Smart Barcode Based Trolley for Automated Billing Using Image Processing Technique

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Abstract - *Shopping mall is a place where almost every people in the city goes to shop the daily requirements of life such as food, clothing, electrical products etc. [1] Almost the weekends of the week are meant for shopping at these kinds malls. Malls are very common in the metro cities when compared to towns. The space of these malls is also very wide which helps the customers to shop spaciously without any congestion. All the products which are present in the mall are provided with barcodes. Barcode is the oldest technology since we have used it from years. Each and every product has a barcode which is been put at the back of the product. Trolleys are normally used in malls for shopping purposes. As all of us know about the crowd that occurs near the billing counters for final billing which is very time consuming. Customers will also be not aware of the price and also the number of products they have put into the trolley. In this paper, we building a system in order to overcome this problem by doing automated billing at the trolley itself by getting the details of cost of each and every product and also having count of the number of products put into the trolley by modifying or adding more features to the existing barcode system which becomes a cost-effective system since we only add additional features to the existing system. We have used a Raspberry Pi for the purpose of controlling, an LCD for displaying the cost of the products which the customers put into the trolley, a camera to click the pictures of the barcodes of the products and LabVIEW for the purpose of decoding the barcode and ID.*

* **Key Words**: *Barcodes, ID, Raspberry Pi, Webcam, LCD display, Beeper, Switch, LabVIEW.*

1. INTRODUCTION

 A mall is a place where we find almost all the items. Almost the weekends of the week are meant for shopping at these kinds malls. Malls are very common in the metro cities when compared to towns. The space of these malls is also very wide which helps the customers to shop spaciously without any congestion. As the city and technology are improving, the infrastructures of these malls are also improving on that basis. [2] Improving of these malls along with the technology is also very important since the customers also expect the higher version of comfortable. All the products which are present in the mall are provided with barcodes. Barcode is the oldest technology since we have used it from years. Each and every product has a barcode which is been put at the back of the product. These barcodes require a straight line of sight in order to get recognized which is one of the disadvantages. It is also very slow in terms of speed. As all of us know, while we enter the shopping malls, we need to take a trolley along with us so that we can drop the products which ever we want. After putting all the products which customer wants, they will have to go to the billing counter for paying the bill. If in case, there are many people standing in the queue at the billing counter then we will have to wait in queue till our chance to get the final billing done. There the billing person, scan barcode of each and every product and then gives the final bill which is very time consuming. It also requires lot of man power at the billing counters. [3] In case if the total cost of the products exceeds the budget of the customer, then he or she will have to remove the products so that it matches the total cost of the products which is very embarrassing. Thus, there are certain issues with the existing system of barcode.

- Customers are not satisfied because of waiting at longer queues. [4]

- Requires of lot of man power which is expensive.

- Unaware of the total cost of the products.

    In order to overcome these issues, we have come with a design such that it avoids these problems. We have built a design such that it does automated billing and reduces the customer's time and also does not require too much of man power, hence less expensive. [5] Also, no need of customer standing in longer queues. We have also overcome the issue of the customer being aware of the total cost of the product before going to the billing counter which also gives the customer shopping satisfaction.
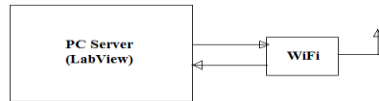
2. BLOCK DIAGRAM

2.1 Billing Unit

Fig 1: Billing Unit

The billing unit consists PC that acts as a server within which we will be using LabVIEW in order to start billing at the trolleys. LabVIEW acts as a single server in that particular mall where all the trolleys are being operated or accessed from there. Wi-Fi is being used so that the values of the barcode and ID that are decoded is sent back to the Raspberry Pi. Also, a program is being written at the LabVIEW i.e. writing to a file is programmed and from that the data is written back into the raspberry pi such that from there it goes to the LCD and all the details of that particular product is being displayed for the customer purpose.
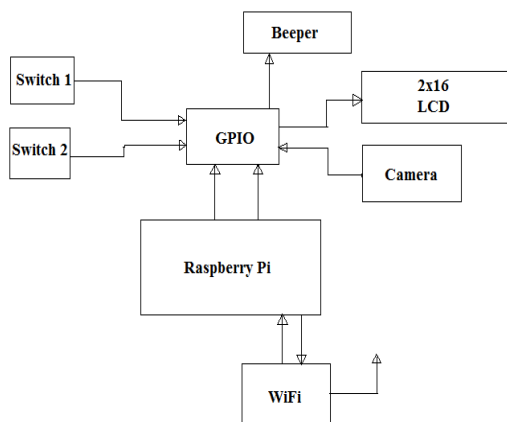
2.2 Trolley Unit

