SMART SHOPPING TROLLEY (USING ARDUINO)

A MAJOR PROJECT REPORT

Submitted by

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In partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

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B.TECH (ECE)

Under the supervision of

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DECLARATION

I, Javed Khan a student of **BACHELOR OF ENGINEERING AND TECHNOLOGY (BTECE) Enrollment number: 2016-333-024.** hereby declare that the dissertation entitled "**SMART SHOPPING TROLLEY (USING ARDUINO)"** which is being submitted by me to the Department of Computer Science, SEST, Jamia Hamdard, New Delhi in partial fulfillment of the requirement for the award of the degree of **BACHELOR OF TECHNOLOGY(B.TECH),** is my original work and has not been submitted anywhere else for the award of any Degree, Diploma, Associate ship, Fellowship or other similar title or recognition.

Javed Khan

ID: 2016-333-024

Date: 24th-September-2020

Place: Jamia Hamdard University

CERTIFICATE FROM SUPERVISOR

I do hereby recommend that the thesis work prepared under my supervision by Javed Khan (2016-333-024), titled "SMART SHOPPING TROLLEY (USING ARDUINO)" be accepted in the partial fulfillment of the requirements of the degree of Bachelor of Engineering and Technology for Examination.

Date: 24th-Spetember-2020

Place: Jamia Hamdard University

Signed by: Ms. Samia Khan

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Javed Khan

Date:24th-September-2020

Place: Jamia Hamdard University

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Chapter-1:

Introduction:-

1.1 ABOUT THE PRODUCT

The arrival of wireless technology with the other communication facilities & techniques helped in making the online trading (sales & purchases) very popular. An advanced or futuristic product must imply to the convenience, comfort & the efficiency of the user in everyday life. Here in this project we are going to discuss a very effective & futuristic way of shopping with the help of Smart shopping trolley. This will meet the goal of giving simple engineering technology, low cost, easily accessible system to the user and hence avoiding long queues at the billing counters of major retailing stores, malls etc.

According to this project every trolley will be fitted with the similar electronic device which will help customers to purchase or to undo their purchases according to their needs. This electronic system will allow the user to place the object in front of the ultrasonic sensor so that the lid opens & it allows the purchaser to input the commodity bought. The other sensor which is further placed inside the trolley will detect the commodity again and ensures that only single quantity is being entered and will again close the inlet. After the inlet is closed the specified application will consider it as a single unit and will display its price along with quantity at the screen. This process will again work in a loop until the consumer will make an input to total up the sum of the purchases being made.

1.2 EXISTING PROCESS

In the existing scenario, customers are unaware of the amount of the total purchases they have made, until they go to the paying counters for paying the wholesome amount of money. One can undo a purchased product, once he gets to the counter, at the time consumer decides to revert back and undo the purchase. To avoid such problems, we here develop a smart trolley, where an individual can know the total amount of money to be paid & also the total amount is also being sent to the verifier wirelessly.

1.3 PROPOSED PROCESS

According to this project, every trolley will be embedded with the similar electronic device which will help customers to buy or to undo their purchases according to their needs. This electronic system will hence allow the user to place the object in front of the ultrasonic sensor so that the lid opens & it allows the purchaser to input the commodity bought. The other sensor which is further placed inside the trolley will detect the commodity again and ensures that only single quantity is being entered and will again close the inlet. After the inlet is closed the specified application will consider it as a single unit and will display its price along with quantity at the screen. This process will again work in a loop until the consumer will make an input to total up the sum of the purchases being made.

1.4 SCOPE OF STUDY

The scope of study which is required for the establishment of this project is depicted below:-

1. Knowledge related to the basic concepts of Arduino.
2. Programming related to the Arduino concepts based on C programming.
3. Pin configurations of various components inbuilt in this system including ultrasonic sensors & servo motors.
4. Barcode Scanners
5. Knowledge regarding the mobile applications of Arduino for providing input & uploading the barcode details to the smooth functioning of the overall process.
6. The circuits & the devices that are required to the completion of the project and hence establishing connections between the devices wired & wirelessly.

Chapter 2:-

LITERATURE SURVEY

ARDUINO UNO:-

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller. The board is installed with sets of digital and analog input/output (I/O) pins that may be connected or configured to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable via a USB (Universal Serial Bus) cable. It can be powered by a USB cable or by an external 9 volt battery, because of its capability to accept voltages between 7 and 20 volts.

Arduino UNO can be better understood using the below set of figures and illustrations:-

FIGURE 1: Arduino UNO

General Pin functions:-

- **LED**: There is a built-in LED driven by digital pin 13. When the pin is HIGH (binary 1) value, the LED is on, when the pin is LOW (binary 0), it's off.
- **VIN**: The input voltage to the Arduino board when it's using an external power source. You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin or power can also be supplied using an OTG cable connected through an electronics mobile phone for easy convenience.
- **5V**: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the overall circuitary of the Arduino microcontroller.
- **3V3**: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND**: Ground pins.
- **IOREF**: This pin on the Arduino board provides the voltage link with which the microcontroller operates. A properly settled and coded shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.
- **Reset**: Typically used to add a reset button to shields which block the processes being operated on the microcontroller.

