# Mobile barcode system with Inventory management and Employee work tracking using Google Analytics

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**Abstract: The paper includes three aspects ,firstly we are going to replicate the commercial barcode scanner (i.e HC2D barcode and QR-code) on the mobile device which operates on Android. Secondly using this application in Inventory management and Employee work tracking. Thirdly using Google Analytics for product tracking, automatic report generation. Our main goal is to decode the barcode images in real-time, quickly and efficiently. This involves improving the image decoding algorithms and choosing efficient image manipulation and barcode libraries .Here our focus is basically on implementing reader for HC2D barcode. The HC2D is a high capacity two dimensional barcode. Barcode represents data using lines, rectangles and spacing between them. For reading the HC2D barcode, the bit representation of the barcode is obtained by scanning the image of the barcode with scanner machine only. A HC2D barcode is a 2D barcode which consists of a black square pattern on white background. The HC2D barcode contains information in the vertical direction as well as the horizontal direction. Here we propose a system to read a HC2D barcode in real time mode using the embedded camera device in mobile phones. The proposed system consist of algorithm to work on code area found by the 2 vertical line, one horizontal line and dash line detection of H2CD barcode. Thus our proposed system works in real time environment and eliminates all the drawbacks of earlier systems.**

**Keywords:**HC2Dbarcode,GoogleAnalytics

## 1. Introduction

Barcode provides a convenient way for people labeling a tag on a product so that people can easily and quickly identify the content of product itself. It can be classified into two types, one-dimensional (1D) barcode and two-dimensional (2D) barcode. The 1D barcodes use different width of lines and spaces to represent data, for example, code 39, code 128, EAN-13, EAN-128, ISBN, and etc. As for the 2D barcodes, they use symbol types of stacking and matrix to represent data, such as QR code PDF417, Data Matrix, Maxi Code, and etc. Table 1 shows different types of 1D barcodes and 2D barcodes. In generally, 1D barcodes put emphasis on "product identification" and 2D barcodes put emphasis on "product descriptions". Because of the limitation of 1D barcode storage, only a few data like product identification is stored in 1D barcode. 2D barcodes are superior to that 1Dbarcode in embedding payload, error resistance, data security, and readability. In the storage size, 2D barcode can store a lot of information like product descriptions, including product ingredient, product item, product details, web links, and etc. For error resistance, 2D barcode scan defense different levels of error occurs. The security of 1D barcodes is lower than 2D barcodes. 1D barcodes are very easy to read by scanning the lines and the spaces. However, 2D barcodes are not easy to read a symbol pattern by human eyes. With regard to readability, 1D barcodes must scan along a single directional. If the angle of a scan line does not fit within a range, the data would not be read correctly. However,

2D barcodes get wide ranges of angles for scanning. Thus, 2D barcodes are readability.2D Barcodes provide a unique identifier for objects and applications to automatic checkout system, commerce, industry, hospital, and etc. Barcodes are very convenience to automatic systems, but they have data privacy weakness. A reader device with video capture function can read

the content from tags directly. When barcodes contain privacy information may result in the risk of security issue. Therefore, the confidential data is often stored in the back-end database. When a reader captures a tag, it only gets a network link from a tag and later connected to the back-end database through the Internet. A user who has access right can login database to retrieve the privacy information.



TABLE 1: 1D Barcodes and 2D Barcodes.

## 2. Background Materials

A .Problem Statement
As we all know that HC2D barcode is a highest capacity of 2D barcode which requires less space. Barcode represents data using lines, rectangles and spacing between them. For reading the HC2D barcode, the bit representation of the barcode is obtained by scanning the image of the barcode with scanner machine only. A HC2D barcode is a 2D barcode which consists of a black square pattern on white background. The HC2D barcode contains information in the vertical direction as well as the horizontal direction.
Here we propose a system to read a HC2D barcode in real time mode using the embedded camera device in mobile phones. The

proposed system consist of algorithm to work on code area found by the 2 vertical line, one horizontal line and dash line detection of H2CD barcode. Thus our proposed system works in real time environment and eliminates all the drawbacks of earlier systems.