Fig 2: Trolley Unit

In this unit, the Raspberry Pi is connected to the camera. There is a button used which when pressed clicks the picture of the barcodes of the product and adds the cost of the products to the total bills and displays onto the LCD. There is also a beeper used so that it beeps soon the picture of barcode is clicked in order to inform customers that they can drop the product into the trolley.

3. HARDWARES USED

3.1 Switch

This hardware is used in such a way that only when it is pressed the camera clicks the picture and further operations is performed.

3.2 Beeper

It is a device which produces sound when certain operation to which it is programmed performs successfully.

3.3 Quantum PC Webcam

This is used to click the pictures of the barcodes of the products so that they are decoded later and the products can be recognized easily.

3.4 LED

It is used so that there is enough light and the barcode pictures are clicked in such a way that they are visible clearly.

3.5 LCD Display

This is a 16x2 segmented display. This is used for displaying the last result for the customer purpose.

3.6 Raspberry Pi

This is the control unit which we have used since it is a low-cost computer. We have used this because of its compact size, low power. It supports LINUX operating system and also has an SD card. It supports all kinds of languages, networking and devices and also supports multi functions.

4. SOFTWARE DESCRIPTION

4.1 Samba File Server

This is a server that is used for the networking purpose in order to share the files or folders between Raspberry Pi and any other device like PC or laptop.

4.2 LabVIEW

This software we have used at the billing unit so that it performs all the decoding of the barcode and ID of the products. In this only we have several techniques for the decoding and getting details of the products.

5. TECHNIQUES USED

5.1 Barcode Detection

In this barcode detection, the barcode lines are being decoded and value or data related to that barcode is been decoded and detected. In this barcode detection flow diagram, that output barcode read which has 2 information i.e. the data and barcode type is given as an output to the comparison diagram to compare that data value and ID to give the details of an item. Since that barcode read has 2 information, we cannot directly give that entire value of barcode read as an input because we

want only the data value and not the barcode type for the comparison.

The data value should be extracted from the barcode read and hence we use an index array function. We have given the index as 0. Here the data value and barcode type is in an array. That output is given as an indicator. That indicator value is given to something called as Unbundled. This tool is used to unbundle the information and take information which ever the user wants.

5.2 Pattern Matching

For the pattern to match, there are 2 steps that needs to be done. They are learn and load.

1. Learn

This is required as a memory. We learn all the ID of the products and keep them stored in the database of these ID or the memory. Learning is done by selecting that particular position where the ID values are there and then pressing the learn button. This is done so that during the pattern matching operation i.e. when we load the image, the detected IDs match with these learnt IDs which in turn means that the product is being identified.

2. Load

This is used for checking the match between the IDs that are detected and the one that is stored in the database. It just the normal running of the pattern matching block diagram.

5.3 Comparing the detected barcode and ID

After the barcode detection and pattern matching, it is very much required to compare these two in order to check if the index number or the position of these barcode and ID pattern matches. If there is a match then that particular row product details will get extracted from this code and gets displayed on the LCD for customer convenience.

6. OPERATION OF THE SYSTEM

- Before the start of shopping, the trolley number is being checked with the database of the trolley numbers. If they match then the permission for shopping for that particular customer is given.
- When the customer purchases a product, she/he should press a button to indicate that he/she is adding the product and hence cost should be added.
- Then the customer should first hold the product in front of the camera. There will be a buzzer which beeps to indicate that the camera captured the picture of the barcode ID and now it can be placed into the trolley.
- While the camera clicks the picture of barcode and ID of the product, the picture captured by the camera is transferred to the Raspberry Pi.

