Department of Electronics & Communication Engineering

Government Engineering College, Barton Hill

Project Report

on

AUTOMATED RESTAURANT SYSTEM

Submitted by:

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Prof. APARNA S THAMPY

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CERTIFICATE

This is to certify that the project report entitled **"AUTOMATED RESTAURANT SYSTEM"** is a bonafide record of the work done by the team consisting of **ASSAY M KALLIAN(TRV19EC019), DEVIKA JAYARAM(TRV19EC023), SREELAKSHMI S(TRV19EC055) & VARSHA R AJITH(TRV19EC058).** This report is submitted to the Department of Electronics & Communication Engineering, Govt. Engineering College, Barton Hill, in partial fulfillment of the requirement for the award of B.Tech Degree in Electronics & Communication Engineering under A P J Abdul Kalam Technological University during the year 2021-22.

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ACKNOWLEDGEMENT

By means of this page, we humbly thank God almighty for providing the wisdom, grace and knowledge to develop a well- accepted presentation. We express our sincere gratitude to Our Principal Dr. Bijulal D, Government Engineering College Barton Hill for the opportunity to present the same. We sincerely thank Dr. Hari R., Head of the Department, Electronics and Communication, for his continuous support and cooperation. We gratefully acknowledge our mini project coordinators Prof. Smitha S L and Prof. Aparna S Thampy, who is also our guide, for their constant guidance, support and constructive feedback. We express our genuine gratitude to APJ Abdul Kalam Technological University for giving us an opportunity to do the mini project. We also thank our family and friends for the unceasing support, encouragement and for providing valuable insight, all of which have been instrumental in the completion of the mini project.

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ABSTRACT

A good restaurant is one that provides good service, delicious food as well as promising comfort and a hygienic place to have a meal. In these modern days the number of restaurants are increasing. They also require very fast processing for serving food to the customers. With the increasing number of customers, it would require more manpower to provide satisfactory services to the customers. It is also not possible for any changes in the hardcopy of the menu. Hence, with the existence of an automated food ordering and delivering system, this problem can be avoided as the customers can make their order from their own seats.

Automated systems are increasing in day to day life. Applications like home and industrial automation reduce man power while increasing efficiency. The primary concept of an automated restaurant system is to automate the menu for ordering food in restaurants. Using simple component and programming techniques, an automation system is proposed. Menu is displayed on the LCD and the user should press the corresponding number of selected items from the display.

Moreover, robots are able to carry out every work more effectively and efficiently than a man can. Apart from automated menu ordering, the proposed system also enables the delivery of food to the customers. A line following robot can be designed using sensor operated motors to reach the correct table and to provide proper service to the customer. This system can make the customers happy as it helps in ordering the food as soon as they arrive at the table without waiting for the server to take or deliver the order.

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LIST OF ABBREVIATIONS

TFT Touch shield	Thin film transistor touch shield
LCD	Liquid Crystal Display
RF	Radio Frequency
2WD	Two wheel drive
I/O	Input-Output
HMI	Human Machine Interface
GND	Ground
Vcc	Voltage Common Collector
Vdd	Voltage Drain Drain
Vss	Voltage Source Source
I2C	Inter-Integrated Circuit
IR	Infrared
RX	Receive
TX	Transmit
IDE	Integrated development environment

1 INTRODUCTION

Dining is enjoyed by everyone whenever we go on vacations, holidaying and other activities. We always appreciate the quality of service provided by restaurants if they serve as per our needs and this all depends on the dining and the quality of service provided by them to the customers. But sometimes there is a delay in this service and the customers get irritated.

To address this issue, an Automated restaurant system is proposed which is a direct connection between customer and the hotel chef where orders will be placed directly to the kitchen and will be delivered to them. So, basically the system is divided into three parts i.e. first one is the **Transmitter Section**, second one is the **Receiver section** and third is a **line follower robot**. Transmitter section includes Arduino UNO, TFT display and a transmitter which will transmit the data given by the customers i.e. the food items ordered by them and in the kitchen, the chef will receive the order. Hence, food will be prepared quickly without wastage of time. The second point of focus is that it is environment friendly. In short, in earlier times the waiter used to note down the order on paper and then place the order. After that the paper would be discarded. Considering the increasing number of customers, there will be a huge amount of paper wastage. But with the proposed system, this problem can be eliminated by directly placing the orders from the customer side to the kitchen side. Hence, it increases the efficiency of providing quality services to the customers. The system uses a TFT LCD display with standard font, font size and bright cool color which is not only an eye stress reliever but also eliminates mistakes due to illegible handwriting of the waiters. And the line follower robot will deliver the orders to the respective tables which inturn reduces the use of manpower. The Arduino set-up used in the system is user friendly as it is easily configurable and even an average learned person can operate it.

2 LITERATURE REVIEW

[1] In the past decades, the rapid growth of network and wireless technology has had a great impact on how people communicate with each other remotely. At the same time, this technology also leads to different kinds of industries to change their entire management aspect. The F & B industry is one of the industries in the market that apply these technologies into their business processes that assist them to be much more convenient and efficient. From the message above, Wireless Food Ordering System is a system that integrated both the concept of intranet and wireless technology. This system allows users to access the data, information and services from a remote server, which enables users to access the central databases distributed across the restaurant network. The system requires the user to build an intranet network within the restaurant and there will be a central database server residing in the network and the client can perform data retrieval by using the mobile devices such as PDA (Personal Digital Assistant) connected to the wireless access point. Waiters have to take orders by choosing the food that they wish to order from the menu on the mobile devices as the input and the data will be sent to the central database, after that the computer residing in the kitchen will retrieve the data from the central database and display it on the computer screen. After the food is being cooked, the employee in the kitchen can confirm the food order and update it to the database. This will signal the waiter mobile device to acknowledge the waiter the food is ready to serve the food to respective customers.

The limitation would be that all the client devices are connected via the wireless access point in order to let the client perform data retrieval from the central database. Unfortunately, there might be a problem if the wireless signal coverage is not strong enough to cover the whole restaurant area and thus cause the waiter's mobile device to disconnect from the server.

[2] In our generation era, computers have become a key component to our daily life because of the advancement of technology. The World Wide Web that becomes an internet that allows each and every user connected with theirs' computer for information sharing throughout the whole world. The World Wide Web made a great contribution to a lot of enterprises which use this mechanism for information sharing within the enterprise and also outside the enterprise. From

the benefit of the World Wide Web, a lot of fast food industries apply a system known as Online Ordering System to assist their business processes. Online Ordering System is a technique that allows customers to order their favorite food online via the internet by using a web browser that is installed in their respective computer or smartphone. Implementing this system can help the fast food industry to solve the problem that they face while using the traditional food ordering processes. Customers access to the website and choose the food that they prefer from the online menu display then customers have to choose whether the food is delivered to them or it will be packaged for pick up and the payment method will be upon delivered or pick up and lastly it will show all the order details to the customer for double checking and confirmation. Once customers have placed an order via the internet, the data will be sent to the restaurant database and placed in a queue in real-time. In addition, the data will be displayed on the computer screen along with the corresponding option.

The main weaknesses of the system will be internet connection depended. The system will not be operating without the internet connection. Because customers have to place orders via the internet as a medium and the data sent to the restaurant database for further processing, the customer will not be able to access the web service if no internet connection is available. Furthermore, if the Internet Service Provider (ISP) is under maintenance it will have a great impact on the restaurant that relies on the online order system for their business. Other than that, the system is not effective enough to target all the customers on the market. Because a lot of senior citizens are computer illiterate, they do not really understand how to utilize the web service. Thus, if they want to place an order by using the system it will be a very troublesome incident for them.

[3] This order system overcomes the drawback of traditional paper based order systems, it changes everything from paper based into computerized. First of all, the system will be programmed with the food availability from the respective restaurant and displayed on touchscreen devices that have been setup in each of the tables within the restaurant. In addition, the touchscreen device will have a very attractive Graphic User Interface (GUI) that displays the food menu for customers to make their choices and enable customers to place an order by touching the particular food image that displays on the device screen. Next, when the customer placed an order, the food order will be sent to the kitchen and the chef can prepare the food. This

system eliminates the issue from the traditional paper based system where the waiter has to manually deliver the order to the kitchen. Other than that, the system provides a sub-module that enables restaurant owners to update the food details, food price, etc. It was very convenient compared to the traditional paper based system, because the paper based system required the restaurant owner to dispose of all old food menu cards and re-print the latest food menu cards to serve their customers. Last but not least, the system fully relies on the gadgets and the gadgets don't need leave or vacation and thus it can work efficiently 24 hours per day and 7 days per week. Therefore, it can reduce the excess manpower needed in the restaurant business by reducing the number of the employees within the restaurant.

Although this system provides a lot of ideal solutions that can help a restaurant to solve the problem that they encountered in their working hours, it needs the restaurant owner to invest a huge amount of money in these systems. For many restaurant owners, they might not take the risk of investing a huge amount of money into this system.

[4] Bullet Train Delivery System（Sushi Train）uses the latest WiFi, infrared, and wireless battery charging technology to implement the automated food delivery process from kitchen to diner's table. Infrared technology setting in the food delivery train detects plates taken off and auto-returns to the kitchen without pressing any button. Automated food delivery train charge automatically with no cable required after serving food and back to the kitchen.

Automated food delivery trains enable voice and light notification. When it has reached its destination, it will light up and tell customers that the food has arrived. Speed of delivery also can be adjusted according to different types of food being served and custom-made train shells into other vehicle designs like car, ship and rocket. Hong Chiang provides highly customizable automated food delivery vehicle design to fit in with the theme of the client's restaurant; the client can hand in the restaurant design layout for further discussions.

When a food runner is replaced by an automated food delivery system, cooks spend less time communicating with staff and are always on the same page with HMI, saving time and avoiding delivering the meal to the wrong table.

