on May 16, 2013 at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0.

The following features are provided in the current stable version:

- Gradle-based build support
- Android-specific refactoring and quick fixes
- Lint tools to catch performance, usability, version compatibility and other problems
- ProGuard integration and app-signing capabilities
- Template-based wizards to create common Android designs and components
- A rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations
- Support for building Android Wear apps
- Built-in support for Google Cloud Platform, enabling integration with Firebase Cloud Messaging (Earlier 'Google Cloud Messaging') and Google App Engine
- Android Virtual Device (Emulator) to run and debug apps in the Android studio.

4.2 Coding standards of Language used

Coding Standards for Components: It is recommended to write components name by its purpose. This approach improves the readability and maintainability of code.

Coding Standards for Classes: Usually class name should be noun starting with uppercase letter. If it contains multiple word than every inner word should start with uppercase.

Eg: String, StringBuffer, Dog

Coding Standards for Interface: Usually interface name should be adjective starting with uppercase letter. If it contains multiple word than every inner word should start with uppercase.

Eg: Runnable, Serializable, Comparable

Coding Standards for Methods: Usually method name should either be verb or verb noun combination starting with lower letter. If it contains multiple word than every inner word should start with uppercase.

Eg: print(), sleep(), setSalary()

Coding Standards for Variables: Usually variable name should be noun starting with lowercase letter. If it contains multiple word than every inner word should start with uppercase.

Eg: name, age. mobileNumber

Coding Standards for Constants: Usually constant name should be noun. It should contain only uppercase If it contains multiple word than words are separated with (_) underscore symbol. Usually we declare constants with public static and final modifiers.

Java Bean Coding Standards: A Java Bean is a simple java class with private properties and public getter and setter methods

4.3 Testing Techniques and Test Plans

4.3.1 Unit testing

It is a level of software testing where individual units/ components of a software are tested. The purpose is to validate that each unit of the software performs as designed. A unit is the smallest testable part of any software. It usually has one or a few inputs and usually a single output. In procedural programming, a unit may be an individual program, function, procedure, etc. In object-oriented programming, the smallest unit is a method, which may belong to a base/ super class, abstract class or derived/ child class. (Some treat a module of an application as a unit. This is to be discouraged as there will probably be many individual units within that module.) Unit testing frameworks, drivers, stubs, and mock/ fake objects are used to assist in unit testing.

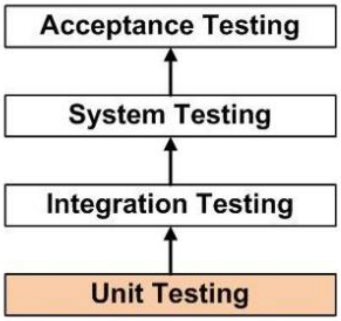


Figure 12: Unit Testing

You already know that making a Test Plan is the most important task of Test Management Process. Follow the seven steps below to create a test plan

1. Analyze the product
2. Design the Test Strategy
3. Define the Test Objectives
4. Define Test Criteria
5. Resource Planning
6. Plan Test Environment
7. Schedule & Estimation
8. Determine Test Deliverables

5 Results and Discussions

5.1 User Interface Representation

5.1.1 Brief Description of Various Modules of the system

Card-Based Layout: Apps often need to display data in similarly styled containers. These containers are often used in lists to hold each item's information. The system provides the CardView API as an easy way for you show information inside cards that have a consistent look across the platform. These cards have a default elevation above their containing view group, so the system draws shadows below them.

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Image Cropper: Android Image Cropper is a powerful (Zoom, Rotation, Multi-Source), customizable (Shape, Limits, Style), optimized (Async, Sampling, Matrix) and simple image cropping library for Android.

Text Recognizer: Recognition results are returned by detect(Frame). The OCR algorithm tries to infer the text layout and organizes each paragraph into TextBlock instances. If any text is detected, at least one TextBlock instance will be returned.

