

An Efficient and User Friendly System for Smart Shopping

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Abstract

The Smart Shoppe trolley is an innovative user friendly product that is designed to fasten their shopping work. This proposed market Shopping trolley gets all of the purchased product information to the place where the final bill is verified. This significantly reduces the time of purchasing. RF is the major contributing field by which time and efficiency is greatly saved in shopping systems of present day. By keeping the RFID reader on the trolley and RFID tag on the products. It uses a individual unique identification for all the products available in the shopping mall. When sensing a particular product, intimation is sent to the PIC micro controller, through which product information is exactly displayed and finally the bill amount is calculated. Here ultrasonic sensor, IR sensors are utilized to track the consumer like tracking the human and while they move, the IR obstacle sensor is utilized to find the obstacle in the shop. In cases when load crosses the weight limit, message regarding this will be displayed in all sections of the mall.

Keywords: IoT, 4G technology

1. Introduction

Shopping mall is a center from which most of the goods for our daily life is purchased and some of the other things like gardening tools; electrical goods will also be available. Nowadays most of the people prefer to buy the things in shopping malls, the demand for it also increases. Due to this changed mindset of the public, advancement in the shopping centers also changes rapidly.

As a usual thing, if a consumer need something to purchase from a shopping mall, they have to pick out the product from the shelf then they have to wait in a long queue for their turn to pay for the bill. Problem will surely arise when the size of a shopping mall is relatively huge and sometimes consumers don't even know where certain items are placed.

But there is a vast change in the facilities offered by the foreign malls and our shopping centers in terms of quality. Due to this our consumers are finding difficult in many situations while shopping. Because if enough money is not brought to buy the products then it will become a problem and they have to return the items. Instead if price tag is there and it is also correct then according to that we can decide whether we can purchase a particular item or not. These are the problems that are currently faced by most consumers.

Many similar works has been done which addresses the above problems. An innovative product [1] is introduced by the author and when we pick a product and place it into the trolley, the QR scanner scans the product's unique code and its price which is displayed on the LCD screen. When costumer has finished shopping theyhave to come to the counter and pay the bill as shown by the LCD display found in front of the trolley. The above said item will save the time for us and there is no need to scan the items. In [2] the Automated Shopping Trolley is a Smart Trolley is proposed by the authors. In this method, Rasberry Pie Embedded Chip with two Bar code Scanners is used to self-check-out the products by the customers at Super Markets. This will greatly reduce the time of the customer simply

wasting at the bill counter. An advanced method is designed the author [3] in which Electronic Shopping is equipped with Barcode Scanner for product identification and a consistent Wi-Fi connection with the shop's server. In spite of this it has LCD screen to inform about special offers, discounts and other details then it gives the total bill amount also. After purchasing, the customer has to press the finish button in the trolley to indicate the completion of the shopping. Since it is connected to the shop's server, no need to wait, he has to just pay the bill and leave the shop. In addition to this the consumer themselves scan the items and the LCD display on the trolley keeps updating the final amount. This makes the shop owner and the customer very beneficial and often more no. of people will come to shop for purchasing. Besides if a customer has a membership card then his details will be in the server database and the RFID is attached to it. So that, shopping data is send to the computer system in the billing counter. Due to this, compared to the other customers, he can finish the shopping earlier and save his time. So people prefer to be a member in a particular shop, so that they utilize this facility.

In another model [5] the Automated Shopping Trolley contains GSM module in addition to barcode scanners and Aurdino board. It also has a weighing Sensor to verify the overall weight of the items purchased. This is similar to the previous type but additionally it has GSM module. All the modules are kept as an embedded system in the smart trolley. We can make use of RFID technology for many fields and in this proposed system it is utilized for shopping trolley. The survivability problems associated to RFID systems is discussed in this paper [6]. In agricultural food sector Traceability [7] is a major factor and it is carried out utilizing Radio-frequency identification technology and it is readily compared with the old style. So that by utilizing the above technology agricultural-food increases their automation level thereby raising their efficiency, in a defensible way. The paper [8] deals with the use of Radio frequency identification for supply chain management. Similarly in [9] particularly the challenges faced with the use of RFID technology to categorize the vehicles based on range of miles journeyed data from armed vehicles are discussed.

Similar to the solar panel tracking system [10], our proposed system particularly provides enhanced services to the customers i.e. compared to the old-fashioned method which is very time consuming. The automated human tracer is fitted in the smart trolley and it has RF ID tag and RF ID reader. The tag is located on every product and it has exclusive identification code for each and every product. To read the specifications written in the tag the RF ID reader is fitted on the trolley. The necessary item is sought through the system and once the necessary goods are sensed by the RF ID reader, the movement of trolley is supported by means of driver relay circuit. To find out the obstacles in the path of the trolley is found by the IR obstacle sensor.

