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# Smart Trolley In Malls

Premprakash Pal[1], Harshada Sonawane[2], Mahalaxmi Palinje[3]
[1,2,3](Department of Electronics and Telecommunication, Atharva College of Engineering, India)

***Abstract:*** *Nowadays purchasing and shopping at big malls is becoming a daily activity in metro cities. Customer in shopping malls are facing problems like pulling heavy trolley from rack to rack for collecting items and after total purchase customer needs to go to billing counter for payments. At the billing counter the cashier prepares the bill using bar code reader which is a time consuming process and results in long queues at billing counters. To overcome these problems, a microcontroller based system is proposed which is totally automatic. The system will be placed in all the trolleys. It aims to reduce the long queues at billing counter by scanning the product by customer before placing it in the trolley and displaying the total amount of bill and the quantity of product scanned on the spot. This proposed system follows the customer while shopping and maintains the safe distance between customer and itself.*

***Keywords:*** *Bluetooth module, Obstacle sensor, Ultrasonic sensor, Zigbee Technology.*

## I. Introduction

The Human beings have always developed technology to support their needs ever since the beginning of mankind. The basic purpose of innovation in technology, irrespective of the domain, has been in simplifying tasks and making everyday chores easier and faster. One quotidian task that human beings spend considerable amount of time is in shopping. According to a survey conducted by US Bureau of Labor, on an average, human beings spend 1.4 hours every day on shopping. A large number of customers will tend to walk out of a queue if the line is too long. The current Shopping environment can be simply being classified it into two categories (1) Shopping in-person and (2) Shopping in absentia. Shopping in absentia is supported in numerous ways including online shopping, tele-shopping, etc. wherein a shopper does not have to be physically present in the shopping area. Shopping in-person involves a personal visit to the place of shopping and selecting the products based on various factors including need, convenience, brand etc.

Nowadays interest in shopping malls is increasing among people. In the present shopping malls, customers find various difficulties. Those difficulties are mentioned below. One third of major shoppers buy groceries on a budget. Most of the times, it is only at the end of purchase shoppers come to know that the overall purchase total is greater than their budget. Then they spend much time in searching for their desired products and finally overall shopping process becomes more time consuming too. Due to this, several times shoppers couldn't buy all their desired products and miss out few items. Another major problem faced by users is that they have to wait in long queues for billing. Thus, the proposed system overcomes all these drawbacks faced by shoppers in shopping malls [1].

Several previous studies, have also discussed the development of shopping trolley which overcomes all the problems discussed above. Shopping trolley with RFID tag reader consist of a RFID reader and all the products in the mall will be equipped with RFID tags. When a person puts any product in the trolley, its code will be detected and the price of those products will be stored in memory and bill will be done in the trolley itself [2].

Novel Model for Automating Purchases using Intelligent Cart, this was the first model which provided an idea of LCD use for offers, discount and total bill features.

The RFID Based Smart Shopping and Billing, in this system more utilization of LCD like removing the product by cancel or delete button on LCD is implemented [3].

Thus, all the system that we have discussed above have found an alternative to the conventional shopping methodology by using the RFID mechanism but the major issue with these system is the cost of implementing it. The RFID technology requires the radio frequency waves to be emitted continuously. The radio frequency waves may be harmful in certain cases and also the cost of implementing RFID based smart trolley in a big shopping mall which consists of hundreds of trolleys may not be as efficient as expected. Another issue is that the barcodes are free of cost but the RFID tags are costly and fixing of RFID tags to all products is not considered to be as an efficient process [4].