2.1 INFERENCE

The restaurant menu ordering is relying on the interaction with waiters to place orders into the kitchen. In busy hours this coordination is a challenge resulting in dissatisfaction with the customer. And this result also courses the late payments as well as the exchanging cash in hand. Through the literature survey made; it was understood that an automated system is practical and economical. Enough information on the needs and significance of such a system was effectively studied and formulated by various sources making it easier to venture into the problem statement. Multiple solutions already exist on the internet but each has their disadvantages. We figured out using the information provided to us that a geographically relevant and economical solution system can be designed.

3 PROBLEM STATEMENT

Traditional method involves customers specifying their desired menu to the waiter who takes the order on a paper personally, then takes the order to the kitchen department and finally supplies the order to the customer. So, it was a time-consuming process. It leads to wastage of paper and also it requires reprinting of all menu cards. Also, in many cases for small changes to be made in menu cards, it is not convenient to print all menu cards again and again. Simply saying that the menu card once printed can't be changed. After some days, the menu card will lose its worthy look and attractiveness.

To use the traditional food ordering system is entirely a manual process which involves waiters, pen and paper. Customers wait for waiters to take the order in a pen and paper system. To use this traditional system is simple; but it involves errors while noting down the orders as well as in making calculations.

Difficulties in food order ticket tracking

For those restaurants which are using traditional methods for food ordering processes, this is a problem that can’t be eliminated. Because the entire manual process involves waiters, pen and paper. Each and every food order transaction is noted down on a piece of paper and the waiters pass the food order ticket to the kitchen for further processing. While the food order tickets have passed to the kitchen, the sequence of the food order ticket might be interchanged with other tickets. Therefore, it will cause the restaurant not to be able to serve their customers sequentially according to the customer order sequence especially in peak hour, so customers would complain to the restaurant in turn it will affect the customer relationship of the restaurant.

Potential to increase cost of operation

The cost of operation of a restaurant will increase from day to day because of the economic inflation. When inflation comes in, the cost for each and every fresh ingredient that used to support the restaurant daily operation will be affected too. Therefore, the restaurants have to

make changes to the food price accordingly in order to maintain the profit, and then all the food menu cards have to be reprint to reflect the updated price. By doing so, it will raise the cost of operation to the restaurant because we will not know how frequent the inflation occurs in the economy. Next, if the physical areas of the restaurants are very large. It might need to employ extra workers in order to serve their valued customer and thus it will increase the cost of operation too.

Difficulties in updating menu card information

The information that is printed in the menu card is very important because it will lead consumers to make different orders to the restaurant based on the information that the menu card gives. If the food and beverage details change but the employer does not update the menu card information, it may cause some possible issues such as consumer dissatisfaction with the restaurant,and consumer cannot make their preferable decision and conflict during consumer make their payment.

3.1 OBJECTIVE

General Objective

- The general objective of this project is to develop an automated restaurant system using arduino and RF.

Specific Objective

- To design a user friendly admin panel and user panel for menu ordering system.
- To design an arduino system to carry out the receiver and transmitter setup.
- To design a line follower based delivery system using arduino uno R3.

4 SYSTEM DESCRIPTION

4.1 SYSTEM ARCHITECTURE

In this project, we have proposed a system which is an extraordinary headway in technology because of its highlights like minimal expense and usability.

The system architecture of automated menu ordering system consists of 2 main areas of a restaurant:- the serving area and the restaurant kitchen and the food delivering system consists of an arduino uno line follower system.

For the menu ordering system, we have customers placing their order through the microcontroller and the corresponding order will be received at the user side through another microcontroller. The menu card will be displayed on a TFT touch shield and the user can select whichever dish they want. On the kitchen side, the staff can view the order through an LCD display and a buzzer sound will be heard on each order placed.

For the food delivering system, we have a line follower robot to deliver the prepared food from the kitchen to the corresponding customers. It travels through the path specified by the electrical insulation tape and returns back after making the delivery.

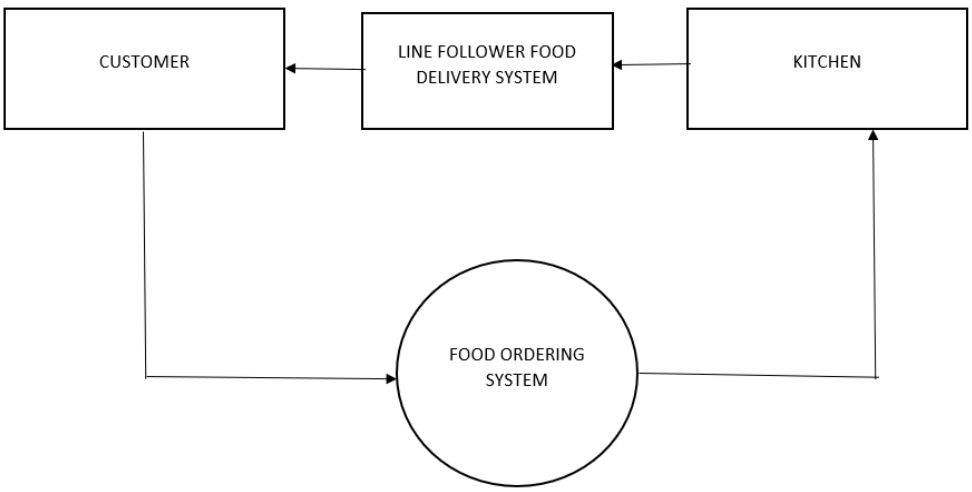


Fig.4.1 System Architecture

4.2 METHODOLOGY

The methodology used will be divided into two parts as system design and system process flow. Our Smart restaurant menu ordering system is basically divided into two blocks . The first block includes the Smart Menu Ordering Block and the Autonomous Delivering Block.

For the first block; it consists of two sections: Transmitter section (Customer Side) and Receiver Section (Chef Side).Whenever the customer enters the hotel and takes a table, he will read the menu given on the TFT display which will be mounted on the table. Then after making a suitable decision the customer will place the order using a TFT display with the help of touch-screen or touch-stick system. The order will be processed by the Arduino UNO and the data will be sent serially with the help of radio frequency transmitter through antenna to the kitchen. The antenna which is at the kitchen side will receive the food order with the help of radio- frequency receiver installed at kitchen side while Arduino uno will process the data and the chef will see the data with the help of 16 x 2 LCD display and start preparing food. In this way, the food will be prepared at the faster rate and time will be saved and more orders can be taken. The prepared food will be taken directly to the customer from the kitchen. Hence, also called as interaction cum service. In case the customer asks for the bill or the waiter; the manager at the LCD receiver end will notify respectively.

The second block; the Autonomous Delivering System which will take care of the food delivery. The main perk of the system is the economic benefit it brings to the owners. The owner can reduce the amount of money they spend on servers and waiters. It also increases the aesthetic attractiveness of the restaurant. The Arduino drives the motors using the L293D Driver using the data received from the IR sensors. When the data is received that the table has reached; the vehicle stops for the items to be taken out and after the set delay; the vehicle moves back to its original position at the kitchen end.

4.2.1 SYSTEM DESIGN

The operation of the whole system can be seen through the block diagram. The 2.4” TFT LCD Touch plus display is used as the input and output for the system design is the lcd module.

The system uses a tft touch module which is placed on each customer's table to make an order. Customers need to select the menu available on the screen. The completed order will be transmitted to the kitchen section once the order button is pressed and the bill can then be sent to the manager.

4.2.2 SYSTEM PROCESS FLOW

The system uses a tft touch module which is placed on each table for the customer to make orders. Order is made by selecting items made available in the menu code on the touch lcd display. Then, the code is decrypted by using arduino UNO. Later it transmits the data via RF transmitter once order is confirmed. The processed data is sent to the LCD display in the kitchen section for ordering purposes through an RF receiver. This system will be done after the customer completed their orders.

For the delivery system; a line follower robot has been selected as the working model.The tables are set to be arranged in a circle and the kitchen will be set at the center of the seating system. The kitchen will send the ordered items via the follower. Manual arrangement of the robot is required for sending out the orders.

1. TRANSMITTER SECTION

In the transmitter section circuitry of our system shown in fig.(1) consist of Arduino UNO which is the brain of the transmitter side that processes all the data and also it is a open source Microcontroller board based on 8-bit ATmega-328P Microcontroller chip. This Arduino UNO board consist of 14 Digital I/O pins in which 6 pins are Analog I/O pin,and the RF transmitter module is used to transmit the selected data to the receiver ie. for transmitting the data from the customer side to kitchen side and for that we have used a RF Transmitter module of 433MHZ which can transmit data at the speed of 10kbps. Afterwards for displaying the menu and taking orders from customers we have used a 2.4 inch TFT LCD Touch shield at the transmitter side. As shown in circuit the data pin of the RF transmitter module is connected to digital pin 12 of Arduino GND while VCC pins are connected to GND and 5V pin of Arduino respectively. After successfully running the simulation we got a

menu list containing dish1,dish2,call waiter etc items at the customer side as shown in fig.(2) and after selecting the desired items by customer and it will be transmitted by RF transmitter module to RF receiver module at the kitchen side.

