

RFID based Smart Multitasking Shopping Trolley System

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Abstract— The characteristic of an innovative product is measured on the parameter of how much it adds comfort, ease and proficiency to the everyday life at the same time having value addition on the social aspects. The trend of purchasing even the smallest of the goods from a shopping mall is observed quit casual now a days as seen in the regular advertisements of different cost effective purchases of daily utility goods by different shopping destinations. This strategy and trend has pulled masses towards the shopping mall. Usually after the purchase of variety of items, the customers will have to stand in long queues for bill payments as the billing counters are very limited as compared to the number of shopping items on board. To increase the pace of a billing process, RFID technology has been used significantly since long, thus providing many new services and convenience in the retail environment. The RFID technology provides reading the bar code (RFID tag) at the cashier end to quickly count the number of items purchased, thus reducing time to stand in long queue. In the proposed review paper, different techniques used to design the RFID based smart multitasking shopping trolley system are compared and contrasted. One, which makes use of RF module protocol.

Key words: RFID, AVR Arduino 328 microcontroller, RF module, SCM, UIDM, SCIMM

I. INTRODUCTION

Human beings have adopted technology to suit their needs since long they came into existence. Innovation in technology has brought about magnificent changes in terms of making life of the beings easier, simpler as well as faster. As far as the regular activities of a normal citizen of any country, it is causally observed that he/she spends most part of the week in shopping activities [1]. US bureau of labour [4], human beings spend 1.4 hours every day on shopping. Visa has also conducted similar survey [5], which narrates that nearly 70 % people prefers to walk out of the queue, if the queue gets too long because of the heavy rush, and 10 % of the persons are irritated at the very moment they stand in a queue be it a long or shorter one.

Shopping malls are the suppliers of different daily utility items including food products, cosmetics, groceries, clothing, electrical & electronics appliances etc.

The shopping has been widely classified as shopping in person and shopping in absentia. Shopping in absentia includes internet shopping, tele-shopping, etc. In this kind of shopping, a shopper need not have to be present in the range of shopping arena. Shopping in-person involves physical presence of a person at the vary place of shopping so that he could be able to physically see and develop a touch and feel of the objects and accordingly makes the selection depending on variety of factors including requirement, ease, brand name, discount/offer, etc [1].

The proposed research evaluates various strategies to assist shopping for a consumer to minimize the shopping

time in the mall at the same time provides equal opportunity to aid the store management by providing real-time updates on the inventory.

The advent of newer and newer techniques like RFID technology and wireless networks have assisted shopper by making process of shopping at a faster pace, making it more efficient as well as making it more transparent. RFID tags are nothing but small transponders that communicates to a reader wirelessly by transmitting some identifier such as serial number [3]. By construction, they are special type of wireless cards, which carries built, in embedded chip and a loop antenna. The chip represents 12-digit card number. The RFID reader circuit generates 125 KHz magnetic signal. RFID tags have been widely used to track items and label them in various shopping destinations like that of supermarkets. They are treated as advanced form of bar code.

To overcome shopping related issues and to make it more suitable and permeable the proposed work compares and contrast various strategies used as discussed in the sections to follow. The related work section comprises of various techniques used in the literature till date.

II. LITERATURE SURVEY

The proposed survey takes into account two important research contributions by [1,2]. Author incorporates use of very versatile AVR microcontroller connected with the LCD module while the other paper discusses the built of the system making use of microcontroller, the LCD display and RF module [1]. Salient features of each one of them have been briefly discussed below one by one.

The author discusses the interfacing of RFID, and barcode reader with the microcontroller [2]. The system diagram of the system is as shown below:

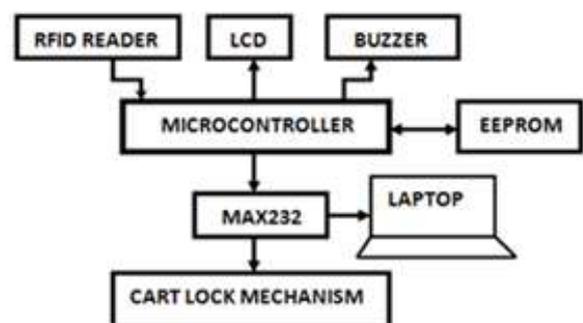


Fig. 1: System diagram using AVR [base paper]

As the user throws the item into the trolley, the reader on the trolley reads the tag and sends the signal to the microcontroller. compares the item with the look up table after storing it into the memory. If match found then displays the item and its cost on the LCD display along with totaling of the item.

