Automatic Shopping Trolley with Instant Billing and Theft Protection

H. R. Ramesh[1], Peri Shri Vidya[2]

[1]Associate Professor, Dept. of Electrical Engineering,
University Visvesvarraya College of Engineering, Bangalore University, Bengaluru, Karnataka, India[1]

[2]PG Student [Control & Instrumentation], Dept. of Electrical Engineering
University Visvesvarraya College of Engineering, Bangalore University, Bengaluru, Karnataka, India

Abstract: *Technology has affected society and its surroundings in a number of ways. A modern innovative product is the one that assist in the comfort in everyday life. Automatic Shopping Trolley is designed to give customers more satisfaction and make them comfortable when shopping. By using this trolley consumers can scan the item they want to purchase in the trolley itself and can also know the price of the items, thus, making the shoppers know the estimation of their expenditure. In addition, this project will also have techniques for tracking customer path so as to reduce the effort to pull the trolley from rack to rack and it also maintains safe distance between customer and itself.*

**Keywords:** Shopping, Billing, Theft, Tracking, etc

1. Introduction

The inception of wireless technology has developed electronic commerce to provide convenience, comfort, and efficiency in day-to-day life. Technology has drastically changed the way of life in our societies. Technology has affected society and its surroundings in a number of ways. In many countries, technology has helped develop more advanced facilities to be used in daily life. It also allows more tasks to be completed in less time, increase efficiency and create entirely new ways to make a living. Hence, more areas of life have been improved. A modern innovative product is the one that assist in the comfort in everyday life.

In this project, we discuss a revolutionary concept of Automatic Shopping Trolley with Instant Billing and Theft Protection. The main goal is to provide a technology oriented, low-cost, easily and rugged system for aiding shopping in person. The automatic shopping trolley will reduce the time and effort of the customer, thereby helping the customers at retail stores to checkout immediately from the billing counters. Super Market is a place where people from all walks of life will get their daily necessities. Customers often face problems and inconvenience when shopping. Also old-aged customers, who are very weak, face problems in pulling the trolley from rack-to-rack and then wait at the queue for their turn to checkout after bill payment.

2. Methodology

The entire process of Automatic shopping trolley is divided into two parts, one is the Barcode Scanning and automatic billing system and the second one is the automatic movement control of the trolley. Both the processes are explained using flowcharts and block diagram.

### 1) Flowchart for Billing System
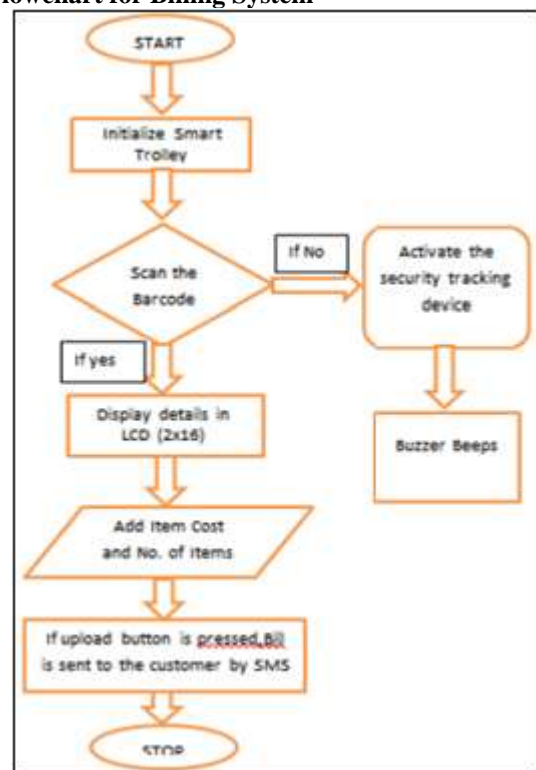
To start the billing process, we will first initialise the smart trolley by turning on the start button. Initially the cart will display zero items in the cart and total bill amount will be zero. Whenever the customer makes a purchase, he/she has to place the barcode side of the product in the barcode scanner, which in turn will add the product to the billing system and number of products and bill amount will be incremented accordingly.

