Optimizing the Security of Business through Artificial Intelligence

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Abstract— Almost all the products and items that exist into the market today have a unique code or an ID associated with them. This special ID is what we call as Barcode. Barcode Detection and Generation is very common and is a necessity today. One scan of the code and all the details of the product will be easily fetched. An integrated tool is required so as the user just enter the details of the product and a barcode is generated instantaneously. It's becoming even more popular and prevalent day by day. A new technology has emerged to extract text from image using Machine Learning. Everyone today has a mobile phone and with document scanning, high-quality pdf format can be created by capturing image from their phone. We are trying to develop a tool for ease of the users for detecting the information from Barcodes/QR code.

Keywords— *Barcode Detection, Barcode Generation, Text Extraction, Document Scan, Machine Learning, Flutter App.*

I. INTRODUCTION

The technology has been rapidly developing in this era. Barcode has been quite common in this phase of advancement. Most of the items and products that are present in one's household currently have their own unique barcodes. One can scan them and easily obtain all the relevant information like price, product details and description. In fact for machine readable digital data storing on product packages or paper, barcode is a cost-effective and simple method.

In the world of rapid development, we are going paperless. One step in this direction is the extraction of text from images and scanning of documents so that a softcopy of these can be acquired.

For Text extraction we are using Firebase ML Kit.ML Kit is a mobile SDK that brings Google's machine learning expertise to apps in a powerful yet easy-to-use package. Implementing the functionality needs a few lines of code. There's no need to have deep knowledge of neural networks or model optimization for their implementation.

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II. BAR CODE INFORMATION

A **barcode** (also **bar code**) is an optical machine-readable representation of data; the data usually describes something about the object that carries the barcode. Traditional barcodes systematically represent data by varying the widths and spacings of parallel lines, and may be referred to as linear or one-dimensional Later, two-dimensional variants were developed, using rectangles, dots hexagons and other geometric patterns, called *matrix codes* or *2D barcodes*, although they do not use bars as such. Initially, barcodes were only scanned by special optical scanners called barcode readers. Later application software's became available for devices that could read images, such as smartphones with cameras.

Fig 1: Example of 1D Bar Code

Fig 2: Example of 2D Bar Code

The numbers written in the barcode under parallel lines are actually a unique ID to the item. This code is scanned at marketplaces using a laser-scanner or a mobile phone. The scanned code contains all the relevant product information. Using barcodes is now a Checkout system in all big malls and markets. At checkout, the code is being scanned and the mall employee gets the cost price of the product and the bill is easily generated.

There are basically two types of barcodes:

1. Linear Barcode (1D Barcode)
2. Matrix Barcode (2D Barcode)

Linear barcodes consist of subtypes like Code 11, Code 25, EAN-2, EAN-5, EAN-8 etc.

Matrix barcodes consist of subtypes like Aztec Code, Cyber code, Dot code. Etc.

Detecting and Decoding Algorithm for 2D Barcode

There can be classified the 2D Barcode mainly in two types which are matrix 2D barcode stacked 2D barcode. The structure of types of 2D barcode is discuss in this paper in brief. The flowchart of detecting 2D barcode propose this paper and the 2D barcode also decoding.

Fig 3 shows the steps involved to check if the image contains Barcode or not and the type of Barcode the image

contains. The proposed system is capable of detecting different type of Barcodes.

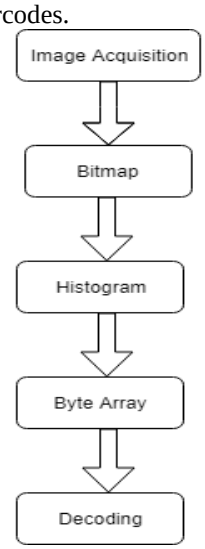

Fig 3: Detecting 2D barcodes

III. PROCESS OF BAR CODE GENERATION

Physically, barcodes are made up of a series of lines that vary in width and correspond to various numeric, alphanumeric, or multicode configurations which can then be read in by a laser barcode scanner. Code 128 is a very effective, high-density symbology which permits the encoding of alphanumeric data. It includes verification protection both via a checksum digit and byte parity checking. This symbology has been widely implemented in many applications where a relatively large amount of data must be encoded in a relatively small amount of space. Its specific structure also allows numeric data to be encoded at, effectively, double-density.

A. PARTS OF CODE 128 BARCODE

A Code 128 barcode consists of a leading "quiet zone", one of three start codes, the data itself, a check character, a stop character, and a trailing quiet zone.