The block diagram of the complete system is as shown below:

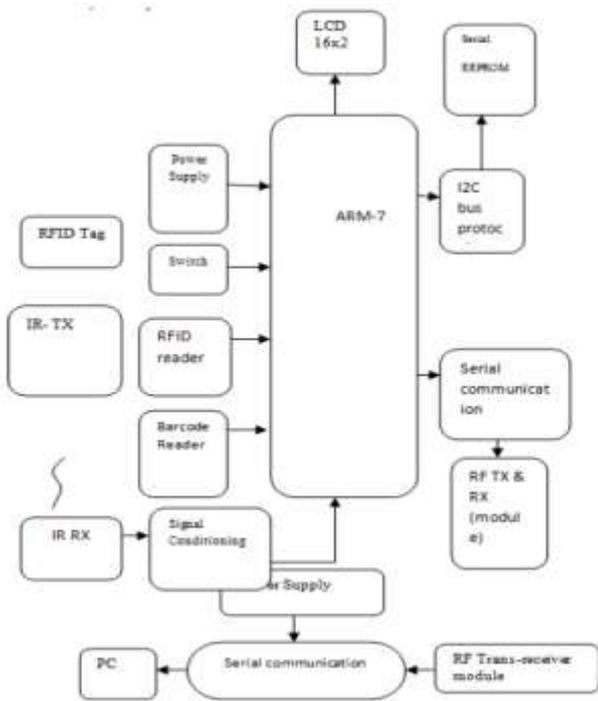


Fig. 2: Block Diagram of System [2]

The hardware used in this work, includes, Trolley unit, billing unit, power supply, RFID tags, RF ID reader, Bar code reader, IR sensor, LCD display and RF module. The RF module consists of three parts: transmitter module, receiver module and transceiver module.

The software part consists of embedded C interfaced with the hardware, that is, RFID receiver (fitted in the trolley) and transmitter (RF ID tags), which finds the item and maps it with product price. Visual basic used as the front end of the display, which will display final billed amount and display at the exit where final payment is made.

The process used is as follows: Start => Initialise the system => search for RFID => check RFID => read corresponding data from memory => Display the data on LCD => Add item cost as items are added => when upload

key is pressed send data to the counter => print the bill => stop.

This work which makes use of RFID reader along with interfaced Arduino 328 has made billing process very simpler, at the same time making it fast and increasing security of it.

The author described the trolley section system diagram as below [1]:

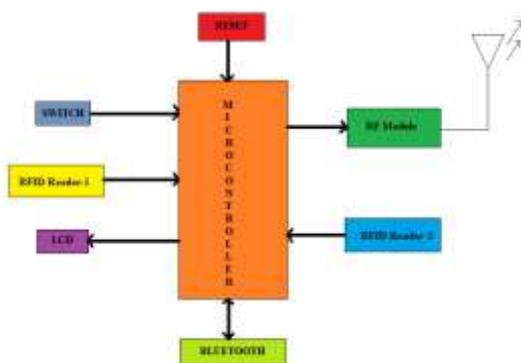


Fig. 3: System diagram of trolley section[1]

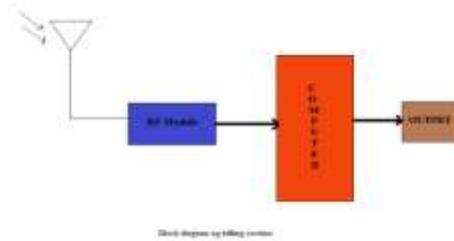


Fig 4: System diagram of billing section [1]

The aim of the system proposed by [1] is to provide state of the art, lower at cost, scalable and robust system for acting as the best shopping assistance for the customer. The system which is developed by [1] consists of three major modules (a) Server Communication module (SCM) (b)

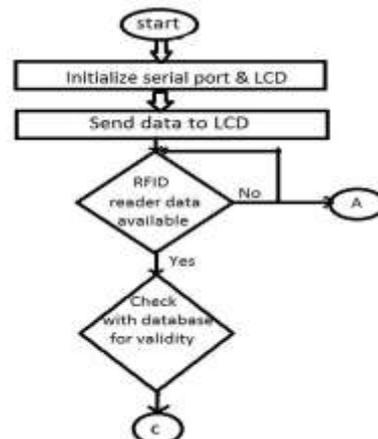
User Interface and display module (UIDM), and (c) Automatic billing and Inventory management module (ABIMM). SCM module creates the connection of shopping cart with the main server. UIDM offer user interface and ABIMM works on billing and inventory management in alliance with SCM. These three modules have brought together, integrated into a system, and validated to satisfy the functionality.