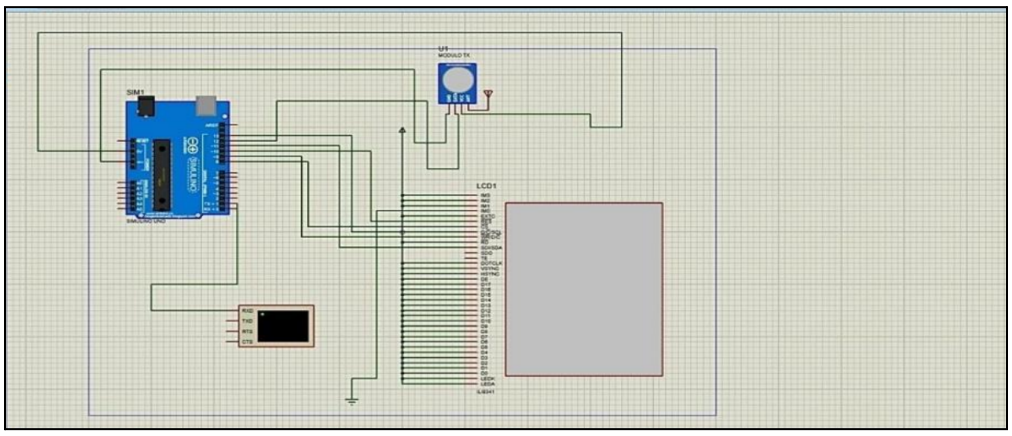


Fig.4.2 Proteus design transmitter section

2. RECEIVER SECTION

The transmitter section circuitry of our system shown in fig.(3) consists of an Arduino Uno, RF Receiver, 16x2 LCD module, and I2C module. Here we have assembled an RF receiver module to receive the data from the transmitter section, and the LCD module is used to display the received data from the transmitter side. Also, we used a buzzer to make a sound whenever a new order was placed and connected the data pin of the RF receiver to digital pin 11 of the Arduino while the GND and VCC pins are connected to the GND and 5V pin of Arduino respectively. We have connected the positive pin of Buzzer to the digital pin 2 of Arduino, and the negative pin is connected to the GND pin of Arduino. Also, SCL and SDA pins of the I2C module are connected to analog pins A5 & A4 Arduino while VCC and GND pins are connected to 5V and GND pins of Arduino. After receiving the data it is shown on the LCD module at kitchen side as shown in fig.(4).

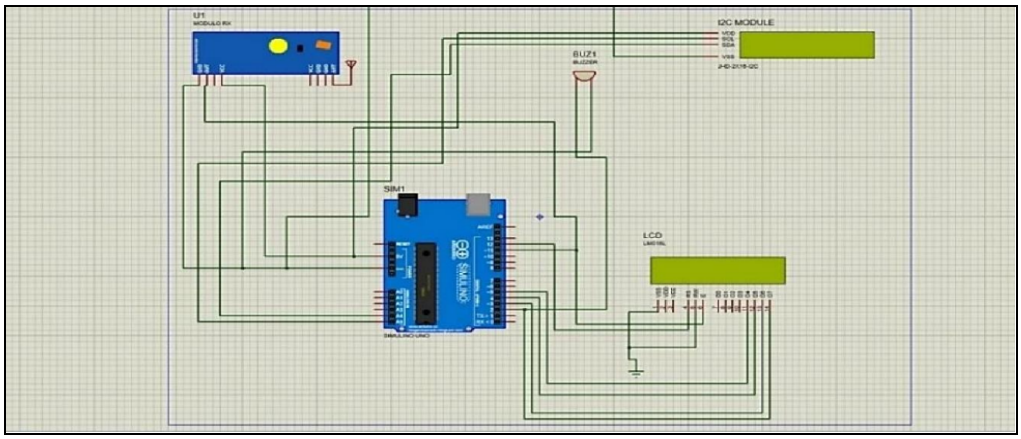


Fig.4.3 Proteus design receiver section

The system uses a tft touch module which is placed on each table for the customer to make orders. Order is made by selecting items made available in the menu code on the touch lcd display. Then, the code is decrypted by using arduino UNO. Later it transmits the data via RF communication once order is confirmed. The processed data is sent to the LCD in the kitchen section for ordering purpose, and to the manager section for the billing purpose.This system will be done after the customer completed their orders.

3. AUTOMATED DELIVERY SYSTEM

The delivery system is run by an ArduinoUno line follower system. The table setup is circular with the line follower following the line path towards the desired table with the dish ordered. The IR sensor detects the end of the path for the robot and switches off the power to the motors. A delay of 20s is set as a working model setup and after the stipulated time; the system automatically powers ON and drives the motors in the reverse direction, returning back to the kitchen area.

4.2.3 SOFTWARE DEVELOPMENT

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. A complete circuit of the entire system was simulated using the software design suite and verified and evaluated. The best software and hardware components were then selected

using the received data and simulated. The received data was used to fix the components needed.

The software Arduino IDE was used in embedded C language. The Embedded C language is used to write a source code for this arduino UNO which is then compiled. When the program can successfully run with no error in the source code, then the arduino UNO will be programmed.

4.3 FLOWCHART

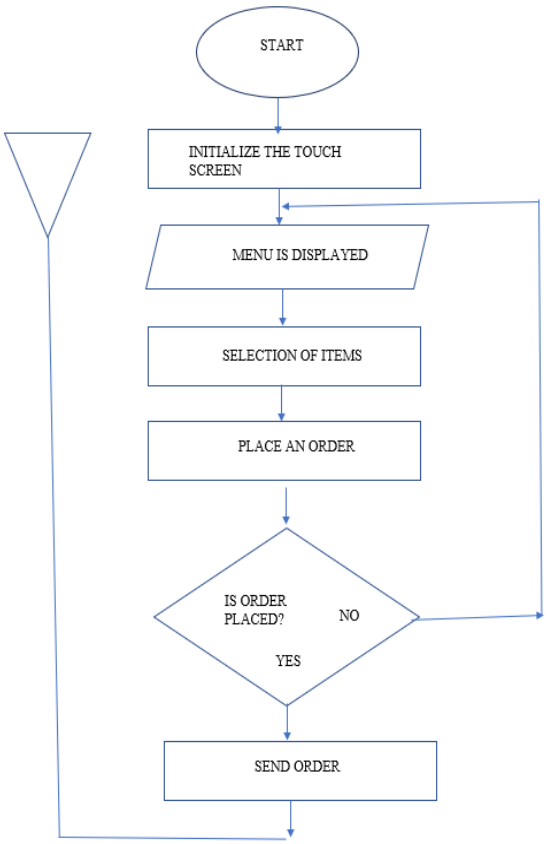


Fig.4.4 Transmitter in Menu ordering system

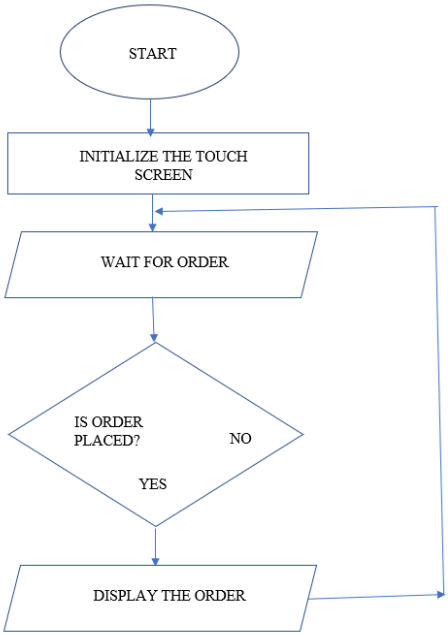


Fig.4.5 Receiver in Menu Ordering System

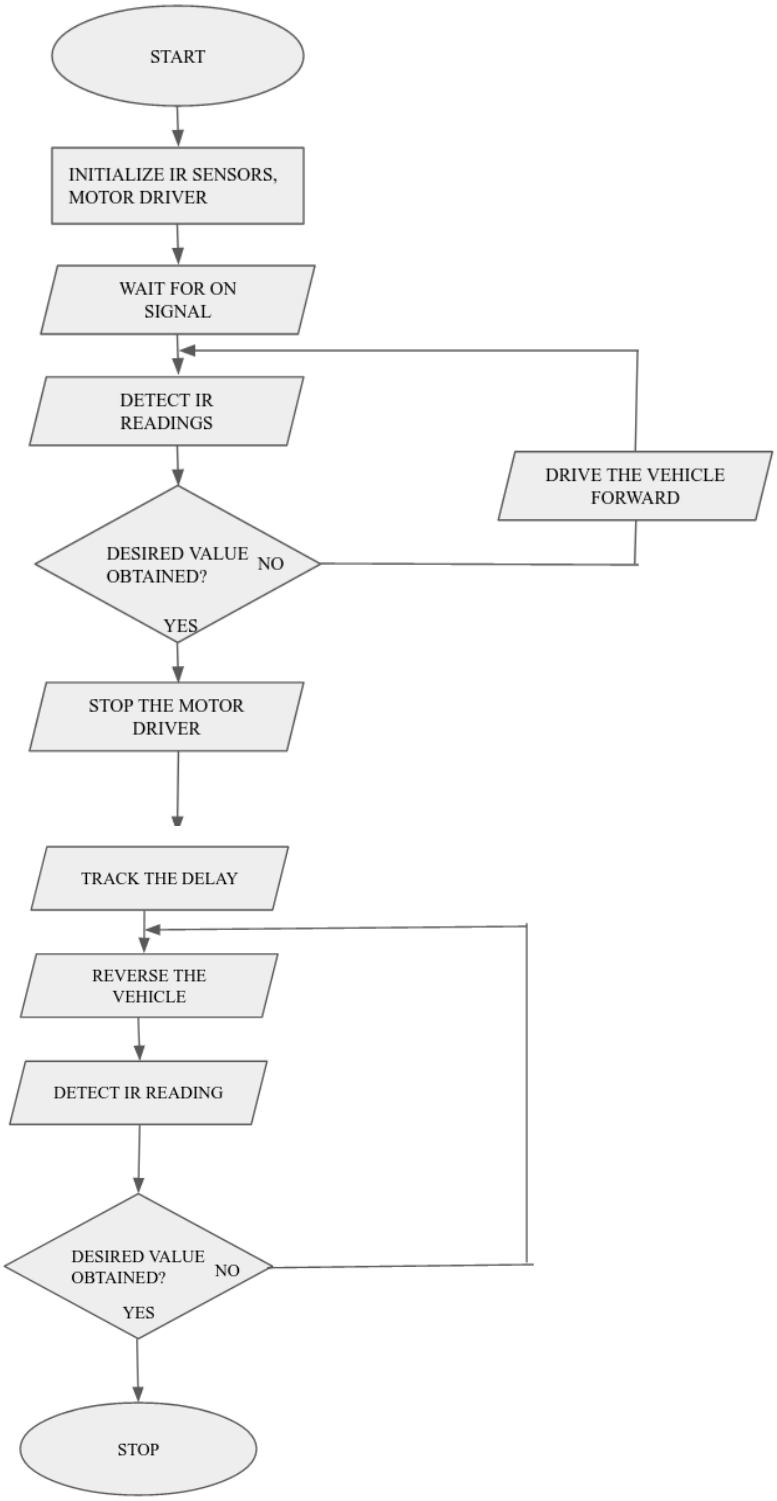


Fig 4.6 Line follower for food delivery

5 SYSTEM DESIGN

This chapter, is discusses the following concepts: Physical design of Smart Menu Ordering cum Autonomous Delivering System, Use case diagram, Modeling concepts, Data flow diagram of Smart System and Entity-relationship design.