## II. Block Diagram Of Proposed System

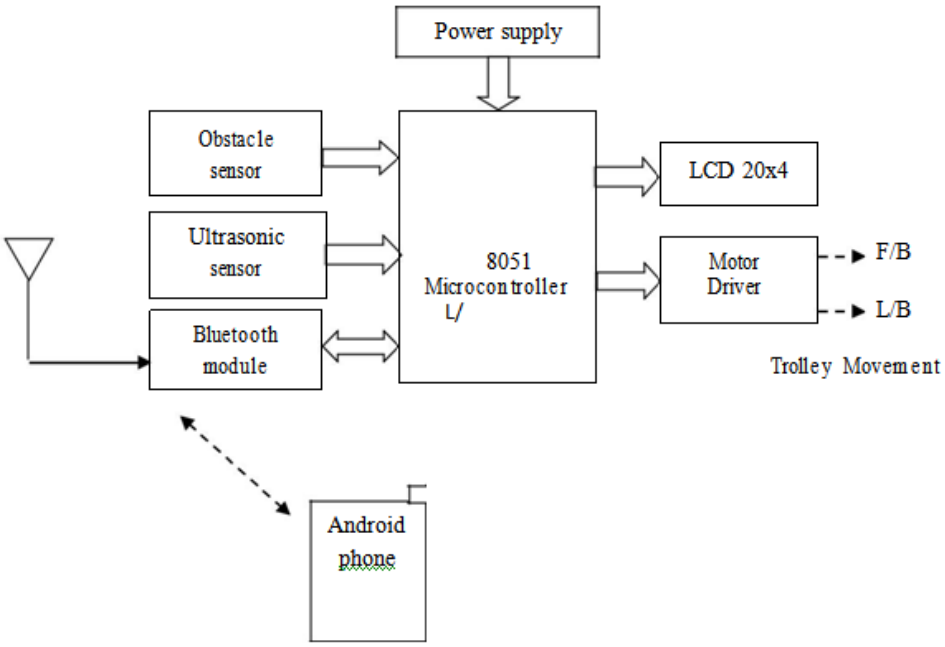


**Fig.1** Block Diagram

In fig.1 Obstacle sensor, Ultrasonic sensor, Bluetooth module and Motor driver circuit is connected to the 8051 microcontroller. Android phone is connected through Bluetooth module. There is a single power supply of 12V. The trolley will move with the help of DC motor and will follow the user using ultrasonic sensor which is mounted on front side of trolley. If any obstacle is detected using obstacle sensor then trolley will stop moving. Obstacle sensor is mounted on bottom side of trolley. Every product will have unique Barcode, which will get scanned by the android application present in user android phone. After scanning user will put the product in trolley. Android app and microcontroller will communicate using Bluetooth. When any product gets scanned, the data of product will have transmitted from android app to microcontroller and microcontroller will display the data on LCD attached to trolley. If person wants to remove any product, it can delete the product from android app and remove the product from trolley.

## III. Hardware And Software Used In Proposed System

3.1. AT89S52 - 8051 microcontroller:

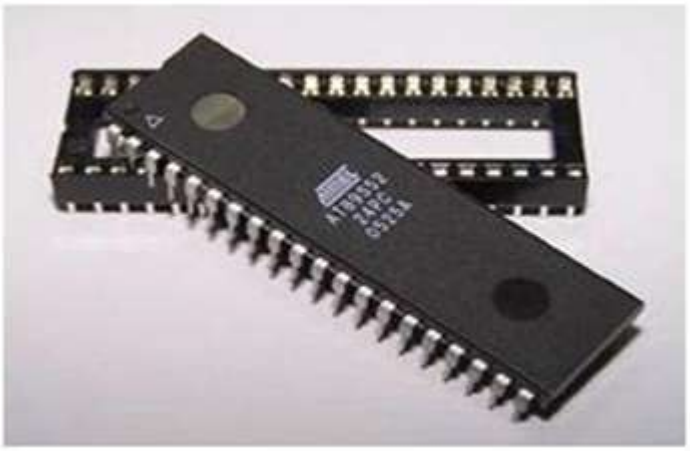

Fig.2 Microcontroller

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

3.2. Ultrasonic sensor - HC-SR04


**Fig.3** Ultrasonic sensor

Ultrasonic sensors work on a principle similar to sonar which evaluate distance of a target by interpreting the echoes from ultrasonic sound waves. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The module includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

(1) Using IO trigger for at least 10us high level signal,

(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.

(3) If the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time×velocity of sound (340M/S) / 2

3.3. Obstacle sensor:

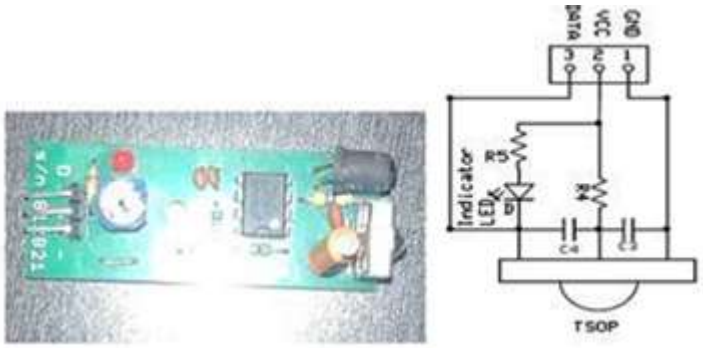


**Fig.4** Obstacle sensor

It consists of three major components. The first is an Infra-Red (IR) transmitter (usually an IR LED), the second is a TSOP (an Infra-Red receiver) and third IC 555.