The **quiet zone** is the clear area (free from marks) before and after the bars and spaces; its presence allows scanners to establish base values for the color and reflectance of the material they are reading. These numbers are used to dynamically determine what will count as a "space" and what will count as a bar.

The **start code** is one of three codes that signal the start of the Code 128 barcode. The Code 128 specification defines three "character sets" or "character modes." The different codes, Start-A, Start-B, and Start-C, signal which character set will be used. The character set may also be changed in the middle of the barcode to encode the data more efficiently

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The Code 128 **data** is encoded in strips of bars and spaces. The table below uses a binary system to represent the encoding, using a "1" for a single-width bar and a "0" for a space. Note that sequences of zeros or ones simply appear as thicker bars or spaces.

Fig 4: Code 128 Bar code

IV. DOCUMENT SCAN

Whenever the user wants to scan a document then he just has to click a photo of the image and he should be connected to the internet.

For Document scanning, we have used a library of Python called Python Imaging Library. **Python Imaging Library** (abbreviated as **PIL**) is a free library for the Python Programming Language that adds support for opening, manipulating, and saving many different image file formats.

Pillow offers several standard procedures for image manipulation. These include:

1.Per-pixel manipulations,

2.Masking and transparency handling,

3.Image filtering, such as blurring, contouring, smoothing, or edge finding,

4.Image enhancing, such as sharpening, adjusting brightness, contrast.

5.Adding text to images and much more.

The python code is uploaded on the cloud and when the user wants to convert image to PDF format then that code on the cloud gets executed and it returns a file which is in PDF format.

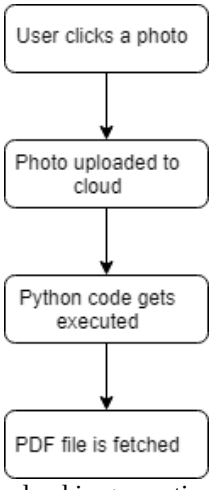

Fig 5: Steps involved in generating Pdf document

V. LITERATURE REVIEW

QR Code Detection in Arbitrarily Acquired Images.
Through creation of links between Internet resources and physical objects, there enable rich context interaction by applications of Quick Response (QR) codes. There are this kind of barcode applications are not common in spite of the widespread use for people and robots which are visually impaired because during image acquisition that the symbol is properly by existing decoders framed are assumed. To perform accurate detection of QR code symbols a two-stage component-based approach proposed by this work in arbitrarily acquired images.

Camera Readable 2D Bar Codes Design and Decoding for Mobile Phones.
The author Hao Wang and Yanming Zou says that 2D bar codes were designed to carry significantly more data than its ID counterpart. With the popular combination of cameras and mobile phones, it will naturally bring great commercial value to use the camera phone for 2D bar code reading. This paper addresses the problem of specific 2D bar code design for mobile phones and introduces a lowlevel solution of matrix codes. At the same time, we propose an efficient scheme for 2D bar codes decoding, of which the effort is put on solutions of the difficulties introduced by low image quality that is very common in bar code images taken by a phone camera.

Design and Analysis of the Three-Dimensional Bar Code.
The author states that the bar code needs to increase its information capacity because of its widespread use. The author has talked about a novel bar code— three-dimensional bar code. It can greatly increase the information capacity. The three-dimensional bar code combines the variety of widths, the variety of colors and a vertical array to provide significantly more information content. the three-dimensional bar code is proposed on the basis of the two-dimensional bar code. The design principle and information content of the three-dimensional bar is also discussed in the paper. Finally, the authors experiment proves the three-dimensional bar code can withstand the influence of noise and blur.

Barcode fingerprinting: Unique identification of commercial products with their JAN/EAN/UCC barcodes.
This paper proposes a method to uniquely identify commercial products with an item level barcode, specifically JAN/EAN/UCC, with which we usually cannot distinguish individual products. This research is motivated by the industrial and consumer needs for first-in-first-out operations of their inventories in the environment, where serial level barcodes, such as GS1-128 and SGTIN, or RFID are still not available. The proposal, referred to as Barcode Fingerprinting, utilizes the microscopic features of printed barcode stripes to discriminate each other. The author zoom in a particular portion of a barcode image and apply SURF Algorithms and RANSAC Algorithms, to extract the microscopic features. The features are stored with the barcode ID and the time stamp for the future comparisons. The author examined the feasibility of the proposal method by processing 100 barcodes of single brand PET bottles. The experiment reveals that we can uniquely identify each of the 100 barcodes by using Barcode Fingerprinting with a proper preprocessing of images.