5.1 HARDWARE

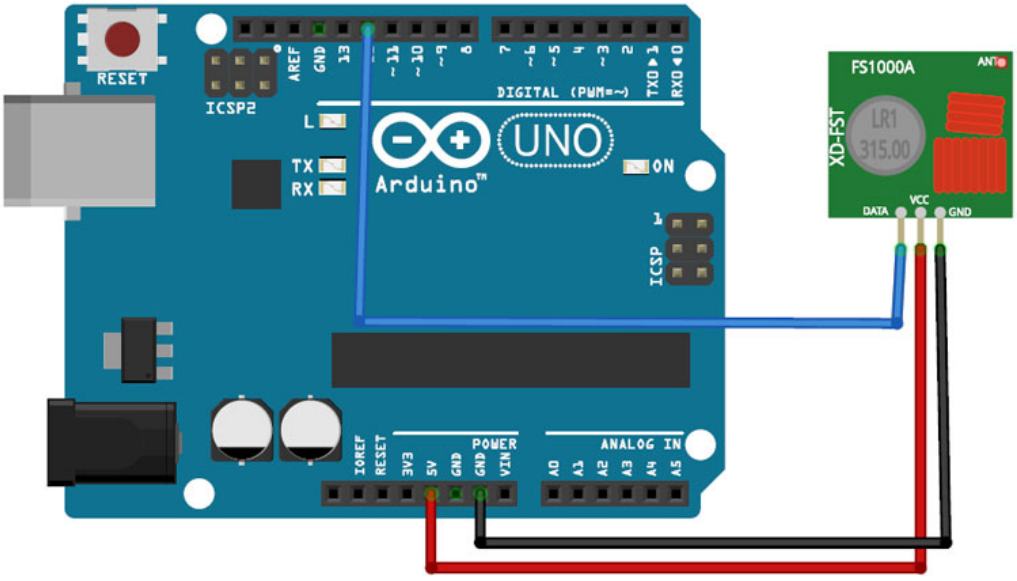


Fig 5.1 Circuit diagram of transmitter

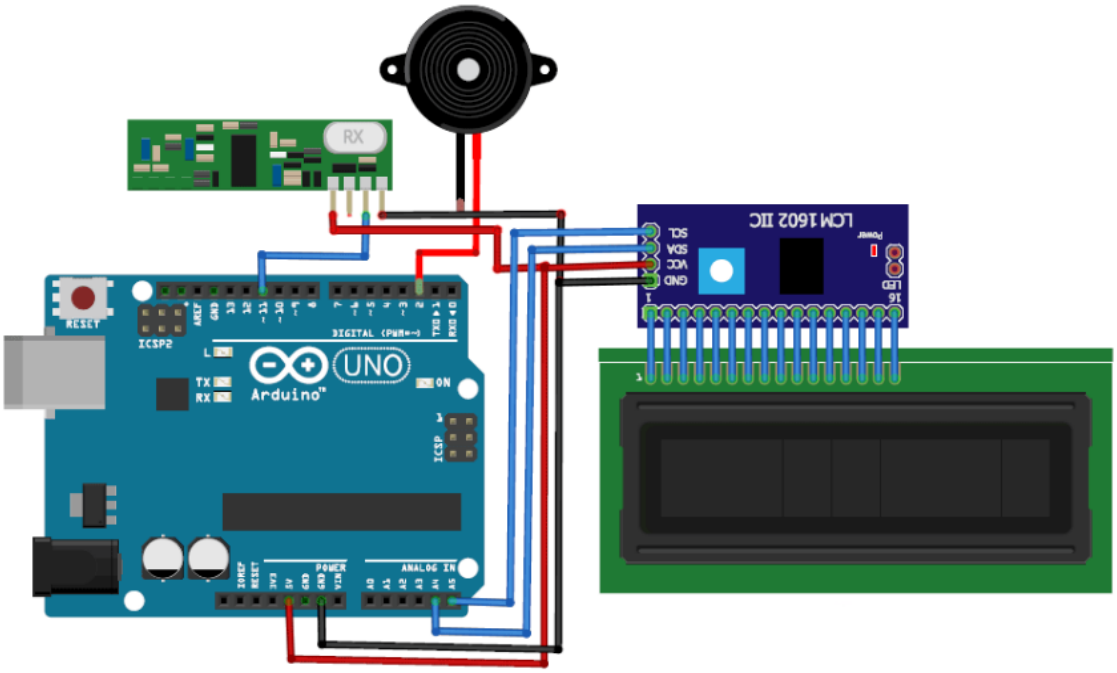


Fig 5.2 Circuit diagram of receiver

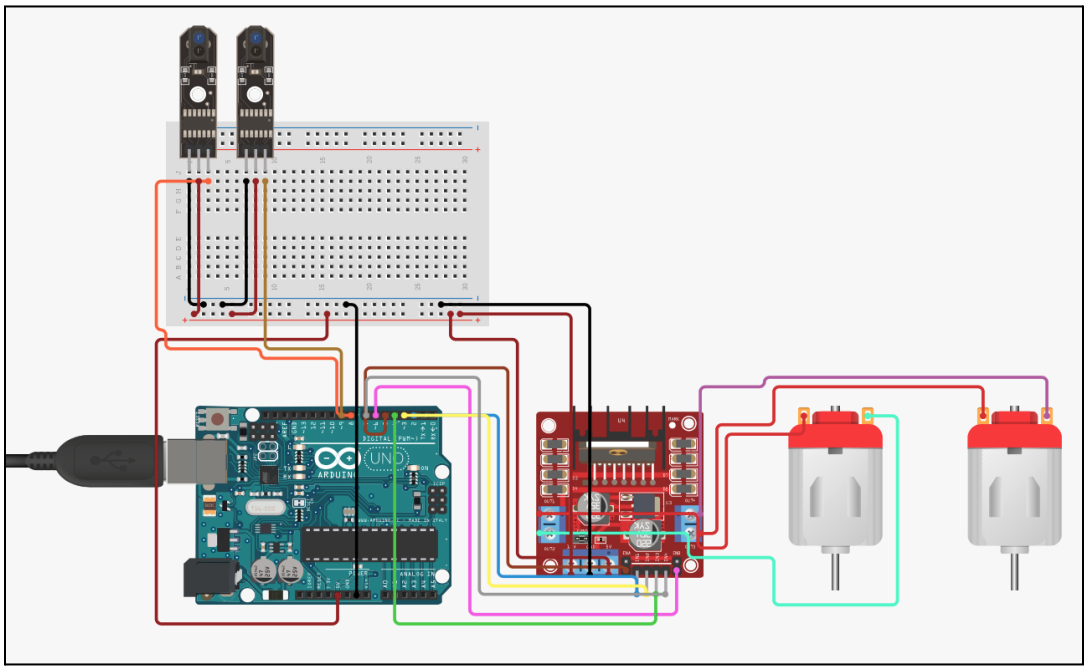


Fig 5.3 Circuit diagram of line follower

COMPONENT	QUANTITY	COST(in INR)
Arduino Uno	2	998
I2C module	1	74
433 MHz RF Transmitter and Receiver	1	113
2.4” TFT Touch Shield	1	445
16x2 LCD Display	1	119

Table 1: List of Components Used for 1st block

COMPONENTS	QUANTITY	COST
Arduino Uno R3	1	499
IR Sensor	2	58
L293D Motor Shield	1	125
Motor	2	110
2WD Car chassis	1	374
Electrical Insulation Tape	1	10

Table 2: List of Components Used for 2nd block

5.1.1 ARDUINO UNO

Arduino UNO is a Microcontroller Board which is based on an 8-bit ATmega328P microcontroller. Along with ATmega-328P, it comprises other components such as voltage regulator, serial communication, crystal oscillator etc. to support the microcontroller. Arduino UNO consists of 14 digital input-output pins where 6 pins of them can be used as analog input pins and another 6 pins of them are used as PWM outputs, Power Barrel Jack, a USB connection , a Reset button and ICSP header. Arduino board can be used to communicate with another Arduino board, a computer or other microcontrollers. The ATmega-328P microcontroller delivers UART TTL (5V) serial communication which can be done using digital pin 0 i.e. Rx and digital pin 1 i.e. Tx.

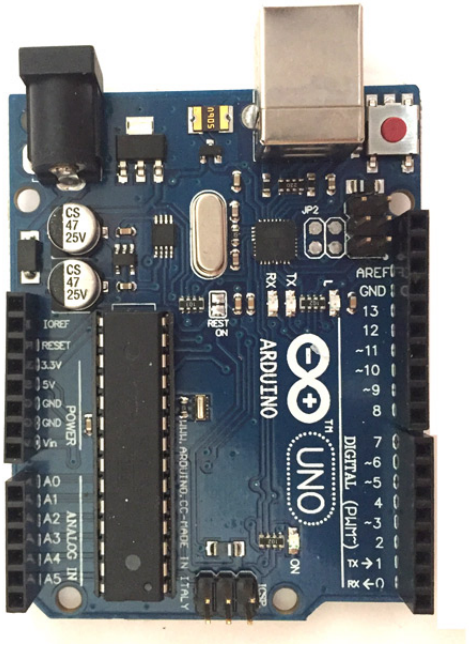


Fig.5.4 Arduino Uno

5.1.2 RF TRANSMITTER AND RECEIVER MODULE

The 433MHZ RF Transmitter and Receiver module is one of the best reasonable and simple to use modules for every wireless project. These types of modules can be used alone in pairs and only Simplex Communication is possible with these modules. The Transmitter (Tx) module has operating voltage +5V only where the operating current ranges between 9mA to 40mA on the other hand the Receiver module has operating voltage range is 3V to 12 V and operating current is 5.5mA .These types of module could cover a minimum of 3 m(meters) and with appropriate antenna power it can cover upto 100 m theoretically. But practically, roughly we can get nearly 30-35 m in normal test conditions and have data transmission speed up to 10 Kbps.