2. Design methodologies

This paper introduces unified and automated billing system using RF ID. Once the RF ID reader senses the specified item, it transmits the signal to the PIC micro controller, to find out the specification about the product and to calculate the total purchased amount and it is displayed. In every shopping cart is provided with the Product Identification Device that has microcontroller. When the load surpasses the specified weight, the corresponding message is displayed and suddenly intimation sound is heard and the different sections of the mall are alerted. Figure 1 shows the block diagram of the proposed system.

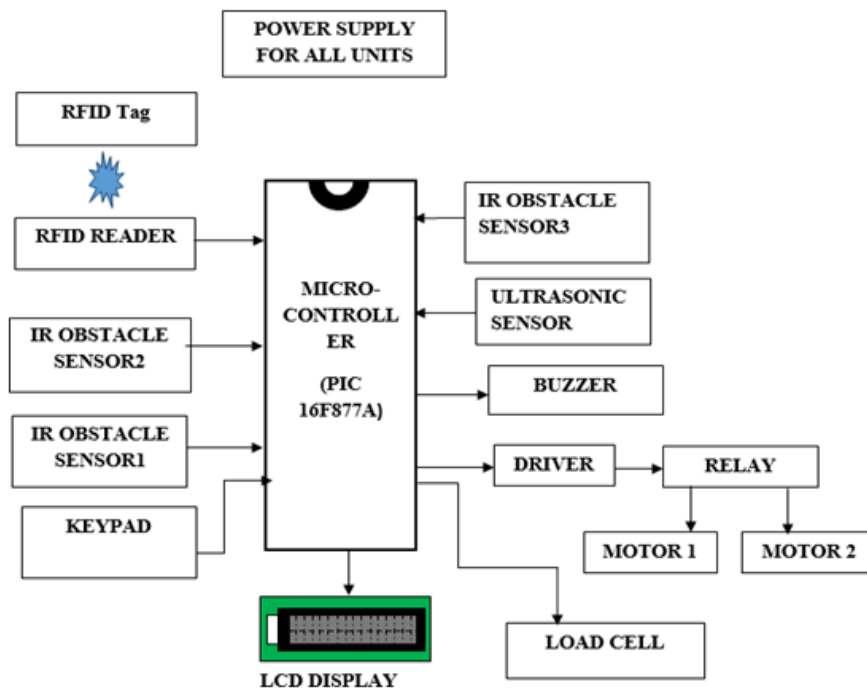


Fig. 1 Block diagram of the proposed system

PIC is a specially designed modified Harvard architecture microcontroller known as “Peripheral Interface Controller” and its pin diagram is shown in figure 2.

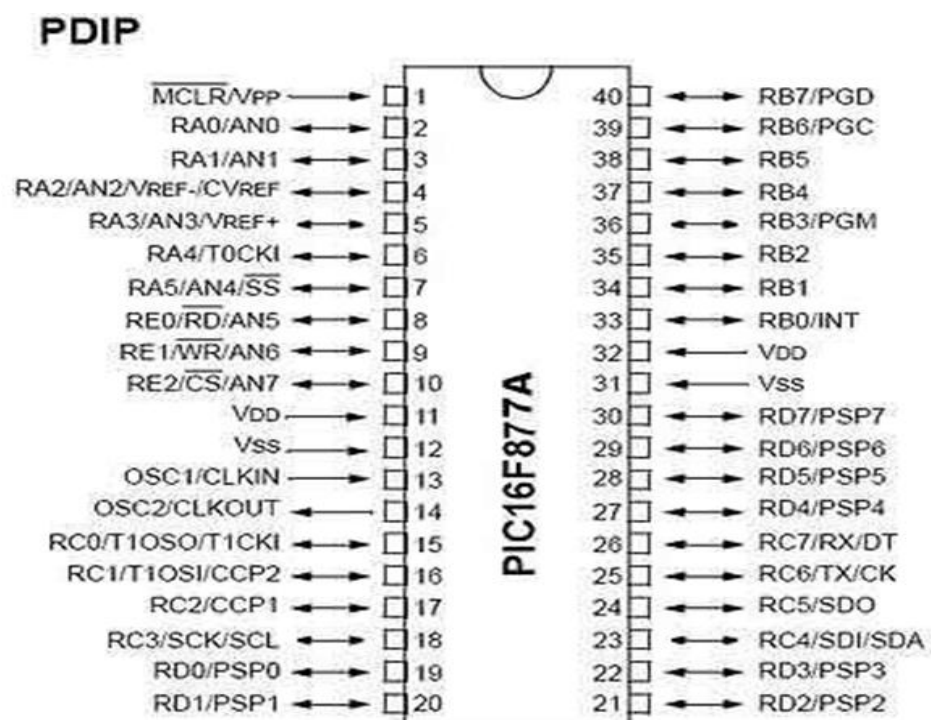


Fig.2 Pin diagram of PIC Microcontroller

The PIC16F877A is a CMOS FLASH based 8-bit microcontroller which has 40pin Dual Inline Package where 33 pins are used for I/O interface. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an LCD, 2 Comparators, 8 channels of 10-bit

Analog-to-Digital converter, 2 PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I²C bus, a USART, and Parallel Slave Port.