The design and implementation of two-dimensional Barcode identification in Smartphone.
Combining barcode identification and cell phones communication capabilities can open up for the applications of geographical dispersion, data sets, strong mobiles. Cell phones are not designed for image recognition use, its optical characteristic and its compute ability are much inferior to the special barcode readers, which will occurs a lot of peculiar problems while using cell phone as a barcode reader. The algorithm of Barcode image recognition was designed focus on the structure of cell phone and finally has been realized in a Linux.

VI. FUTURE SCOPE

With the advent of technology, many applications will come up requiring the use of barcodes. Barcode can be used to track down equipment's and hold basic information including the history, thus helping track down the quality and quantity of products. The barcode of products will be scanned the app will automatically search for similar products on the Internet and will display the list to the user.
There also will be a rise in Machine Learning Technologies so to increase the success rate of detecting Bar codes can be increased with the help of Deep Learning. The Text extraction can be made more accurate by training the model on blurry images and using Deep Learning.
Usage of document scanning and text extraction will help us cut down on the usage of paper. Sharing of documents will be more simple now because the user just have to share a link where the document is present and it would be easier for the receiver to access the documents irrespective of any that he uses.
Further, the scope of this app can be increased by using this in supermarket to generate bill of products which the user is interested to buy and integrating online payment within the app so that the user don't need to wait in queue in the stores.

VII. REFERENCES

[1] N. M. Z. Hashim, N. A. Ibrahim, N. M. Saad, F. Sakaguchi, and Z. Zakaria, "Barcode recog-
nition system, International Journal of Emerging Trends and Technology in Computer Science"
(IJETTCS), vol. 2, issue 4, pp. 278-283, 2013.
[2] S. Kresic-Juric, \Edge detection in bar code signals corrupted by integrated time-varying
speckle", Pattern Recognition 38(12), 2005, pp. 2483-2493.
[3] J. Phaniteja and P. Derin "Evolution of barcode International Journal for Development of
Computer Science and Technology", vol. 1, no. 2, pp 1- 8, 2013.

[4] C. Chen, W. H. Mow, "Poster: A coarse-_ne corner detection approach for two-dimensional
barcode decoding", Proc. Int. Conf. Mobile Comput. Netw., pp. 351-354, 2014 .
[5] Ohbuchi,, H. Hanaizumi, and L. A. Hock, \Barcode Readers using the Camera Device in
Mobile Phones", Proceedings of the 2004 International Conference on Cyberworlds, pp. 260- 265,
November 2004.
[6] T. Pavlidis and J. Swartz, \Fundamentals of bar code information theory", IEEE Computer
23(4), 1990, pp. 74-86.
[7] H. Kato and K.T. Tan, \2D barcodes for Mobile Phones," Proceedings of 2nd. International
Conference on Mobile Technology, Applications and. Systems, pp. 8, Nov. 2005.
[8] Luiz F. F. Belussi and Nina S. T. Hirata, "Fast QR Code Detection in Arbitrarily Acquired Images"
[9] Wang, Hao & Zou, Yanming. (2006). Camera Readable 2D Bar Codes Design and Decoding for Mobile Phones. 469-472. 10.1109/ICIP.2006.312495.
[10] Jerry Zeyu Gao, Lekshmi Prakash, and Rajini Jagatesan," Understanding 2D-BarCode Technology and Applications in M-Commerce – Design and Implementation of A 2D Barcode Processing Solution".
[11] Rina Ueno , Jin Mitsugi, "The design and implementation of two-dimensional Barcode identification in smartphones ".
[12] Sonam Wasule ,Shilpa Metkar, "An effective approach to recover corrupted or mobile captured 2D barcode images with improved accuracy ".
[13] Feng Liu ; Anan Liu ; Meng Wang ; Zhaoxuan Yang "Robust and Fast Localization Algorithm for Data Matrix Barcode".
[14] Puchong Subpratatsavee , Narongrit , Preeyawal Kuha , Chanchira Chintho "HC2D barcode reader using embedded camera in Android phone ".
[15] Changsheng Chen , Wenjian Huang , Baojian Zhou ; Chenchen Liu , Wai Ho Mow " PiCode: A New Picture-Embedding 2D Barcode".
[16] Pengjia Pang ; Jing Wu ; Chengnian Long "CodeCube : A multi-layer color barcode for mobile social applications "
[17] YeMin Li , Li Zeng "Research and application of the EAN-13 barcode recognition on iphone ".
[18] Hui Zhang , Guoliang Shi , Li Liu , Miao Zhao , Zhicong Liang "Detection and identification method of medical label barcode based on deep learning ".

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