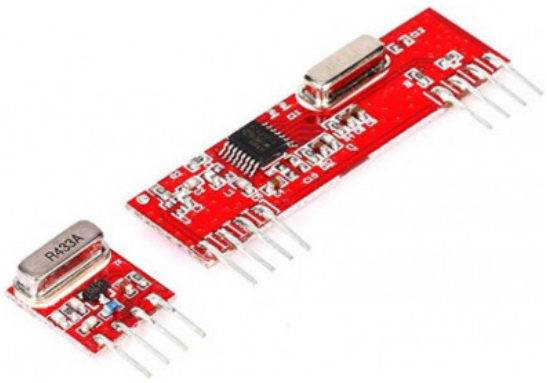


Fig.5.5 433 MHz transmitter and receiver.

5.1.3 2.4" TFT LCD MODULE

A 2.4 TFT LCD module comprises of a Bright backlight and a colorful display of 240*320 pixels. Its main highlighting aspect is individual RGB pixel control which gives a far improved resolution than the black and white displays. A Resistive Touch Screen comes pre-installed along with the module as a bonus and hence you can simply detect your finger presses anywhere on the screen. Its Operating voltage is about 3.3V .It also has SPI and 8-bit operating Mode.

Fig.5.6 2.4" TFT LCD module

5.1.4 16x2 LCD MODULE

LCD modules are generally used in many embedded projects, the reason being its low

Price, Programmer friendly and Availability. It has 2 Rows and 16 columns. There are many combinations are available such as 8×1, 8×2, 10×2,16×1, etc. but commonly used one is the 16×2 LCD module. 16×2 LCD module has 32 characters(ie.16×2=32) in total and each one character has 5×8 Pixel dots. It has operating voltage in between 4.7V to 5.3V and the current requirement is 1mA without backlight in use. Also, it can be operated on both 4-bit and 8-bit mode.

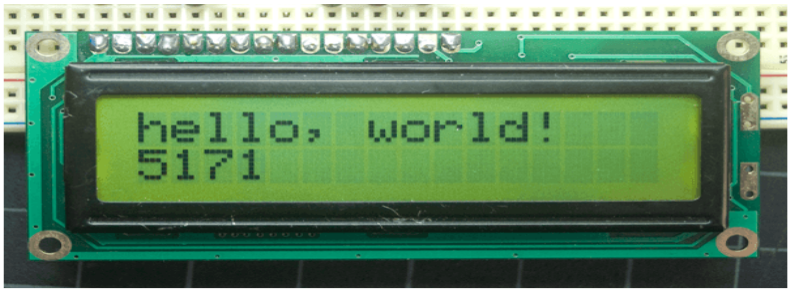


Fig.5.7 16x2 LCD Module

5.1.5 I2C MODULE

For displaying received data on the LCD module we have used I2C module. The I2C Module has an inbuilt PCF8574 I2C chip that converts I2C serial data into parallel data for the display on the LCD. These modules are currently supplied with a default I2C address of 0x3F or0x27. Also, in this module with the help of potentiometer Backlight and Contrast is adjusted.

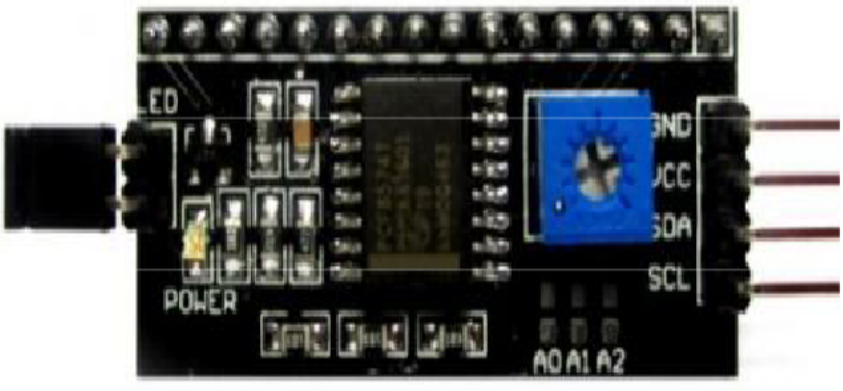


Fig.5.8 I2C Module

5.1.6 L293D MOTOR SHIELD

The L293D is a dual-channel H-Bridge motor driver capable of driving a pair of DC motors or single stepper motor. As the shield comes with two L293D motor driver chipsets, that means it can individually drive up to four DC motors making it ideal for building four-wheel robot platforms. The shield offers 4 **H-Bridges** and each H-bridge can deliver up to 0.6A to the motor. The shield also comes with a 74HC595 shift register that extends 4 digital pins of the Arduino to the 8 direction control pins of two L293D chips.

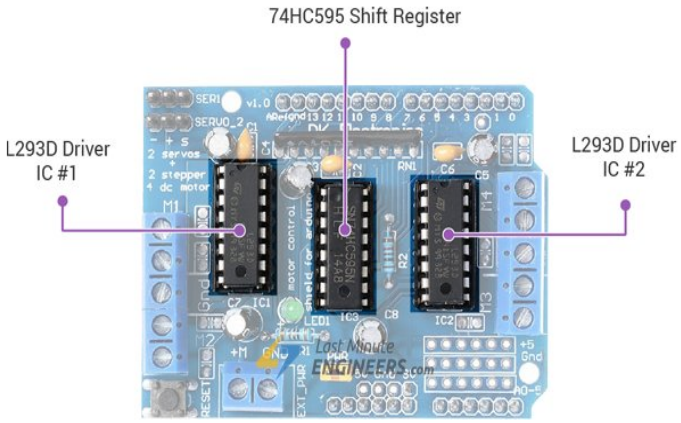


Fig.5.9 L293D Motor Shield

5.1.7 IR SENSORS

The IR sensor has a 3-pin connector that interfaces it to the outside world. The connections are as follows:

VCC is the power supply pin for the IR sensor which we connect to the 5V pin on the Arduino.**OUT** pin is a 5V TTL logic output. LOW indicates no motion is detected; HIGH means motion is detected.**GND** Should be connected to the ground of the Arduino.

The working of the IR sensor module is very simple, it consists of two main components: the first is the **IR transmitter section** and the second is the **IR receiver section.** In the transmitter section, IR led is used and in the receiver section, a photodiode is used to receive infrared signal and after some signal processing and conditioning, you will get the

output. An IR proximity sensor works by applying a voltage to the onboard Infrared Light Emitting Diode which in turn emits infrared light. This light propagates through the air and hits an object, after that the light gets reflected in the photodiode sensor. If the object is close, the reflected light will be stronger, if the object is far away, the reflected light will be weaker. When the sensor becomes active it sends a corresponding Low signal through the output pin that can be sensed by an Arduino or any kind of microcontroller to execute a particular task. The one cool thing about this module is that it has two onboard LEDs built-in, one of which lights on when power is available and another one turns on when the circuit gets triggered.

Fig.5.10 IR Sensor

5.1.8 LITHIUM ION BATTERY

1500mAh 1.5 Volt 1009541 Lithium Li-ion Rechargeable Battery.

Fig 5.11 Lithium ion battery

5.2 CIRCUIT DESCRIPTION

Our Smart restaurant menu ordering system is basically divided into two parts : Transmitter section (Customer Side) and Receiver Section (Chef Side).

- Whenever the customer enters the hotel and takes a table, he will read the menu given on the TFT display which will be mounted on the table. Then after making a suitable decision the customer will place the order using a TFT display with the help of touch-screen or touch-stick system.
- The order will be processed by the Arduino UNO and the data will be sent serially with the help of radio frequency transmitter through antenna to the kitchen.
- The antenna which is at the kitchen side will receive the food order with the help of a radio- frequency receiver installed at kitchen side while Arduino uno will process the data and the chef will see the data with the help of 16x2 LCD display and start preparing food.

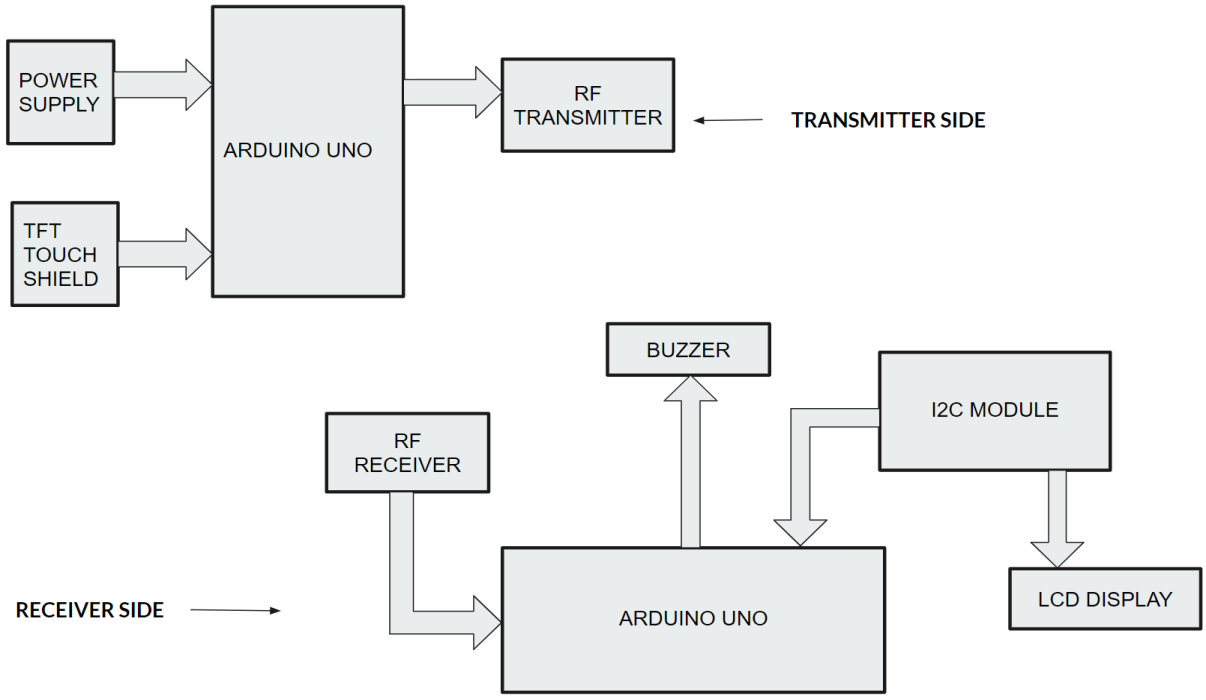


Fig.5.12 Flowchart of transmitter and receiver.