AUTOMATIC RESET:-

Despite requiring a physical press of the reset button before an upload, the Arduino Uno board is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip.

This setup has other implications. When the Uno is connected to a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the boot loader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened.

ULTRASONIC SENSORS:-

Ultrasonic sensors or ultrasonic transducers are a type of acoustic sensor divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. These sensors are widely used in a large number of applications such as RADAR (Radio Detection and Ranging), Embedded projects applications (used for distance measurements as the time between the transmitted and received signal gives the value of distance between the sensor and the object) etc.

FIGURE 2:- ECHO/ULTRASONIC SENSOR

Ultrasonic Sensors includes a transmitting sensor denoted by ‘T’ and receiving sensor denoted by ‘R’ which are majorly involved in the transmitting and receiving of the signals emitted by the ultrasonic sensor. Also it includes 4 pins namely Vcc(providing voltage), Trig pin (for triggering of the pins connected with Arduino) and Echo pin (to be connected to the Arduino) and the Ground pin denoted by ‘GND’ connected with the ground terminal of the Arduino microcontroller.

SERVO MOTORS:-

A servomotor is a moving / rotary motor that allows the user to precisely control various segments in a rotation. For eg:- The control of angular or linear position of the motor segment including the velocity, acceleration with high torque capacity. It involves a motor joint/coupled with a sensor which provides the relevant information of motion in a particular speed, time or at a particular angle.

A Servomotor requires a complicated controller, often a specified module designed controller for its proper functioning. Examples may include Arduino UNO, Arduino MEGA etc. Servomotors have wide applications such as in embedded system controllers, robotics & automated manufacturing.

FIGURE 3:- SERVOMOTORS USED IN VARIOUS APPLICATIONS

Servomotors are most often used as high-effective motors substitute to the stepper motors having inherent abilities of having in built output steps for instance if assigned a rotary motion of 85 degrees the stepper motor will fail and instead do an assigned motion of 90 degrees whereas a servo motor will rotate at an angle of precise 85 degrees.

SURVEY PART:

Ultrasonic sensors:-

Findings-

The HC-SR04 ultrasonic sensor uses SONAR to determine the distance of an object just like the ability of the animal bat. It offers excellent non-contact range detection with good accuracy and non distorted readings in an easy-to-use area which usually varies from 2 cm to 400 cm. This area may also vary depending on the size, configuration of the ultrasonic sensor.

The working and the readings of the ultrasonic sensors are not affected by sunlight or dark material, although acoustically, soft materials like cloth can be difficult to detect. It comes complete with ultrasonic transmitter and receiver module.

As soon as any object or an obstacle comes in the path of ultrasonic sensor the transmitted signal/wave will return back in the form of the reflected wave from the reflecting surface giving us the value of the distance between the transmitter and the reflected surface. This distance can be easily evaluated or observed on the Arduino application in mobile phone or the PC application of the Arduino UNO.

Arduino UNO also makes it more compatible and easier to understand the basic programming concepts of C using the embedded C inbuilt concepts.

FIGURE 4:- ULTRASONIC SENSOR FRONT AND REAR VIEW.

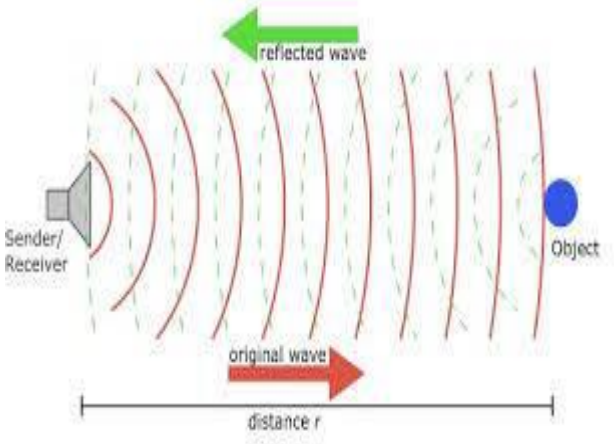

FIGURE 5:- INCIENT AND REFLECTED WAVE CONCEPT.

CHAPTER 3:-

HARDWARE IMPLEMENTATION:-

Introduction:-

In this chapter brief explanation about the Hardware Implementation of the overall project is being done. We will therefore discuss about the design & working of the design with the help of a circuit and a real time demo diagram. Here various features of the Arduino Microcontroller & various other components will also be depicted.