If a customer places a product without scanning the barcode inside the trolley, immediately the security tracking device will be activated and the buzzer will start beeping. When the customer wants to end his/her shopping, the shopping button

should be turned off and the bill will be sent to the customer through SMS to their respective phone numbers. The customer has to go to the billing counter and pay the bill amount and check out immediately without waiting for the queue.

2) Flow chart for Automated Movement
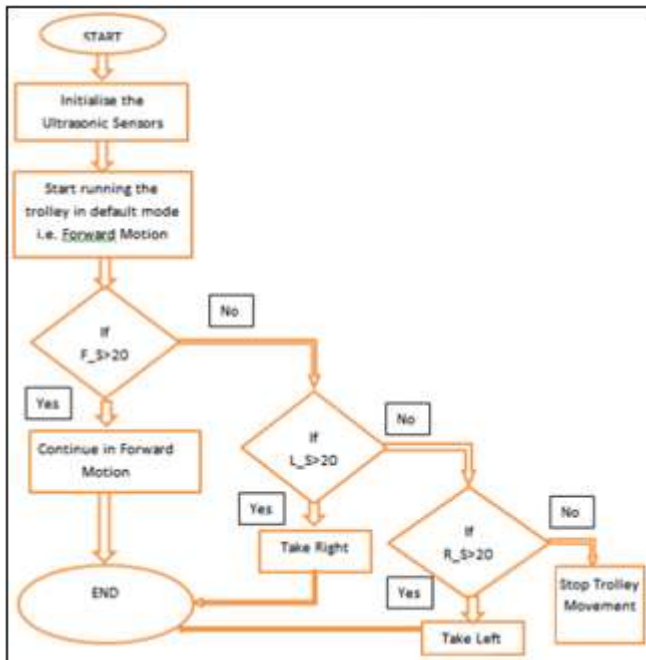
A toggle switch is provided for automatic movement of trolley. Whenever the customer turns on the switch, the trolley will automatically start its movement in its default mode, i.e. in the forward direction. There will be three ultrasonic sensors placed in the front, left and right side of the trolley to detect obstacles coming from front, left and right respectively. If an obstacle comes very nearer to the trolley it will either stop or deviate its path according to the conditions given.

3. Block Diagram

The controller used is an Arduino UNO which is interfaced to all the sensors and modules for getting the desired output. The power to the Arduino and motor driver circuit is given by a 12V, 1.2Amp battery. The otput of the motor driver circuit is fed to the motors for movement control.
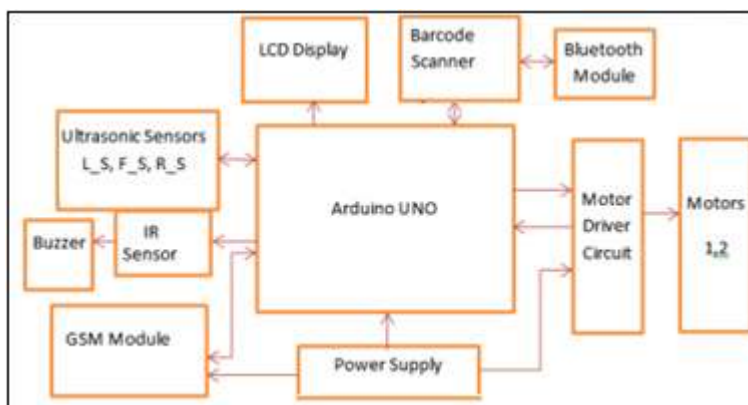

Figure 3: Block Diagram of Automatic Shopping Trolley System

The barcode scanner is interfaced with the Arduino, Bluetooth Module, GSM Module and IR sensor. Whenever a product is being scanned, data is sent from barcode scanner to Arduino using Bluetooth module and the data received by the arduino is displayed on the LCD display. At the end of the shopping, the bill amount is sent to the customer through SMS using GSM module. Whenever the IR sensor gets high, buzzer gets activated. At the same time the Arduino is also interfaced with motor driver circuit and ultrasonic sensors. With the help of ultrasonic sensors the trolley will automatically track the customer path and control the motor movement.