5.2 Snapshots of system with brief detail of each

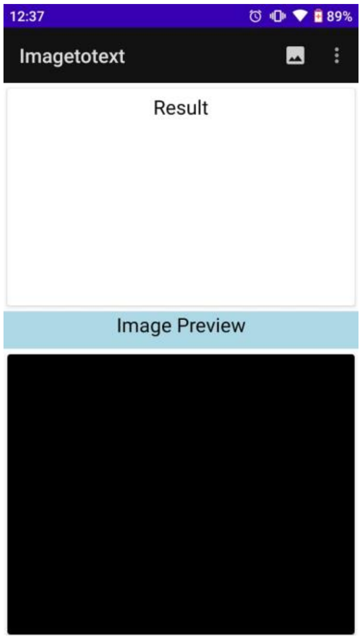
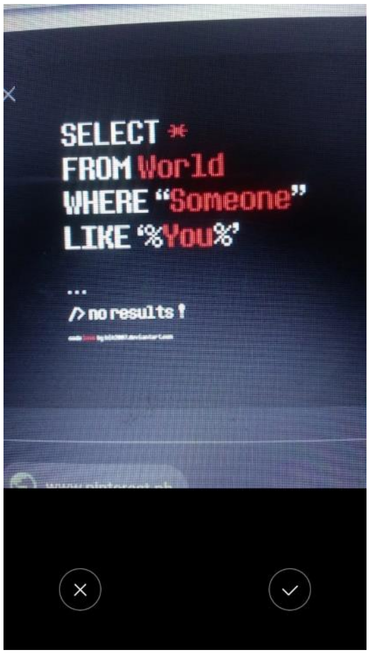


Figure 13: Front-end after successful build



```
SELECT *
FROM World
WHERE "Someone"
LIKE '%You%'

...
/> no results !
```

Figure 14: Captured text image

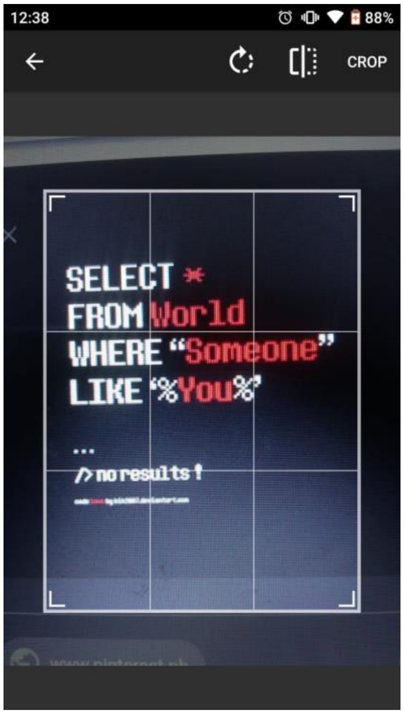
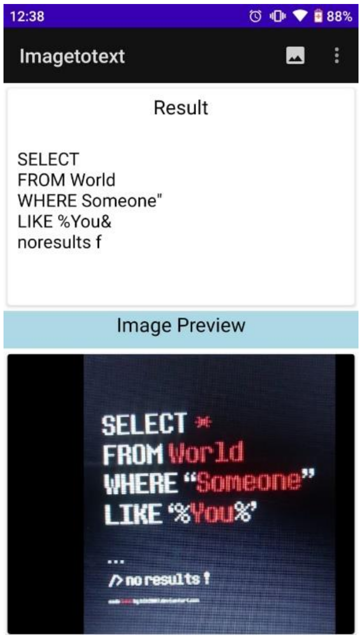


Figure 15: Cropped the text section of the image



```
SELECT
FROM World
WHERE Someone"
LIKE %You&
noresults f
```

Figure 16: Text received in the editable form

6 Conclusion and Future Scope

What does the future hold for OCR? Given enough entrepreneurial designers and sufficient research and development dollars OCR can become a powerful tool for future data entry applications. However, the limited availability of funds in a capital-short environment could restrict the growth of this technology. But. given the proper impetus and encouragement, a lot of benefits can be provided by the OCR system. They are: -

1. The automated entry of data by OCR is one of the most attractive, labor reducing technology

2. The recognition of new font characters by the system is very easy and quick.

3. We can edit the information of the documents more conveniently and we can reuse the edited information as and when required.

4. The extension to software other than editing and searching is topic tor iuture wor

The Grid infrastructure used in the implementation of Optic character Recognition system can be efficiently used to speed up the translation of image-based documents into structured documents that are currently easy to discover, search and process.

References:

https://stackoverflow.com/questions

https://www.youtube.com/

https://www.tutorialpoint.com/

https://www.w3schools.com/

https://www.oracle.com/in/java/

https://androiddvlpr.com/android-image-crop/

https://developers.google.com/vision/android/text-overview