Research Article

SMART BASKET DESIGN USING ARDUINO AND RFID MODULE

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ARTICLE INFO	ABSTRACT
	This ice age customers are facing lots of problems in shopping mall, grocery shops and etc. One of the major problem faced by the customers while shopping at a supermarket is thin ability to locate items and also to carry goods to the billing counter. The trolleys in the shopping malls are enabled with a device consisting of Arduino board which can identify the products by communicating with the racks which in turn consists of an arduino board which is programmed with the details of the product in the rack. The communication is established using a RFID mechanism where the trolley and rack are connected. The customer can pay the bill directly in the counter reducing the billing time where the bill is retrieved by generating an interrupt at the end of the shopping process. The digital display device displays product information along with the total cost of the products in the trolley. Thus this system provides an enhanced way for shopping to the customers with efficient mechanism. This project deals with the problem faced by the people by providing them a better way to shop so that they can utilize their time in many of their important works. With this project we reduce the human effort and save precious time of customers.

INTRODUCTION

The past decade has experienced a steep rise in advancements in the scientific world. Utilizing the same to ease day to day life activities of human, regular problems and to reduce the wastage of time many technologies have been introduced the world. Not only the scientists are looking for ways to make the lifestyle sophisticated for the humans, but they are also trying to make the solutions as cost effective and affordable for the poor and disabled as possible. A few examples of the same include the discovery of low cost touch screens which utilize simple plastic plates as their primary input device, or even innovations such as smart farming systems which help farmers in detecting pest or insect infestation in farms, in turn guaranteeing good produce. Centres or malls on the other hand form a great source of convenience to consumers, since all the products of varying choices are found under one roof. As mentioned previously, a lot of research is also being carried out in the retail sector, to make shopping a more memorable experience. This would not only help consumers but also improvise the economic inflow of such shops as well.

The main goal of this paper is the realization of a smart monitoring system based on an embedded solution which has been developed using Arduino Due, a very flexible and cheap microcontroller, especially for data processing purposes. The

Arduino Due controller has been chosen also for this reason: it has a large memory available for many different applications and this makes it very adaptable for further additional improvements.. Fast identification and correction of faults and failures, together with other issues normally requiring the attention of utility companies, can reduce the overall power outage duration in a significant way. An excellent reliability has been reached using the Arduino Due Wi-Fi shield, because it makes possible to get real time measurements in two different ways: by an external web server or through a local one in case of failure of the first. This project deals with the problems by sorting them out in an smarter way as it is using better advance technology.

Architecture

SABIS stands for the smart arduino based intelligent shopping architecture. Basically the shopping centre consist of many racks in which the product are piled up, so in order to shop the customer has to pick up the product and in case if the mind of the customer is capricious then he has to do the extra work. So, in order to reduce the human effort. The architecture of SABIS is shown in figure (1). It consist of following modules:-

Arduino Board

The arduino UNO R3 is a microcontroller board that is based on ATmega328 normally consisting of 14 input/output pins.

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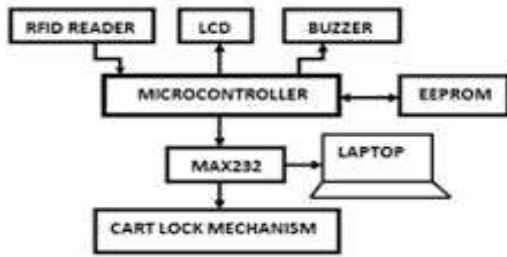
Fig.1 Block diagram of smart cart

The arduino which is kept fixed in the cart will be programmed according to the arduino fixed in the screen of the cashier. The information which is in the arduino of the trolley will be transferred to the cashier and the billing processes will be carried out.
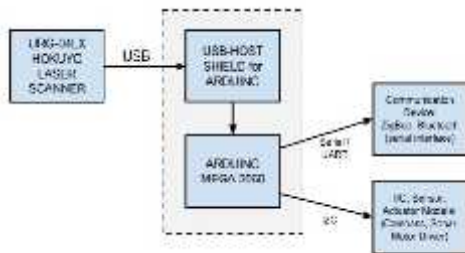

Fig. 2 Block diagram of Arduino Board

RFID Module

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a battery as a source of local power and may operate at hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture.