- From the Raspberry Pi, the picture is being sent to the PC (LabVIEW) by using a software called Samba which is used for networking purpose between Raspberry Pi and PC.
- There in the LabVIEW, the particular folder path should be given where the clicked pictures are being stored. The authentication happens automatically where the file of the picture gets loaded on to the folder path and then the barcode and ID gets decoded using a pattern matching and barcode detection methods, which is at the billing counter.
- Once the image comes into the file path, automatically authentication starts which means the image gets loaded into the program and its operation is performed.
- The decoded value is being internally checked with the database of the product that would be already stored into the system's memory.
- The information of all the products would have been stored at the database depending on the barcode and ID with all the information such as name of the product, price, weight.
- If matches are found then name of respective product, price and weight will be sent back to the Raspberry Pi from the LabVIEW. Before sending back to the raspberry pi, every detail should get printed into a bill and at the end, a final bill is being generated and then from Raspberry Pi the details will be sent to LCD which gets displayed there.
- As the product is being put into the trolley, the price of that particular product is being displayed, hence simultaneously updating the total cost in the PC and also displaying it on the LCD as when the product is put into it.
- Every time the product is put into the trolley, the total price should keep updating so that the customer is aware of the total cost.
- If we want to remove item from the trolley, then there will be another button that should be pressed. It will be possible to only remove the last put product. Hence total cost decreases depending on the price of that product.
- Checking weight is mainly done for security purpose. If in case while wandering round the mall someone removes the barcode or ID and put the product in trolley, then weight of items helps to get information of items purchased.
- Once the shopping is done, the customer can go to the billing counter, pay the bill by not waiting in longer queues.
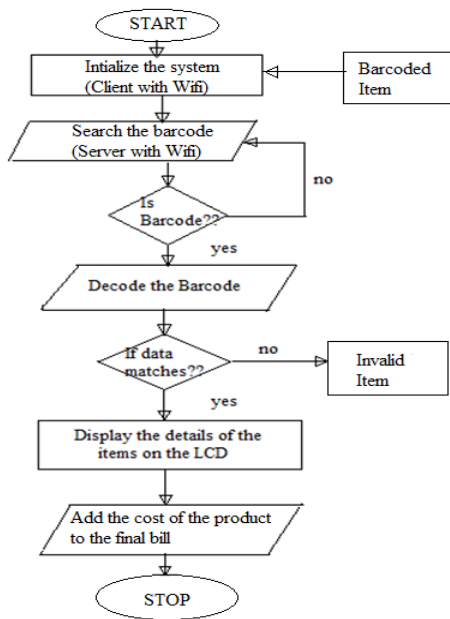
7. FLOWCHART

Fig 3: Flowchart for the operation of the system

8. RESULTS AND DISCUSSION

The result obtained from the above system: This is the database of the products to which the decoded value of the barcode is compared with. In the database, we would have stored each and every detail of the product such as barcode value, its name, product's weight and also the cost of it. Depending on that the details gets displayed on to the LCD.

	Bar Code No	Unique ID	Product Name	Cost of the products
			Database of the products	
0	0000	0000	0000	0000
0	8901216812338	511	Kamasutra Deo Spray	250
	4005808163588	241	Nivea Deoderant	199
	8901052087808	223	Tetley Green Tea	90
	8901396184003	269	Harpic Toilet Rim	57
	8901207018268	245	Meswak Toothpaste	120
	8901531300015	793	Boroline	32
	8902442208636	996	Navneet 300 pages Notes	110
	8901030475580	788	Tresemme Conditioner	171
	8906057531301	346	Medimix 3 packs	95
	8904187000711	110	Fash Facewash	130
	8906067520012	111	D-Free Anti Dandruff	110

Fig 4: Database of the products

The next step after capturing the image of the barcode of the product, the barcode value should now be decoded

using barcode detection method. This is how it looks when the barcode is being detected.

The file path there in the picture is the path for the image whose barcode we want to check. So, every time we should always give the path of the image.