The hardware used in this work, includes, arduino 328 microcontroller, 16X2 LCD display, RF module, RFID, 12V power supply. The RFID reader and RF communicates with each other using UART. The implantation level diagram of the system is shown in Fig. 5.



Fig. 5: Implementation level diagram [1st paper]

The flow chart of the system is as shown below:



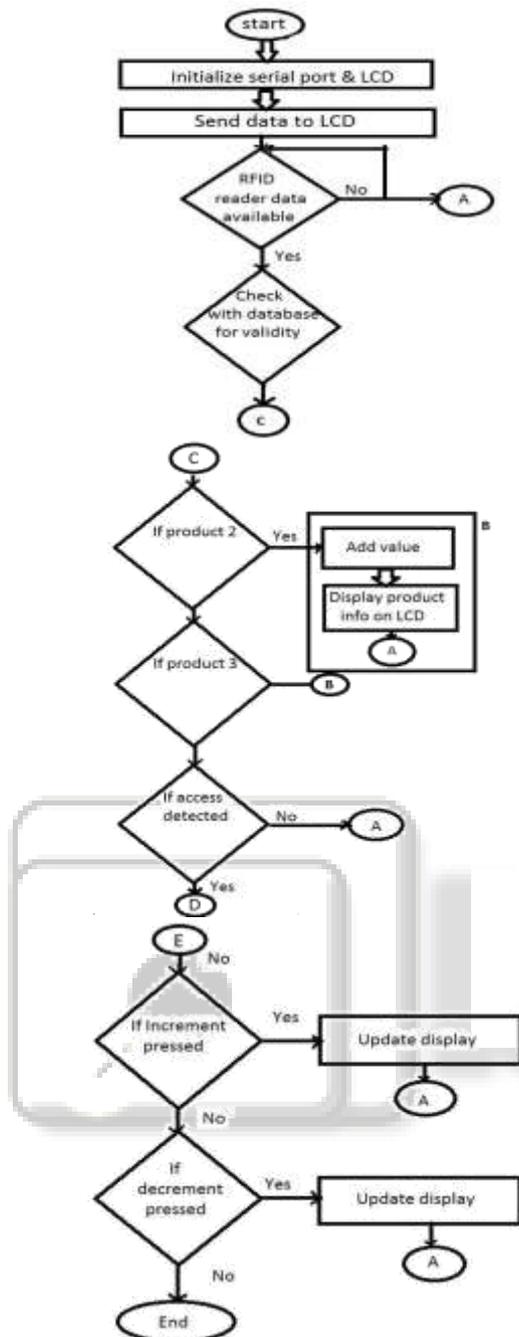


Fig. 6: Flow chart of the work flow [1]

The sample database of the products has also been created and to indicate different products being shopped. As RFID card read the product details are displayed on the display unit. The shopped item details were stored in local memory temporarily. Upon pressing the shopping complete button the contents of the memory were read by the microcontroller and total items, their amount was calculated, and final billing was done. In addition, the same product data containing the information was sent back to the server for inventory updation. All the test cases were done and validated successfully onto the hardware.

The comparison between Bar code and RFID system is as shown in Table. 1.

BAR Code (Existing Technology)	RFID (Proposed Technology)
1. Person is required to read bar code on the product	1. Automatic reading of RFID tag from the

	product
2. Barcode must be visible on the surface of the product	2. RFID can be placed inside the product
3. Line of sight required to read a barcode	3. No line of site required to run a RFID.
4. The readability of barcode can be impaired by dirt, moisture, abrasion.	RFID tags are not affected by such conditions
5. Short reading distance	Long reading distance
6. Bar code does not have read and write capability	RFID tag has read and write capability.

Table 1: Comparison between bar code and RFID system

III. RESULT AND CONCLUSION

Literature survey depicts different strategies to model a RFID based intelligent multitasking shopping trolley system. This is indicated that both the types of the systems described by the [2] and [1] has satisfied the desired functionality by making use of RFID device to the fullest of the extent. The idea of making shopping to the customer effortless, hassle free and easy was being correctly figured by the two different types of strategies making use of different hardware, one using AVR based system and the other using Microcontroller and RF module based system. To further augment with the same, a Bluetooth based system integrated with the existing microcontroller based system is suggested as a further improvement for the future research.

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