- After the food has been prepared for a table; the line follower arduino system will deliver the order to the respective tables. The table input will be provided to the arduino and the

follower processes the data to evaluate and follow the required path.

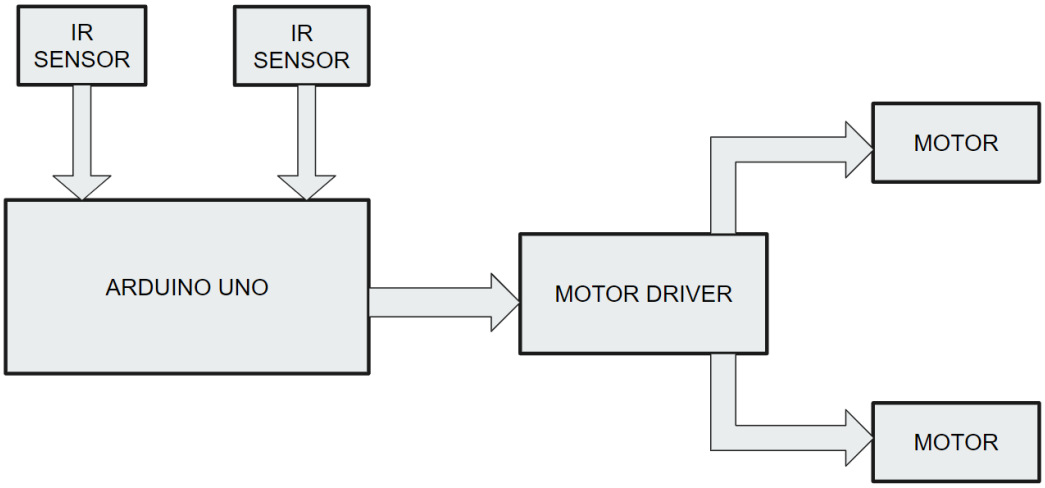


Fig.5.13 Flowchart of line follower robot

5.3 SOFTWARE

5.3.1 ARDUINO IDE 1.8.0

The Arduino Integrated Development Environment - or Arduino Software (IDE) contains a word processor for creating code, a message zone, a substance console, a toolbar with gets for typical limits and a movement of menus. It complies with the Arduino and Genuino equipment to trade projects and converse with them.

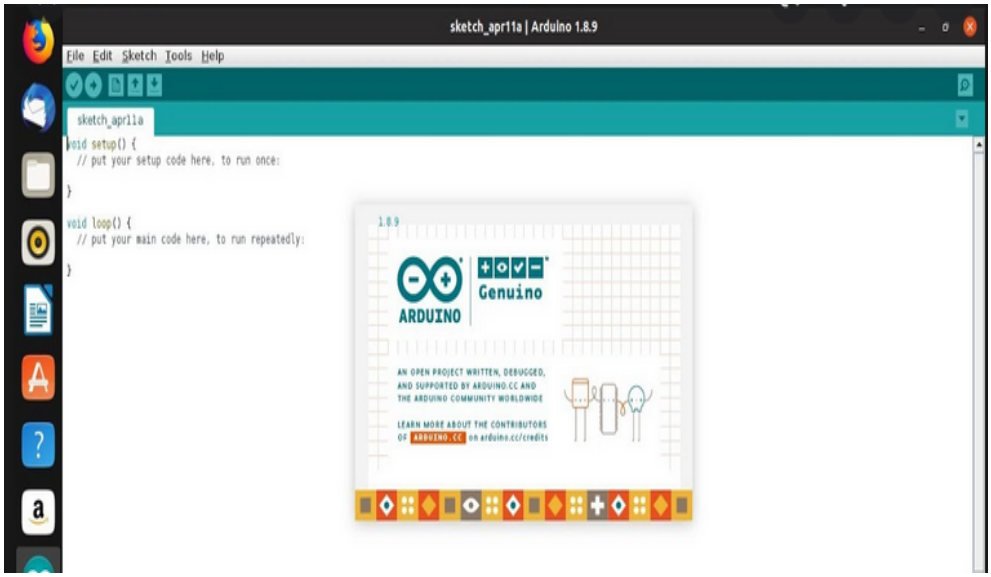


Fig. 5.14 Arduino IDE

5.3.2 PROTEUS SOFTWARE

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. The microcontroller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables its use in a broad spectrum of project prototyping in areas such as motor control, temperature control and user interface design.It also finds use in the general hobbyist community and, since no hardware is required, is convenient to use as a training or teaching tool. Support is available for co-simulation of:

- Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, dsPIC33 microcontrollers
- Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 microcontrollers
- NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 microcontrollers
- Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 microcontrollers
- Parallax Basic Stamp, Freescale HC11, 8086 microcontrollers

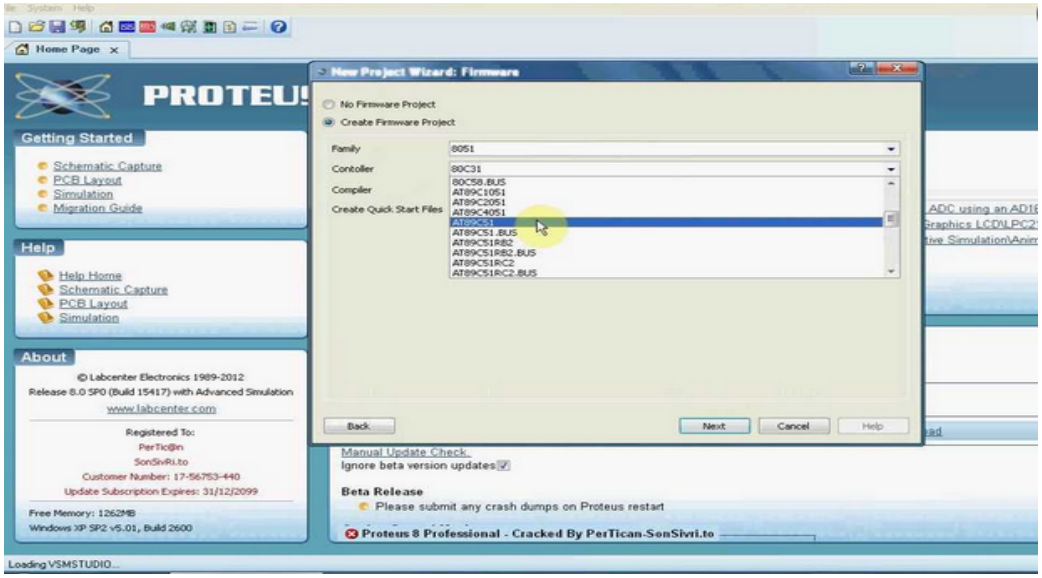


Fig.5.15 Proteus software

5.4 ALGORITHM

5.4.1 ALGORITHM FOR TRANSMITTER SECTION IN MENU ORDERING SYSTEM

- Start the code by including all the required libraries in arduino software. *RH_ASK.h* library is used for communication between transmitter and receiver modules. *SPFD5408_Adafruit_GFX.h* is a Core graphics library for TFT display.
- An object called 'driver' is created for *RH_ASK* after that.
- Then define the minimum and maximum calibrated X & Y-axis values for the 2.4" TFT touch shield.
- Now inside the drawHome() function draw a layout for your TFT screen. Here *tft.fillScreen* is used to set the background color.
- Syntax for *tft.drawRoundRect* function is given below:

  tft.drawRoundRect(int16_t x0, int16_t y0, int16_t w, int16_t h, int16_t radius, uint16_t color)

  Where:

  x0= X coordinate of the starting point of rectangular

  y0= Y coordinate of the starting point of rectangular

  w = Width of the rectangular

  h = Height of the Rectangular

  radius= Radius of the round corner

  color = Color of the Rect.

- *tft.drawRoundRect* function is used to create a filled Rectangle.
- *tft.fillRoundRect* function is used to draws a filled Rectangle
- After creating the buttons on the TFT screen, the text is displayed on the buttons. *tft.setCursor* is used to set the cursor from where you want to start the text.

- Inside the void transmit function, send the data to the receiver side every 1 second.
- Inside the void loop function, read the Raw ADC value using the *ts.getPoint* function.
- Then use the map function to convert the Raw ADC values to Pixel Coordinates.
- After converting the Raw ADC values into pixel coordinates, enter the pixel coordinates for the Dish1 button and if someone touches the screen between this area then send the message to the receiver side.
- The same procedure is followed for all other buttons.

5.4.2 ALGORITHM FOR RECEIVER SECTION IN MENU ORDERING SYSTEM

- For the RF receiver section code, include the libraries for RF receiver and LCD module - *RH_ASK.h* & *LiquidCrystal_I2C.h* . Also include the *SPI.h* library for establishing an SPI communication between Arduino and RF receiver.
- Inside the void loop function, continuously check for transmitted messages. Once the receiver module receives a message, then display the message on the LCD module.

5.4.3 ALGORITHM FOR LINE FOLLOWER DELIVERING SYSTEM

- Install AFMotor.zip library for using the L293D Motor Shield.
- Initialize the motor values in the setup() function and in the loop() function; use the IR sensor values to enable the motors and drive it in the desired direction.
- If the stop tape values are obtained; the motor stops with a delay() and then drives the system in the reverse direction.