### B. Google Analytics

Google Analytics helps you answer the difficult questions about your visitors, their behavior on your sites, and the ROI on your online marketing efforts .By using Google Analytics, you'll learn how to provide more compelling content and target the appropriate audiences. Unlike other web analytics providers, Google Analytics can do this quickly, easily ,and it's free.

One great thing about Google Analytics is that it is useful across your entire organization. Our goal is to have Google Analytics used by everyone in the company with a stake in your website. We have reports for each person within these groups to understand if they are effectively doing their job: Executives, Marketers, Webmasters

Even if you wear all of these hats, you'll find this data to be extremely valuable in helping you reach your online business goals.

Who is Google Analytics for?

All different types of websites can benefit from web analytics.

Think about your own sites. What kinds of goals are you trying to achieve with your

online presence?

Most sites are focused on one or more of these three most common goal types:

1) Selling products or services: E-Commerce

2) Generate leads: Increase sign ups or registered users on the site

3) Promote your brand – increasing product or brand awareness

Google Analytics will help you track the effectiveness of each step required to achieve any of these goals.

## 3. Design

HC2D Algorithm:

The BARCODE RECOGNITION ALGORITHM is as shown in diagram:-

In this algorithm we accept a Barcode image as input to be processed. This image is processed using image processing tricks like Grayscale conversion, Sharpening etc.

Then this processed image is given to Edge Detection algorithm after this Image decoding is applied to get the data stored in barcode.
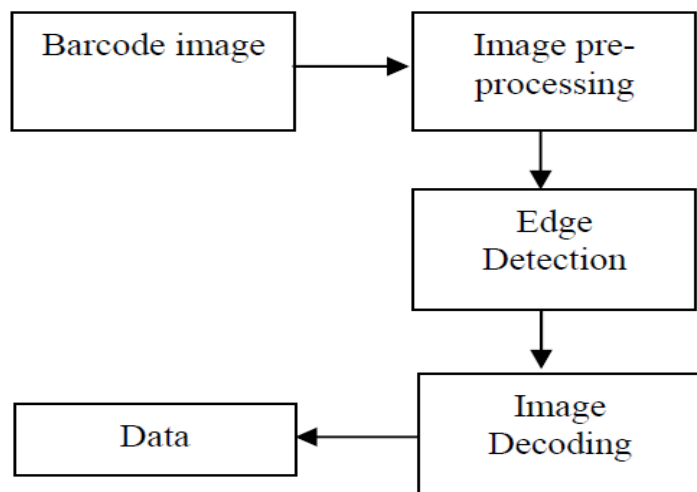


Barcode Recognition Algorithm consists of following parts:-
*Image Pre-processing*

1. Grey-scale processing:-
   *Here the image* captured is converted to the Grayscale image using the following calculations on the RGB of the captured image.

   *Gray_Red = Red * 0.299*
   *Gray_Green = Green*0.587*
   *Gray_Blue = Blue*0.114*

   Thus the Gray_Red, Gray_Green, Gray_Blue give the RGB values for Grayscale image.

2. Image sharpening:-
   To make the captured image look clear we sharpen the image using sharpening process. Sharpening is an important part of digital image processing. It restores some of the sharpness lost in the lens and image sensor.

3. Image binarization:-
   It is a process of converting a gray scale image into a binary format. Thus after the process we get a binary image of 80*80 pixels. In this process a threshold is required to convert the gray image to binary image. This threshold value is given my following formula.

   $$g(x, y) = \begin{cases} 255, & F(x, y) \geq T \\ 0, & F(x, y) < T \end{cases}$$

4. Median filtering:
   Median filtering is a process of reducing noise on an image. The median filter is a non linear digital filtering technique, often used to remove noise. First of all, researcher get another four pixels approximately the pixel which will be processed, two in the above and two in the following; then, researcher sort the five pixels; at last, researcher use the median instead of the current pixel. In this way, salt and pepper noise is eliminated, and background area of the noise can be quiet.

*Edge Detection*
   Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. The same problem of finding discontinuities in 1D signal is known as step detection and the problem of finding signal discontinuities over time is known as change detection. Edge detection is a fundamental tool in image processing, machine vision and computer vision, particularly in the areas of feature detection and feature extraction.