The main difference between LED and IR LED is that IR LED emits Infrared Radiations, which we cannot see by our naked eyes. TSOP requires the incoming data to be modulated at a particular frequency and would ignore any other signals. It is also immune to ambient IR light. They are available for different carrier frequencies from 32 kHz to 42 kHz.

3.4. Bluetooth module - HC-05

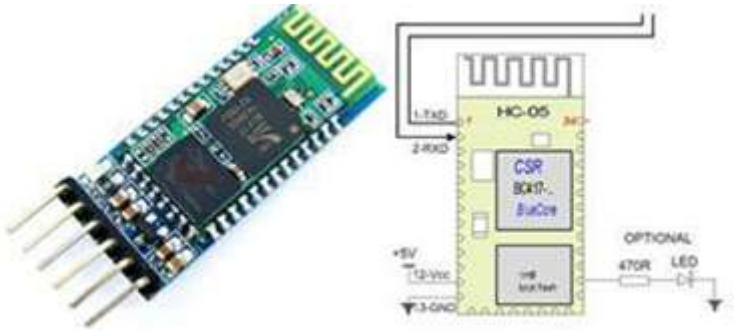


**Fig.5** Bluetooth module

Bluetooth is a specification for a small form-factor, low-cost radio solution providing links between mobile computers, mobile phones and other portable handheld devices, and connectivity to the Internet. It will enable users to connect a wide range of computing and telecommunications devices easily and simply, without the need to buy, carry, or connect cables.

3.5. Software Requirement
3.5.1 Keil - 8051 microcontroller programming
3.5.2 UC flash - Burn program into IC
3.5.3 Diptrace - PCB layout

## IV. Proposed Methodology

Now days people spend lots of time unnecessarily in shopping center in billing queue. Because the cashier has to scan every product at billing counter which turns into long queue. According to a survey, most of the people prefer to leave the shopping mall instead of waiting in long queues to buy a few products.

The uses of smartphones are increasing everyday with huge number. Now days almost every person has a smartphone which has a camera. In this proposed system the customer has to download an android application which is designed for mall. which has inbuilt barcode scanner to scan the products before keeping it in trolley. The scanned data is transferred to the microcontroller through Bluetooth module and the price and quantity of the product will be displayed on LCD. If person wants to remove any product, it can delete the product from android app and remove the product from trolley. Ultrasonic sensor is used to follow the customer which is mounted on the front side of the trolley. When system gets turned ON the ultrasonic sensor automatically sends eight 40 kHz and detect whether there is a pulse signal back. If the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time×velocity of sound (340M/S) / 2

Using the above formula, the distance between customer and trolley is get calculated. And there will be a predefined distance programmed in the system according to which microcontroller will give the information to motor driver circuit whether to drive motors or not. In the proposed system, two obstacle sensors are mounted on the bottom side of trolley. If any obstacle is detected in the range of obstacle sensor then the trolley will get stop.

## V. Advantages

5.1 User friendly and cost effective
5.2 Time saving shopping
5.3 No need to wait in queues
5.4 Maintains record of product
5.5 Easy for user to handle the system
5.6 Reduces manpower required at billing desk
5.7 Customer gets on the spot billing facility
5.8 It is very helpful for the senior citizens
5.9 Users can be aware of the total bill amount during the time of purchase
5.10 Automatically follows the customer

## VI. Application

6.1 Super markets
6.2 Malls
6.3 Airports

## VII. Future Scope

The future implications of the proposed system are very promising considering the amount of time and resources that it saves. The transaction and billing system can be linked with bank account of individual user to make direct payment provided that security issues are being taken care of. Also, the trolley can be further designed to search products in shelves and guide the user accordingly to the position of the exact product.

## VIII. Conclusion

The use of LCD and android app in this smart trolley make it user friendly. LCD display the name of product, cost of product. Automatic billing is done in android app so it saves the time of customer and reduce the rush at billing counter. It also reduces the manpower. Because of the use of IOT it will also helpful to owner.

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