5.5 WORKING OF THE PROJECT

Using the components discussed and explained earlier the working model of the proposed system was designed. The first task was the designing of the transmitter section. We found the use of 433 MHz transmitter-receiver adequate and capable for obtaining the feature we desired in the proposed model. The circuit diagram was designed and tested using Proteus software. The

limitations and notable control conditions required for the system were analyzed and a detailed set of requirements were established.

The block diagram gives an overview on the said system. Secondly, the receiver section was designed and analyzed using the same methods. This was used to establish the receiver block diagram. To check the system working, first the transmitter alone was enabled and the working was understood using the serial monitor of the Arduino IDE. The receiver working was also individually established by reading the reference ID of the device.

Then the transmitter and receiver was integrated; powered using two computer systems and the efficiency of the working model was scrutinized using the serial monitor display values.

Finally the complete set up was integrated together and various combinations of instructions were given through the touch shield and the output display at the LCD display was verified.

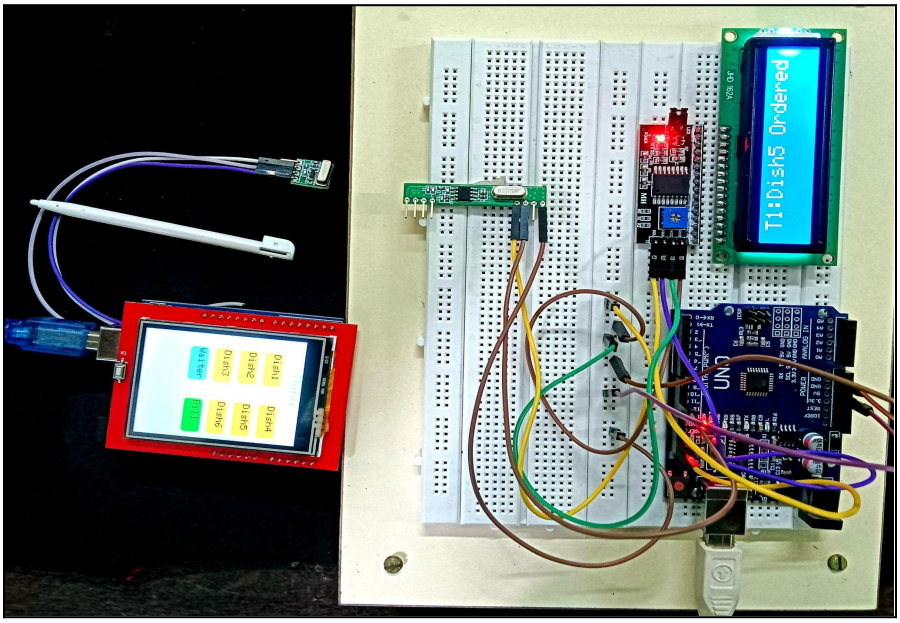


Fig 5.16 Menu ordering system.

The second part of the project; the arduino based line follower food delivering system was wired first using the basic wiring setup available on the internet. Changes were made in the coding and the setup of the rest of the system. Our system required the integration of a plate tray for carrying the food items and the integration of an aesthetically pleasing look for the serving system.

Subsequent changes in the coding of the model were also made using the feature ideas we required.

The resulting system was wired and modifications were made according to the different movements observed and the values were modified until the required pathway/movement characteristics were observed.

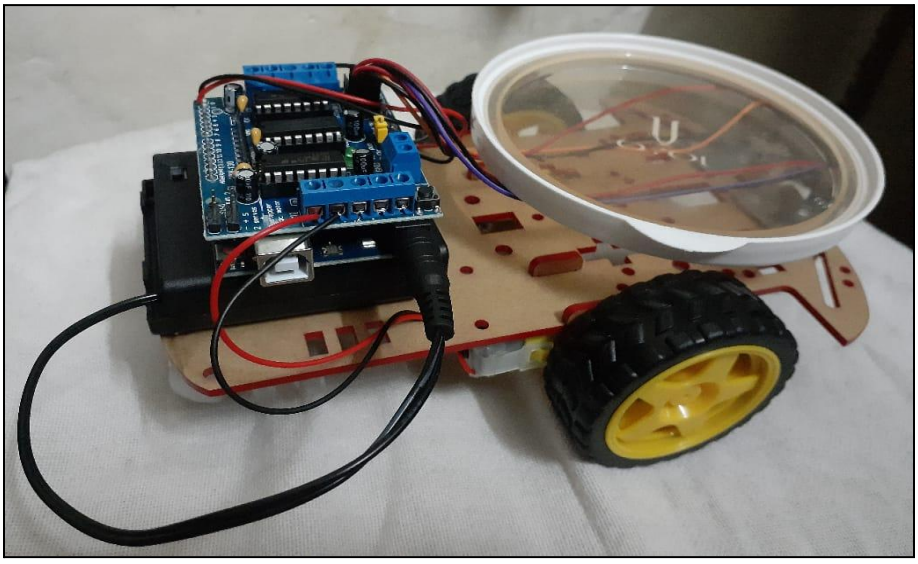


Fig 5.17 Food Delivering system

5.6 COMPONENT TESTING

5.6.1 ARDUINO UNO

We started off by setting each channel to ground and power and read the output in the Serial Monitor. The steps involved were

- We connected one end of the wire to A0 port and the other end to GND port
- Analog0 in the Serial Monitor read 0.0 volts
- The wire from GND was then removed and connected to 5V
- Analog0 now read approximately 5.0 volts
- The same wire was removed from 5V and connected to 3.3V
- Analog0 read approximately 3.3 volts then
- The same procedure was repeated with A1, D2 and D3

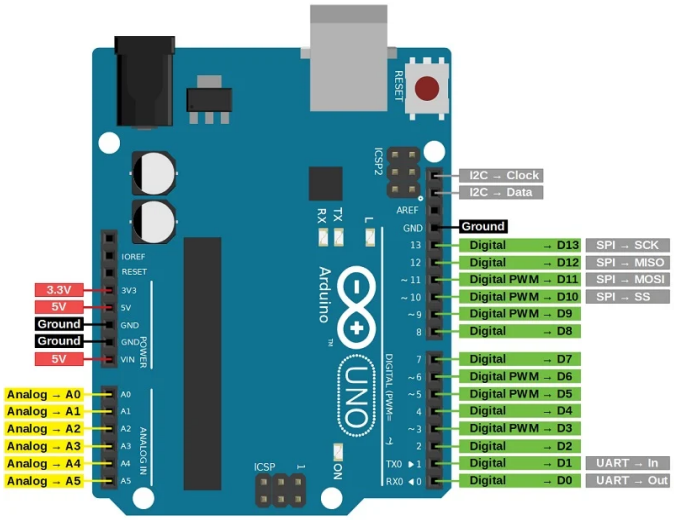


Fig 5.18 Arduino Uno

5.6.2 16x2 LCD DISPLAY AND I2C MODULE

The connections were made as shown in figure. Arduino Uno and I2C module connections are as follows:

- Analog Pin 4 - SDA
- Analog pin 5 - SCL
- 5V - Vcc
- GND - GND
- The arduino was then connected to the computer.

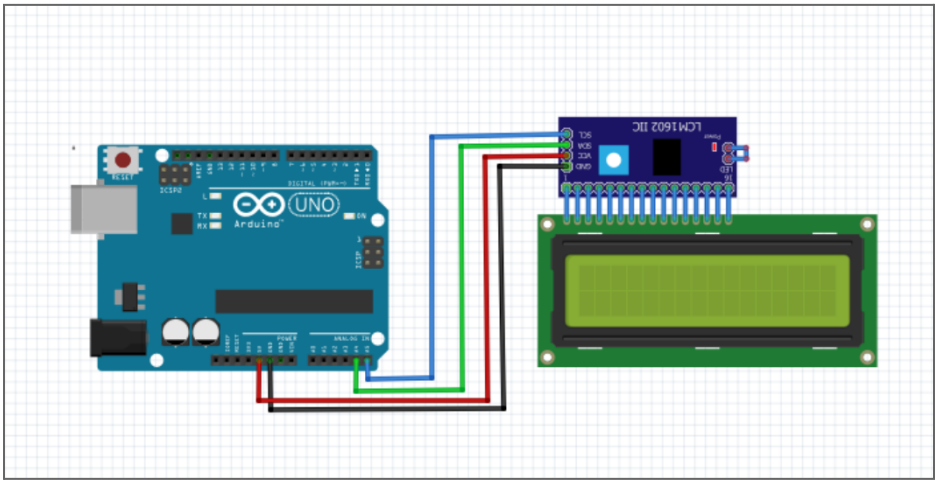


Fig 5.19 16x2 LCD Display and I2C Module

After that, an example code was run to confirm their proper working.

5.6.3 TFT TOUCH SHIELD

TFT Touch Shield was tested using the Graphic test and tft paint examples from SPFD5408 TFT library and Adafruit GFX Library in Arduino.

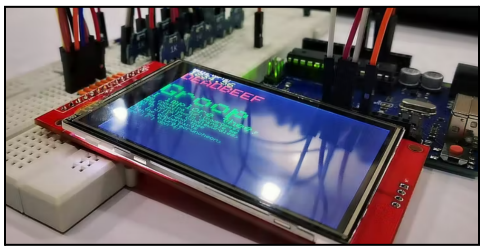


Fig 5.20 TFT Touch Shield

5.6.4 433 MHz RF TRANSMITTER AND RECEIVER

The RadioHead Library is used for checking the working of RF transmitter and receiver.

TRANSMITTER SIDE

Transmitter module is wired to the Arduino by the following schematic diagram.

Here we send a message “Hello World” using the transmitter.