*Image Decoding:-*

   The bit representation of the barcode obtained by capturing the image by mobile phone and converting the image. Reed – Solomon is used for error correction. In order to detect the error correction level, the algorithm first processes the first pixel group as the low error correction level. If the header is obtained correctly, the error correction is at the low level. Otherwise, the algorithm processes the first pixel group at the high error correction level. The header verification is done using the

checksum field. If the checksum value matched the one calculated, the assumed error correction level is accurate.

# 4. Overview of base idea

The base idea of the project is implementing HC2D barcode reader on a Android device. Additionally ,the idea also includes implementing QR code reader and using this application for Inventory management ,Employee work tracking .Our project also includes use of Google Analytics. Google Analytics is a tool which is

used for product tracking ,as well as automatic report or statistics generation. For example consider the scenario, we have android mobile and our app is installed ,now we want to add a product in our inventory suppose for an example NEXUS5 in our inventory that is database .We have purchased 10 nexus5 so we will open our app in mobile where our app is installed then we will add a product which is not there before in our inventory ,now we will fill up the details of product nexus5 details its price and how many quantity we have and set its benchmark point suppose 3 ,then we will set a barcode for nexus only ,and then we scan from our android mobile camera and save the details of product (nexus) and that data will be saved in the local database of mobile that is SQLITEDB whenever internet service will be available will store the product details from local DB to analysis.Now suppose we have sold 1 nexus then quantity will be 9 in our inventory locally as well as in server analysis ,now suppose after few days we have only 3 nexus left with us one service will run in the background to check which are the products in our inventory reached to the benchmark point which we set if it found so our app will notify the user to make an order for the product .

# 5. Architecture

The figure next shows the architecture of our system
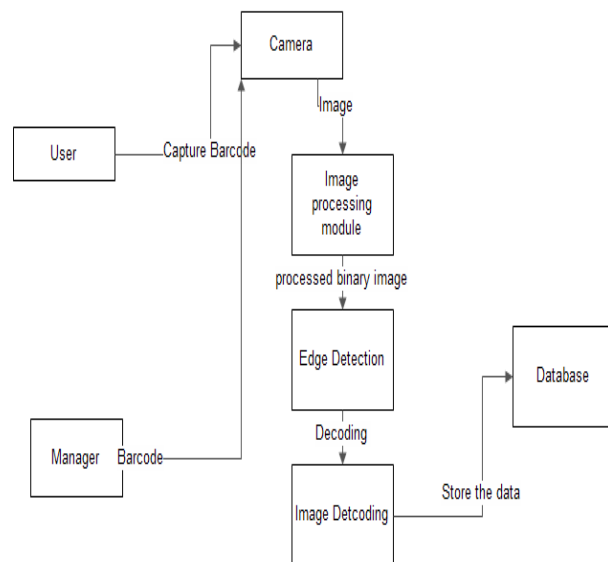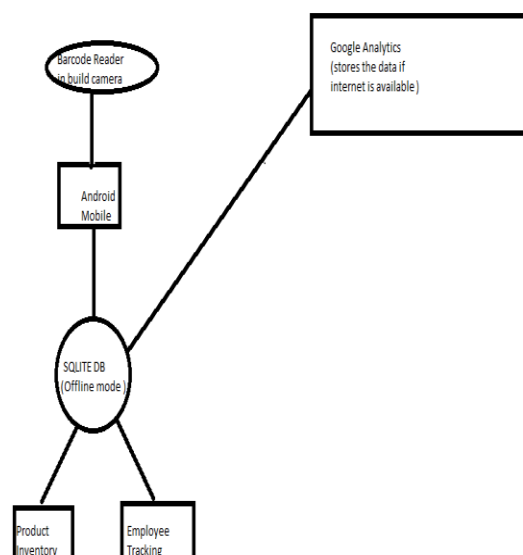




# Conclusion

In this paper, we present the implementation of HC2D barcode on a android phone,and the use of this barcode reader for Inventory Management and Employee Work Tracking.We also propose use of Google Analytics in our system.

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