The unbundled barcode is the value of the barcode that is being detected. The pattern image is nothing but the ID that is being matched.
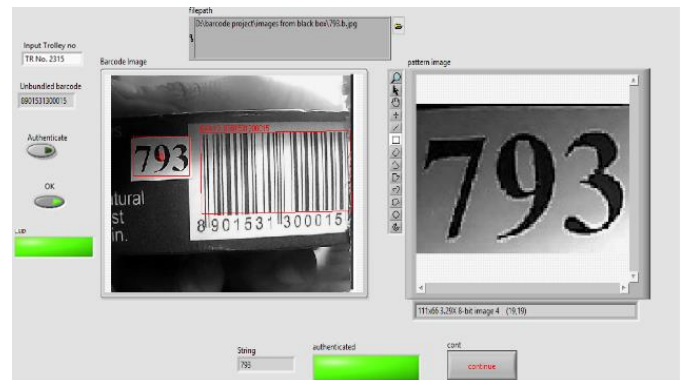

Fig 5: Detection of the Barcode and ID

The index is nothing but the positions of the barcodes and ID in the database table. Depending on the recognition, the index number we get and depending on the index number we get the details of the product.
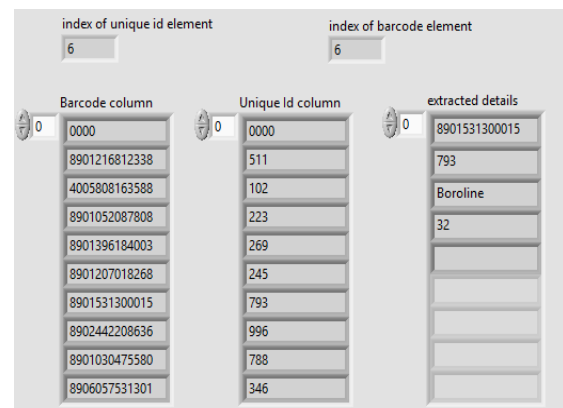

Fig 6: Extracted details of a product

That extracted detail should get printed into the final bill for the customer reference. As the details of the product are being extracted, it should go back to the Raspberry Pi by writing a code known as writing to a text file in the LabVIEW. That details will then get displayed on to the LCD for the customer convenience.

Fig 7: Final Bill

This final bill is then passed to the Raspberry Pi in order to get displayed on the LCD for the customer convenience.

Fig 8: Display of the product details

9. FUTURE WORK

I. Developing a platform near the exit of the mall in order to cross check the total weight of the products for the security purpose.

II. Applying IOT concept at the billing counter so that the total amount of the shopping done at the malls is sent to the head office for the accounting purpose.

REFERENCES

[1] Mrs.Meenakshi M.E., Joshiba Amali.S, Divya P.M, "Smart Trolley and Automatic Billing", International Journal of Advanced Research in Biology Ecology Science and Technology(IJARBEST), Vol. I, Special Issue I, August 2015 in association with Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Chennai.

[2] Galande Jayshree, Rutuja Gholap, Preeti Yadav, P.R.E.C. Loni, Ahmednagar, "RFID Based Automatic Billing Trolley", International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 3, March 2014).

[3] Murulidhara N, SreeRajendra, "Automated Shopping and Billing with Product Inventory Management System", July 2015 | IJIRT | Volume 2 Issue 2 | ISSN: 2349-6002.

[4] S. Sainath, K. Surender, V. Vikram Arvind Final Year, Department of Computer Science and Engineering Hindustan University Chennai, India, J. Thangakumar, Ph.D. Assistant Professor, Department of Computer Science Hindustan University, Chennai, India, "Automated Shopping Trolley for Super Market Billing System", International Conference on Communication, Computing and Information Technology (ICCCMIT-2014).

[5] Udita Gangwal, Sanchita Roy, Jyotsna Bapat, International Institute of Information Technology – Bangalore, "Smart Shopping Cart for Automated Billing Purpose Using Wireless Sensor Networks", Sensorcomm 2013: The Seventh International Conference on Sensor Technologies and Applications.