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An Overview on Cashier-free Checkout System

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ABSTRACT

Advancement in the technology has lead to major improvements in the field of Image processing. Computers can capture high resolution images and videos; manipulate it like adding special effects and many more. Object Recognition in Images is a type of Image processing where the computation part is to recognize the object present in the image. This Image processing has many applications in the field of robotics, automation, security. As the computers are able to extract the information from the image that is captures and this gives computer another dimension of intelligence. With this intelligence the computer can be programmed to perform certain tasks based on the content of the image.

Keywords : Real time Image Processing, Computer Vision, Deep learning

I. INTRODUCTION

Image processing has been the trend in the current computational world. Image processing is the usage of computer algorithms to perform the processing on the images. Processing is usually done for specific data extraction from the images, for example reading the text in the images, identifying the pattern in the images, or recognizing the objects present in the images etc. Image processing is a type of signal processing which usually has an image as input and output may be image or features/characteristics associated with that image.

Image processing includes three steps:

• Image acquisition via any of the acquisition tool

• Analyzing and manipulating the image

• Output, where the result is generally an altered image or the report that is based on the analysis made on the input image.

This paper is on one of the application of Image processing which could make shopping in hypermarkets a lot easier.

II. EXISTING SYSTEM

As there was a sudden hike in the number of supermarkets that were established an easy way of billing was required. Hence the barcode scanning system for the billing process was adapted. A barcode is an optical representation of data which is machine-readable. The data usually represents or describes something about the product/object that carries the barcode. Traditional barcodes represent data systematically by varying the spacing's and widths of parallel lines and may be referred to as one-dimensional (1D) or linear. These barcodes are scanned by a device known as Barcode scanner/ Barcode reader. And later two-dimensional (2D) variants were developed, using dots, rectangles, hexagons and other geometric patterns, called 2D barcodes or matrix codes, although they don't make use of bars as such. Initially, these barcodes were only scanned and decoded by the special optical scanners and barcode scanners/readers. But as the time passed by application software

became available for the devices that could read the images, such as smartphones with cameras.

Barcode reader is an electronic device that reads and output printed barcodes to a computer. Barcode readers/scanners consist of a light source, a lens and a light sensor that translates optical impulses into electrical impulses. In addition, the scanners also contain a decoder circuit that analyses the bar code's data that has been provided by the sensor and sends the barcode's content to the barcode scanner's output port.

There are different technologies implemented in the barcode scanners. Few of them are as follows:

- Pen-type Scanners
- Laser Scanners
- CCD Scanners (LED Scanners)
- Large field-of-view Readers
- Omnidirectional Barcode Scanners

Barcode scanners read the black and white lines which are on the products and feed the information to a computer. The computer then identifies the product using a product database. The barcode scanning process happens like the following steps:

The Scanning device head shines a LED or laser light onto barcode.

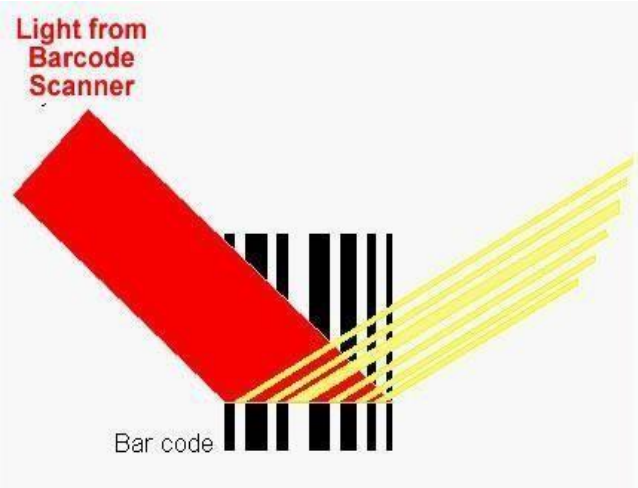
The emitted light hits the barcode and gets reflected back into a light detecting electronic component called Photoelectric cell. White areas part of the barcode reflects most light whereas black areas reflect the least.

As the reads the barcode, the photoelectric cell generates a pattern of on-off pulses that corresponds to the black and white lines on the barcode.

. There's an electronic circuit attached to the scanner that converts these on and off pulses into binary digits (0's and 1's).

The obtained binary code is then sent to the computer which is attached to the scanner. That computer detects the details of the product like maker, cost, and quantity of all the products sold, by the code.

Fig. 1 Barcode scanner working



Advantages of Existing System

- Barcode scanning system eliminate the possibility of human error. Error occurrence is significantly higher than barcodes when it is manually entered data.
- Barcodes are less expensive to design and print.
- They can be customized economically, in a different variety of materials and finishes.
- Barcode system is extremely versatile. They are used for necessary data collection. The data can include pricing or information regarding inventory.
- Barcode scanning system is very easy to get adapt to. It reduces the employee training time.

Disadvantages of Existing System

- Pricing Discrepancies: When discounts are applied to barcoded products, the store employees may forget the update the discount price. This can lead to confusion during the checkout near the counter and cause in delays, inconveniencing the customer and the other customers waiting in the queue.

- Scanning Problems: If a barcode doesn't get scanned due to some technical reasons, the cashier has to manually enter the corresponding numeric code. Because the cashier had become used to scanning barcodes quickly without much effort from their side, their lack of practice in entering the code manually can eventually cause them to be slow or inaccurate in entering the product information, further delaying the checkout process.
- Label Damage: Barcodes that are printed on the torn section of the product packaging or that have been smudged or damaged will lead to scanning problems. If this happens the checkout process can be significantly delayed.

III. PROPOSED SYSTEM

Proposed system is very convenient to the customer. It can be described in the following flow of events:

1. The Customer enters the hypermarket.
2. The Customer picks up the items as per his needs and puts them in his/her bag without needing to scan each item.
3. Those items are added to the customer's virtual cart.
4. The Customer exits without going through any checkout counters or waiting in any queue.
5. Bill amount is automatically deducted from the customer's wallet providing a receipt.

Every customer is identified by the System with his/her unique QR code. When the customer enters the hypermarket, he scans the unique QR code linked to his wallet/account. As the code is authenticated, the customer is then followed by overhead cameras that are installed in the roof of the hypermarket, as they move around the store, without using face recognition [1]. Then the items that are picked by the customer is automatically added to his cart. This is achieved by applying the Machine Learning application of Realtime Image Processing which recognizes the product he's picked up. The accuracy of the product is known by making use of smart shelf sensors. Technology that could be used is computer vision, sensor fusion and deep learning [2]. These technologies help in detecting the

products when they are taken from the shelves or returned to the shelves. The combination of artificial intelligence, computer vision and data acquired from multiple sensors is used to ensure that the customers are charged for the items they pick up [3].

Fig. 2 View from the overhead camera

Advantages of Proposed System

The advantages of this system are listed below:

- The wastage of time that usually occurs because of waiting in a queue for a checkout is eliminated
- Quick and convenient
- Promoting the Cashless Transaction
- Errors due to barcode scanning are eliminated

Disadvantages of Proposed System

The disadvantages of this system are:

- Huge Capital Investment
- The Intelligence system has to be trained for every product available
- Unemployment

IV. CONCLUSION

Like every system, the proposed system also involves advantages and disadvantages. Since its still in its early stages, we can expect a major development in its domain which overcomes its cons in the future by delivering an error free and convenient experience to the customer and making their routines of their life easier.

V. REFERENCES

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