4. Result and Discussion

Automatic Shopping trolley with barcode scanner and automatic movement control algorithm using PID controller has been implemented successfully and results have been obtained. The movement control is obtained using the data observed from the three ultrasonic sensors and decision is made by PID controller for direction of movement. The entire concept is developed in LabVIEW.
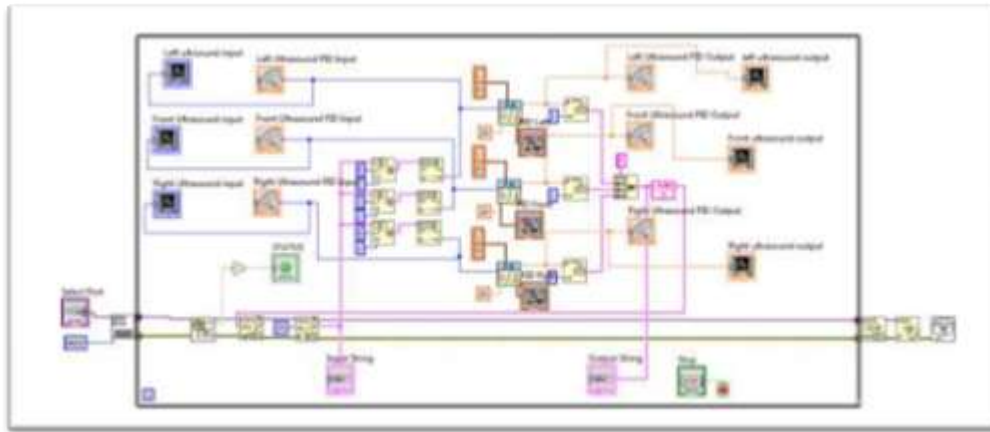
Figure 4: LABVIEW Block Diagram representation

The simulation results for the movement control have been described in this section. The direction of movement of the trolley is decided according to the sensors output. The default mode of operation is the forward motion i.e. when the trolley is turned on it will automatically start its motion is forward direction. Figure 5 shows the output of all the three sensors when the left ultrasonic sensor is active i.e., when obstacle comes in front of left sensor. In this case, the trolley takes a right movement.
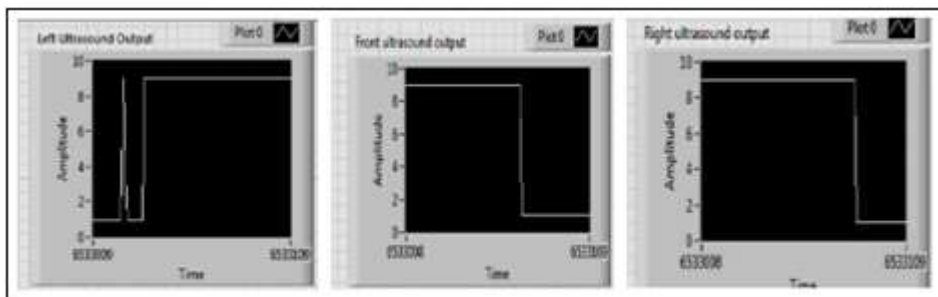

Figure 5: Ultrasonic Output When Left Ultrasonic Sensor Is Active

5. Conclusion

The Automatic shopping trolley is implemented and the hardware and software interfacing is achieved using Arduino UNO. The intended objectives were successfully achieved in the prototype model developed. In this automatic trolley, there is no need to pull heavy trolley, no need to wait in billing queue and no need of thinking about budget. The microcontroller based trolley automatically follows the customer. Also it maintains safe distance between customer and itself. It gives number of products in trolley and total cost of the products on the spot. It gives facilities like trolley stopping, turning right or left. So, we successfully implemented the concept of Automatic trolley. The developed product is easy to use, economical and does not require any special training. This project simplifies the billing process, makes it swift & increases the security using RFID technique. This will take the overall shopping experience to a different level. The Smart Trolley was designed to function as a mobile self-checkout system providing users the flexibility to make transactions from it within the retail store. It is designed to be highly efficient and fully synchronised with the retailer's current system.

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