RFID tag is used by many industries for catching the progress of the automobiles. RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows positive identification of animals. A supermarket is a place where customers come to purchase their daily using products and pay for that. So there is a need to work fast in order to calculate how many products sold and generate the bill for the customer. When we go to shopping mart for shopping, we have to work for selecting the right product. Also, after that, it is hectic to stand in line for billing all the goods. Hence, we are proposing to develop a smart shopping cart system that will keep the record of purchased products and also the transaction which would be online for billing using RFID.

RFID is of two types, first is active and the second is passive. Passive RFID consist of the interrogator, passive tags and host computer. It would be operated by centralised server. Figure(3) depicts a block diagram containing the subsystems of smart shopping cart. Each subsystem is interfaced carefully to form a whole unit. This system consists of a microcontroller interfaced with RFID, IR, RFID Tags, EEPROM forming the hardware unit and interfaced to the server making up the software unit.

RFID signals work on UHF and MW frequencies which cannot penetrate the human cells and tissues. These frequencies have gain the popularity had a standardised value in many countries.
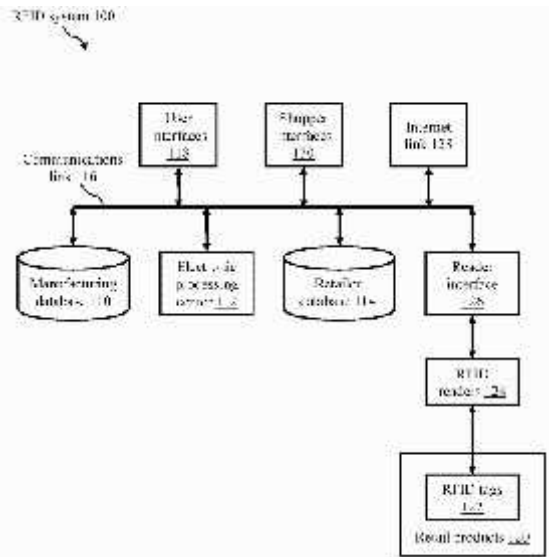

Fig. 3 Block diagram of RFID Module

LCD Display

The LCD display which is used in this system is arduino based TFT display. The display device has the ability to display numbers and characters. It is used to display the total cost of the products that have been purchased and it also displays the product information.

Trolley Unit

In this trolley unit the trolleys will have arduino in it and a LCD display. As the customer pick up the product and add it to the trolley the information will be stored in the data base and the total cost is displayed to the customer using the LCD display. The information of the finally added and subtracted products will be updated automatically via the database.

Billing Unit

The trolley which the customer has selected will have its separate database in the EEPROM of the trolley's arduino board when an interrupt is generated.
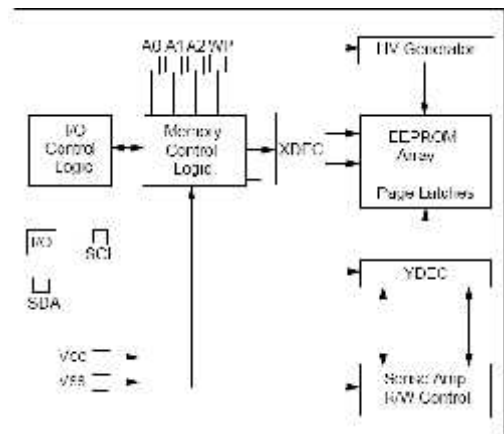

Fig. 4 Block Diagram of EEPROM

The total bill amount displayed by the screen of the cashier is the amount which will be shown in the screen of the selected trolley. Through this the customer will get all the information about the products and billing automatically.