3. Bubble diagram

In figure 3 the bubble diagram is used to represent various components in the PIC microcontroller. Two different type of sensors namely IR sensor and ultrasonic sensor is utilized in our system. Infrared radiation (**IR**) is a type of EM WAVE which lies in the frequency band of 1Hz to 430THz. Wavelength of visible light is shorter than wavelength of Infrared radiation. also its frequency of visible light is higher than frequency of Infrared radiation. Its wavelength range is from 0.7 and 300 micrometers. IR imaging is exploited in military applications and space researches.

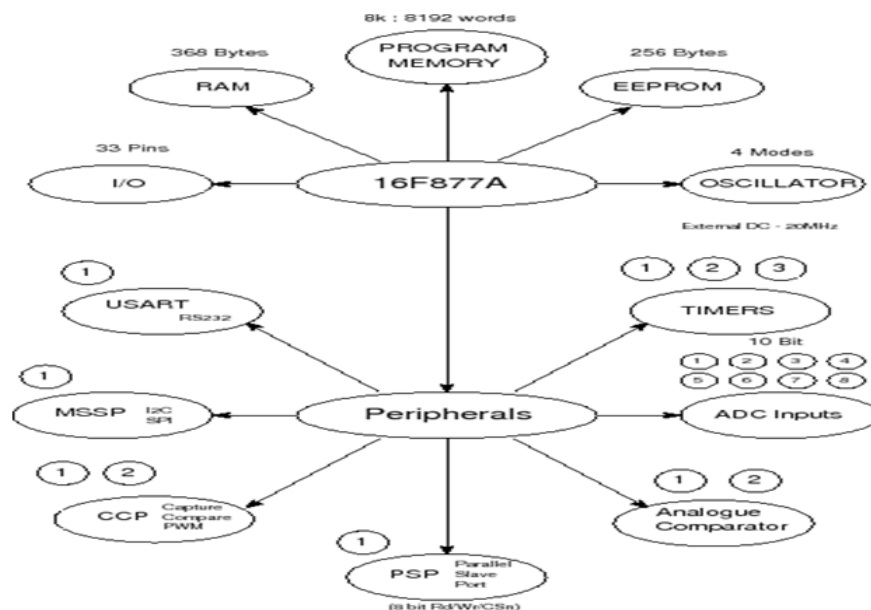


Fig.3 Bubble diagram

Ultrasonic is a radiation which lies in the frequency band of approximately 300Hz to 14 KHz. In nature many animals (bats, dolphins, fishes) use sound as a form of sight to detect objects. Ultrasonic measurement is done by sending a pulse of high frequency sound, then investigating how long it takes for its echo to be sensed. Time taken between the sent pulse and the received echo will be regenerated into distance. This is called Time of Flight (TOF). In air, speed of sound $c = \gamma RT$ Where c is a speed of sound in metres per second, γ is a ratio of specific heats, R is a gas constant, T is an absolute temperature.

$$c = 1.29 * (295.16) * 188.9 = 268 \text{ metres per second}$$

4. Implementation

Thus RFID tag placed in the product is sensed by the RFID reader when it is searched in the RF systems for the particular product. Thus customer can reach the product without any error. RFID placed in the trolley moves automatically based on the instruction received by the PIC microcontroller through RF transmitter and receiver. The IR obstacle sensor is used for easy

access through the mall. The selected product details are also sent to the billing system thereby prevents the time consuming process of separate scanning. Figure 4 and 5 shows the compilation result and performance comparison with the electronic version.

From the figure 5 it is very clear that compared to the electronic version, in terms of reliability and other aspects, smart trolley performs well.