CIRCUIT DIAGRAM:-

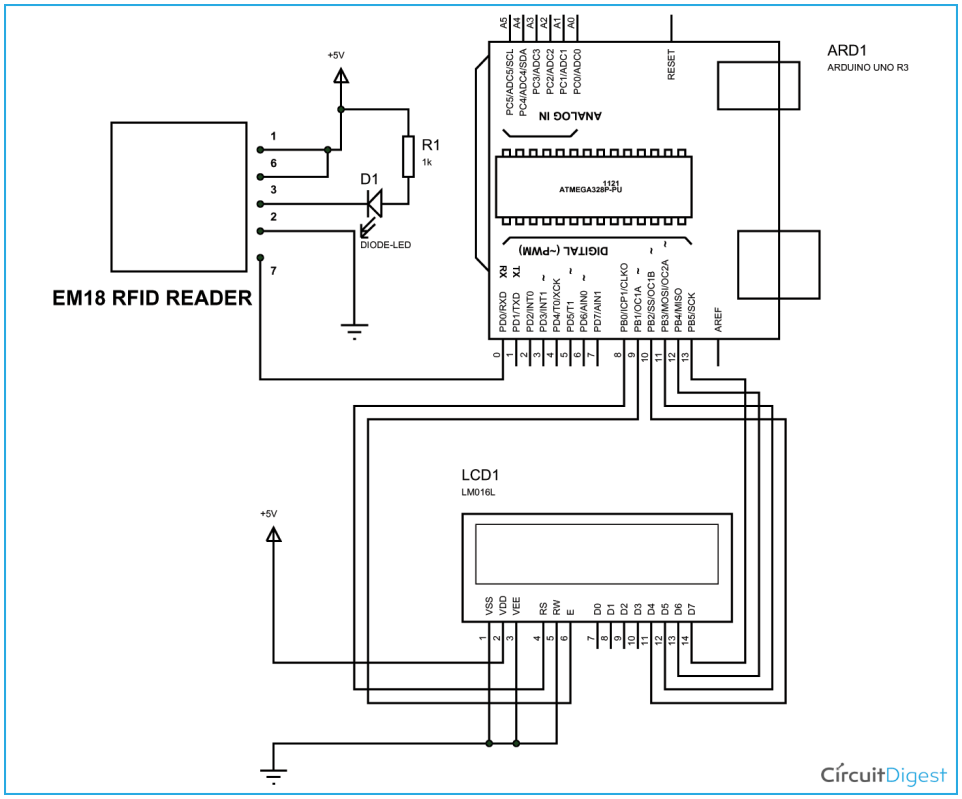

FIGURE 6:- Overall interfacing circuit using Arduino UNO

List of Components:-

Arduino UNO

Jumper Wires

Ultrasonic/Echo Sensors

Servomotors

Power Supply

Insulating Tape

OVERALL IDEA:-

This whole working is based on the working of the single board Microcontroller Arduino UNO which is all equipped with advanced sets of digital and analog input and output ports/pins that are usually interfaced to various extension boards or breadboards and other electronic circuits. The Arduino UNO can be programmed and worked on the platform used in C & C++ programming languages configured on the embedded system platform syntax.

The design of the system is based on the Arduino microcontroller since it provides complete access to the functions of the microcontroller or microprocessor like which is used to program the controller, to use the input and output pins to communicate. The system using Arduino is also less bulky at is easily transferrable from one place to the another also it requires less power supply and we can easily improve or upgrade the sytem if it is relevant or required due to the programming software being used.

Mobile phone will act as a barcode scanner for the perfect identification of the code being displayed on the product which will be further uploaded to the screen of the device for the proper billing and the ease of the customers purchasing a particular product. This system also requires less cost for the designing which makes it user friendly and this idea can be easily implemented to other trolleys in various shopping marts, malls etc.

Most of the Arduino boards comprise of an Atmel 8-bit AVR microcontroller with distributed amount of FLASH memory, pins & features for the smooth functioning of the microcontroller. The Arduino UNO board usually comprises of the female & male pins embedded over it so as it is easier for the wired connectivity for the effective and fast transfer of information to or from the Arduino board to the desired position.

This board is the major building block of thus project under which all the processes are being processed. The jumper wires carry the relevant information and supply current to the various parts of the circuit for the effective working of the overall circuit. Some pins inside the board are used for the power supply for the other connected devices whereas the other pins are being used for the transfer of binary information from the code to the various functional parts.

The first and foremost aspect of this project deals with the sensing of the object to be inserted inside the trolley including the information of the product consisting of price and name of the product. As ultrasonic sensor working is based upon sending and receiving various ultrasonic sound waves therefore in this case the ultrasonic sensor will firstly work as a opener to the inlet of the trolley when an object is placed in the front.