Working

The main function is of arduino and RFID module. The arduino board will be attached to the trolley having LCD display over it. The customer who wants to shop will take the item and will get it scanned by the RFID module and add that into the basket. Now, after the addition the information of the product which the customer has added will be automatically given to the arduino at the billing counter as both the arduinos are synchronised with each other. The data will be stored in the database. The transfer of the data will take place with the help of the Wi-Fi module (ESP-01). The communication between the arduino and the ESP-01 module was done in serial port with 115200 bps baud rate. Furthermore, Arduino microcontroller talks to ESP8266 IC using "AT" commands developed by Espressif. The input terminal of the arduino will be connected to the LCD display showing all the numeric and alphabetical data. The LCD display in the trolley is basically an interface with the arduino attached to the trolley. The information regarding the name, cost, brand etc, of the product and the total cost of the products which have chosen get stored in the internal EEPROM that is found in the arduino board. The digital display which is next to the board will display the total cost to the customer and cashier as well.

Since the bill is with cashier already so, the customer need not to wait and can pay the amount directly.

Fig. 5 Flow chart of working mechanism

During the billing process the product list is cross checked with that of the shopping malls database for any miss match of the number of products is done in order to provide a secure shopping mechanism. The whole shopping mechanism is shown below with the help of flow chart.

Advantages

- The smart trolley can be used by every customer in the mall and can give the better experience of shopping due to its flexibility and automation.
- It plays a major role in cutting off the time which the customer has to put in to shop in shopping malls. This is done by reducing the billing time as they do not have to wait for the billing process. The bill will be updated automatically.
- The efficient roll of the arduino will keep the programming easier and flexible and the customer can control it with ease.
- RFID module which is used for the scanning purposes is providing an opportunity to the customer to go beyond the limit and can add or subtract the product as much time as they can. They just simply have to get the product scanned by the RFID.
- The digital display device has made the project more sophisticated by giving a view to the customer about the details of the product and total amount.
- This method is improving the shopping scenario and the relations too as the customer do not get frustrated due to the wastage of time.

CONCLUSION

One way to reduce the time of the customer is to introduce RFID tags in this project. Smart cart can be used for the intelligent billing purposes. Smart cart allows a customer to manually perform billing without being dependent on cashier by means of swiping the RFID tags over RFID reader or by paying the cashier at the counter after the long billing process. Unlike RFID system, smart cart does not need any visual contact with barcodes which may get distorted in real life situations. All data about purchased products and user account data are stored in a cloud database in the Internet. Then, smart cart shows this information to customers on its display. A customer can delete an item from the list whenever he or she wants to. If the customer decides to finish purchasing, he/she has to a press a button which is required to upload all the information about the purchased product and their total cost to cloud database. Once all payment data is uploaded to the web, total cost is calculated from the registered account cash of the customer. After this full approved process, All purchased products are deleted from the cloud database and the customer can freely pass the anti-theft gate with the purchased products.

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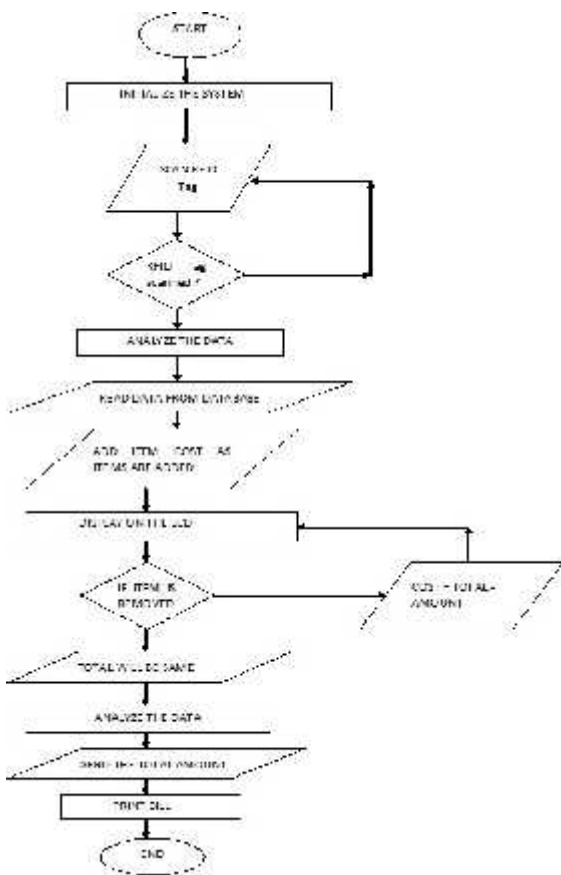
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