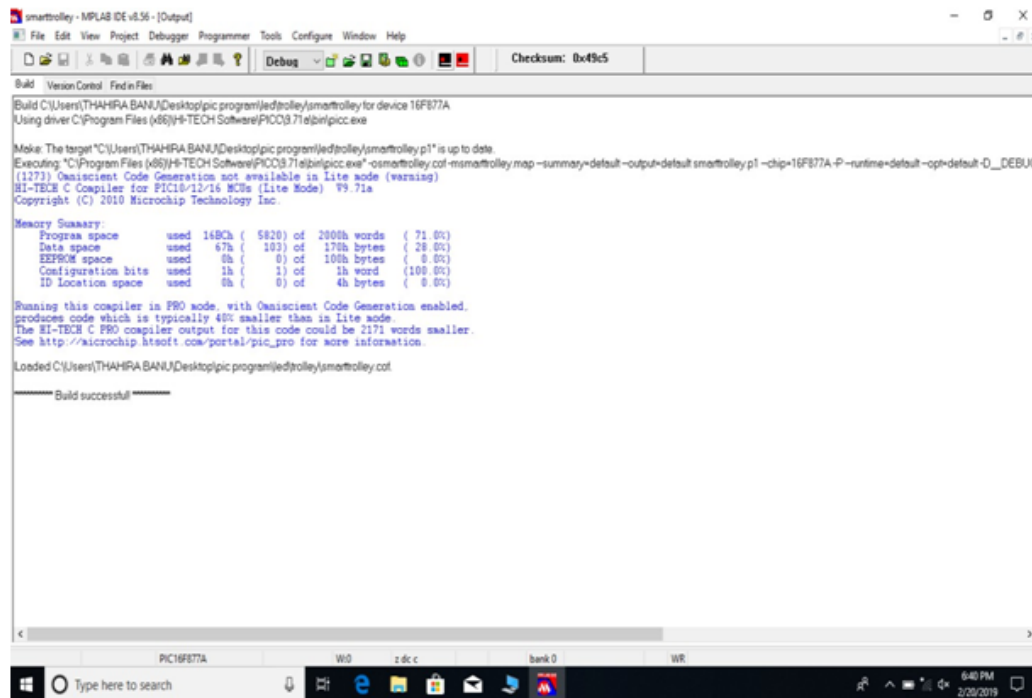


Fig. 4 Compilation result

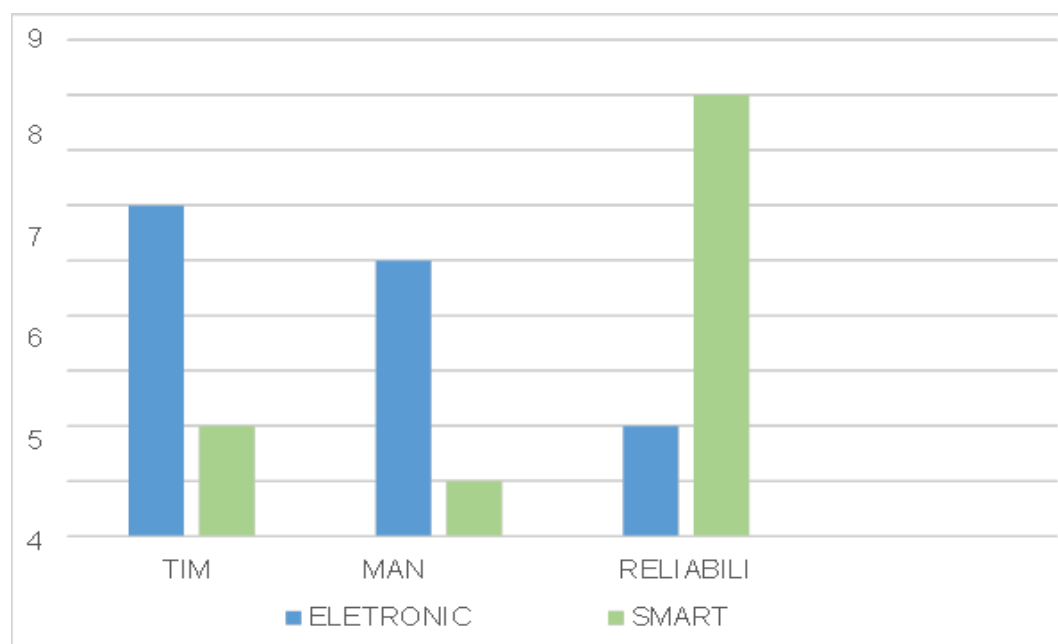


Fig.5 Electronic shopping Vs Smart Trolley

5. Conclusion

This paper aims at improving the service provided to the customers while shopping. The proposed method overcomes the shortcomings of existing method. An RFID reader can access the information of the tag from a distance of around 300 feet and can be interpreted much faster than barcode tags. RF ID reader is capable of reading 40 tags per second. Rewriting is also possible in RF ID which lacks in the existing methodology. In future Bill can be forwarded to the mobile phone and computer. Missed product in the list can be indicated on the display. This is very useful for disabled peoples, senior citizens, and consumers to shop easily. The main drawback is Expensive to implement on large scale. Hence forth, difficult for small scale vendors to implement.

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