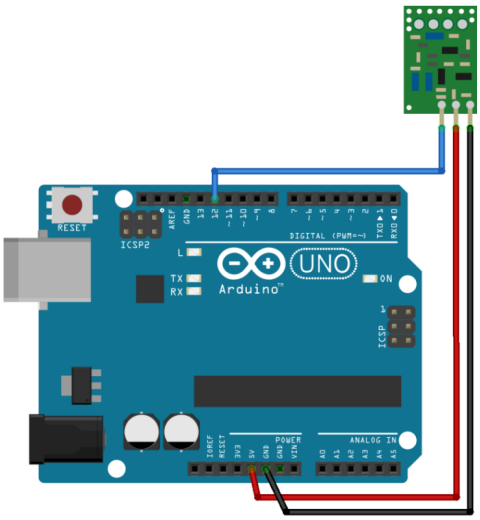


Fig 5.21 Transmitter circuit

RECEIVER SIDE

The receiver module is wired to the arduino as follows.Here in the code, inside the loop() function, we set a buffer that matches the size of the message we'll receive. "Hello World!" has 12 characters so we adjusted the buffer size accordingly to the message we'll receive.Then, we checked if we received a valid message. The message was printed on the serial monitor.

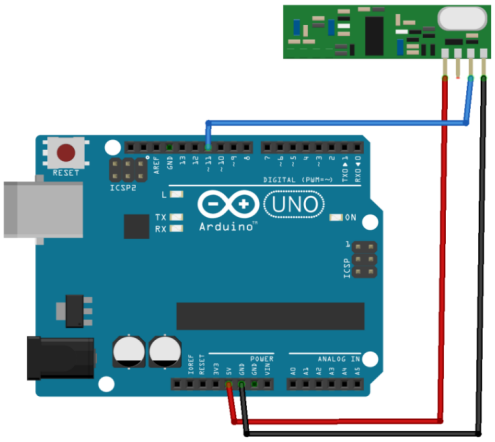


Fig 5.22 Receiver circuit

5.6.5 MOTOR DRIVER

Plugged one motor into the terminal labeled OUT1 and OUT2. Plug the second motor into the terminal labeled OUT3 and OUT4. The row of pins on the bottom right of the L293D control the speed and direction of the motors. IN1 and IN2 control the direction of the motor connected to OUT1 and OUT2. IN3 and IN4 control the direction of the motor connected to OUT3 and OUT4. Power the L293D with up to 12V by plugging the power source into the pin on the L293D labeled "12V". The pin labeled "5V" is a 5V output that you can use to power the Arduino.

Setting IN1 to HIGH and IN2 to LOW will cause the left motor to turn a direction. Setting IN1 to LOW and IN2 to HIGH will cause the left motor to spin the other direction. The same applies to

IN3 and IN4. Setting IN1 to HIGH and IN2 to LOW will cause the left motor to turn a direction. Setting IN1 to LOW and IN2 to HIGH will cause the left motor to spin the other direction. The same applies to IN3 and IN4. To change the speed in the code, use the analogWrite() function on the ENA and ENB pins.

Various combinations of the different conditions were applied to test the components and it was verified with the results.

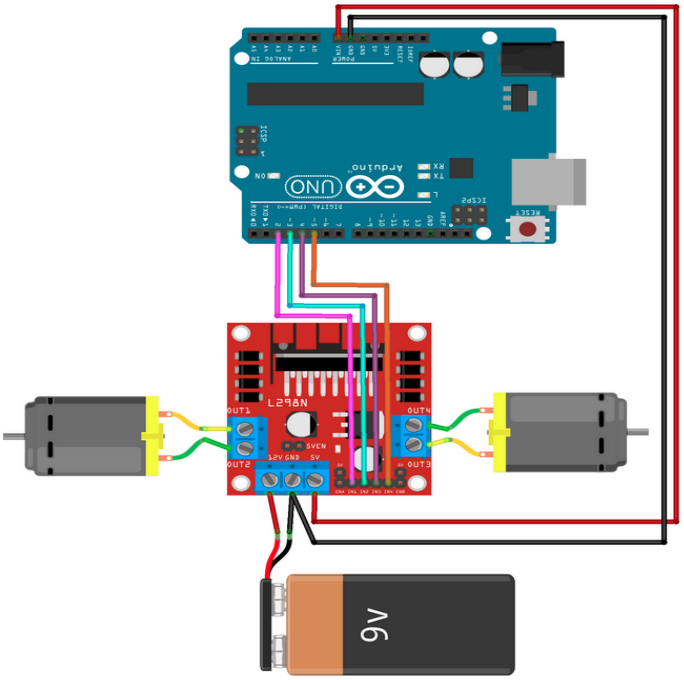
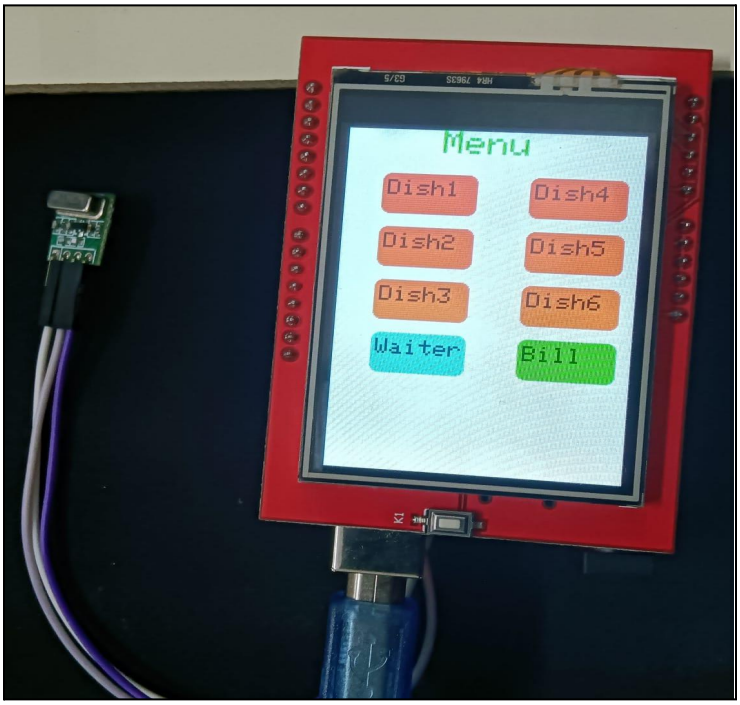


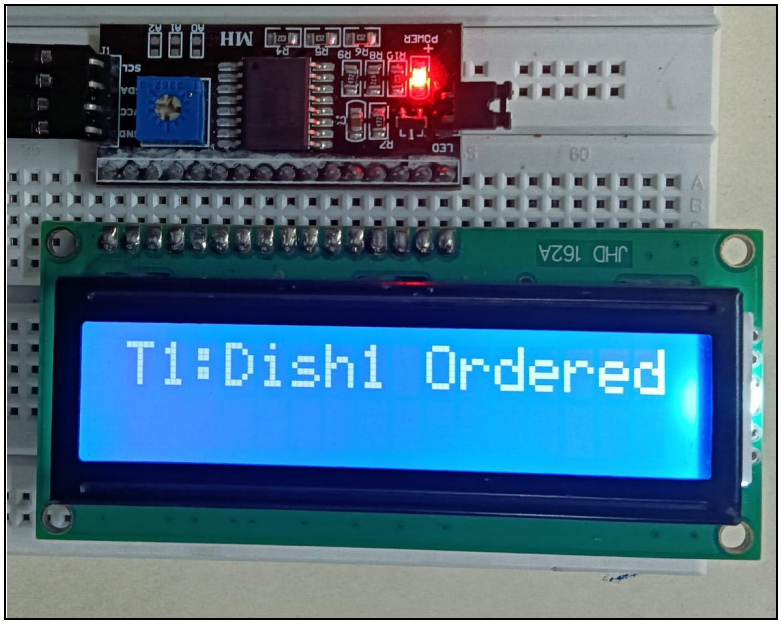
Fig 5.23 Line Follower circuit

6 RESULT

For the menu ordering system; input is given to tft display connected to arduino uno whose interface is shown below



When we select a particular dish;it will be sent to the kitchen and it can be viewed on the lcd display.



When the food gets ready;the line follower sends the food to the corresponding tables.

7 CONCLUSION AND FUTURE SCOPE

7.1 CONCLUSION

The general objective of the project was to develop an automated restaurant menu ordering and delivering system using Arduino, with the general aim to exclude paper-based menu card and talk menu ordering which was done manually. This system was developed to digitalize the menu cards to avoid daily printing paper-based menu cards, and to deliver their order without any need for a staff. This system comes to help customers, restaurant's employees as well as the owner.

In this project, we have proposed a system which is an extraordinary headway in technology because of its highlights like minimal expense and usability. This system permits a quicker and more advantageous admittance to the world. Restaurant automatization is a progressive idea and makes certain to overwhelm individuals. This system is helpful, viable and simple along with improving the exhibition of the restaurant's staff. It will likewise give new dining habits to individuals and transpose the way of people to dine. It would prompt expanded incomes and give the customers a superior insight of what kind of food they wish to have to give customers an extraordinary experience of dining. There is an extraordinary progression in this system because of its main advantages like minimal expense and convenience. These types of systems empower a quicker and more helpful access to the world. This system is fruitful, convenient and simple ,subsequently improving the functionality of the restaurant's staff.

Also, Some components can be added to this system later on to make it more intelligent and easy to use. One of the components is to add the diversion page like games, films or music etc. The customer can use this application during food readiness and keep them from exhausted of holding up during top hour

7.2 FUTURE SCOPE

This Automated Restaurant System has great potential to make a big change in the hotel industry. This will entirely change the way the people order their food from restaurants or hotels.

Currently this system is capable of having the Menu of an individual brand of restaurants. But it can be designed to encompass a Digital Menu of all the hotels and restaurants, all in one place which will give the customers more comfort. This way the customers can easily browse through the different menus of a variety of hotels and pick up the right dish according to their need and taste. This expansion to hold the menu details for all the hotels is the true potential of this system. This feature can also be added in future along with improvement in quicker and simpler, responsive user friendly interface. In this way this system can become a great product for the customers and entirely change the way food is ordered and delivered and the way in which industry is operated.

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