Secondly, when the commodity being purchased is being inserted inside the trolley information regarding the price & name will be displayed on the electronic device connected which might be a mobile phone or a 16x2 LCD display based on the convenience of the user. After these details are being successfully saved by the other ultrasonic sensor residing inside the trolley will again emit some ultrasonic waves and will soon detect the falling or moving of the object being placed inside the trolley. This reaction or motion will close the inlet of the trolley allowing no other stray object to fall inside other than that which is being purchased.

The opening and closing of the inlet is being properly functioned by a servomotor. The motor is being paired with the Arduino microcontroller with some kind of position encoder to provide position and speed feedback. In most of the cases only position of the rotor is being measured and compared to the command position the external input to the microcontroller controller.

FIGURE 7:- SMART TROLLEY

FIGURE 8:- REAL LIFE HARDWARE

CHAPTER 4:-

CONCLUSIONS & FUTURE SCOPE

CONCLUSIONS

The construction and implementation of this project will result in a great help to all the customers or the consumers. This project will result in less chaos in the billing counter section of various crowded marts, malls etc. and hence resulting in profits incurred by the firms by the residual they would have been paying to the employees without this idea of construction of this trolley. Just a single individual would be enough for making all the billing statements verified and would result in less loss to the big marketing funds with a minimal or no investment in maintaining this device.

FUTURE SCOPE

1. This concept can be applied easily at nearly every average or big sized shopping marts, malls etc. since the cost of the overall project is quite economically feasible and acceptable.
2. This project can further be developed by the use of a mobile application for easy and feasible access to all products available rather than using RFID sensor tags at every product which can result in a huge expense and also high on maintenance.

CODING

```
const int trigPin = 8;
const int echoPin = 9;
const int trigPin2 = 12;
const int echoPin2 = 13;
// defines variables
#include <Servo.h>
Servo s1;
long duration;
int distance;
long duration2;
int distance2;
bool door = false;
bool toggle = false;
bool start = false;
int i = 0;
String products[5];
void setup()
{

  s1.attach(7);
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
pinMode(trigPin2, OUTPUT);
pinMode(echoPin2, INPUT);
```

```
Serial.begin(9600); // Starts the serial communication
Serial.print("Firmware Loaded");
}

void loop()
{
  if(Serial.available()>0&&start==false)
  {
    if(i<5&&start==false)
    {
      products[i]=Serial.readString();
      Serial.println("");
      Serial.print(products[i]);
      Serial.print( " is saved" );
      i++;

    }else
    {
      start=true;
      i=0;
      Serial.println("");
      Serial.println("DONT INPUT NOW");
    }


  }
```

```
if(toggle == true)
{
  delay(2000);
  toggle=false;
}

if(door == true)
{
 s1.write(90);
 getdistance2();
 if(distance2<14)
{
  if(i<5)
  {
  door=false;
  Serial.println(products[i]);
  i++;
  }
}

}
if(door == false)
{
```

```
 s1.write(10);
 getdistance();



if(distance<20)
{
  toggle = true;
  door =true;
}

}









}



void getdistance()
{

digitalWrite(trigPin, LOW);
delayMicroseconds(2);
// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin, HIGH);
```

```
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
// Reads the echoPin, returns the sound wave travel time in microseconds
duration = pulseIn(echoPin, HIGH);
// Calculating the distance
distance= duration*0.034/2;
// Prints the distance on the Serial Monitor

delay(10);
}

void getdistance2()
{
  digitalWrite(trigPin2, LOW);
delayMicroseconds(2);
// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin2, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin2, LOW);
// Reads the echoPin, returns the sound wave travel time in microseconds
duration2 = pulseIn(echoPin2, HIGH);
// Calculating the distance
distance2= duration2*0.034/2;
delay(10);
}
```

REFERENCES

1. https://www.arduino.cc/
2. https://en.wikipedia.org/
3. https://circuitdigest.com/
4. https://circuitdigest.com/arduino-projects
5. https://components101.com/ultrasonic-sensor-working-pinout-datasheet
6. https://engineering.eckovation.com/servo-motor-types-working-principle-explained/
7. https://www.elprocus.com/latest-electronics-projects-ideas/
8. https://www.electroschematics.com/
9. https://www.explainthatstuff.com/electronics.html

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Accredited by NAAC in 'A' Category

CERTIFICATE

On the basis of the declaration submitted by **Mr. Javed Khan (Enrolment No: 2016-333-024)** a student of **B. Tech (Electronics and Communication Engineering),** I hereby certify that the dissertation entitled **"Smart Shopping Trolley with Automated Billing Using Arduino"** being submitted to the Department of Computer Science & Engineering, Jamia Hamdard, New Delhi in partial fulfillment of the requirement for the award of the degree of **B. Tech of (Electronics and Communication Engineering)** is carried out by him under my supervision.

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