SEED SOWER

REPORT

Submitted by

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in partial fulfillment for the completion of course Engineering Design Project

of

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

THIAGARAJAR COLLEGE OFENGINEERING, MADURAI–15

(A Govt. Aided, Autonomous Institution, Affiliated to Anna University)

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THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-15

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BONAFIDECERTIFICATE

Certified that this project report "**SEED SOWER"** is the bonafide work of

"**AJAY SS(19C003), DINESH RR (19IT024), SANJAY M (19IT083)**"

who carried out the project work under my supervision during the Academic Year 2020 -2021.

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ABSTRACT

In this fast growing world, it is necessary to make all the things faster and in easier manner. Technology should be used in various fields so that we can achieve the things being done in easier manner. Agriculture is the vital source of occupation for most of the farmers. It is still the only occupation for the village people in India even today. So, it is necessary to use technology to make the farming process easier, thereby helping the farmers. Our project is to create a seed sowing buggy so that farmers can use it sow seeds in the field after ploughing. This is an IOT (Internet of Things) project

In the farming process, often used conventional seeding operation takes more time and more labor. The seed feed rate is more but the time required for the total operation is more and the total cost is increased due to labor, hiring of equipment. The conventional seed sowing machine is less efficient, time consuming. Today's era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production.

In the present scenario most of the countries do not have sufficient skilled man power in agricultural sector and that affects the growth of developing countries.

Therefore farmers have to use upgraded technology for cultivation activity(digging, seed sowing, fertilizing, spraying etc.).

So it's a time to automate the sector to overcome this problem which in turn will also eliminate the requirement of labourers and also avoid the wastage of seeds.

PROBLEM DESCRIPTION

PROBLEM STATEMENT

Agriculture is the backbone of Indian economy. About half of the total population of our country has chosen agriculture as their chief occupation. The states like Maharashtra, Punjab, and Kerala, Assam are highly involved in agriculture. It all started due to the impact of, "Green Revolution" by means of which farmers came to know about the various techniques involved in farming and the advantages in it. As centuries passed, certain modern techniques were invented in agriculture due to the progress in science. These modern techniques included the use of tractors for ploughing the field, production of pesticides, invention of tube-wells etc. Since water is the main necessity in this scenario, techniques were discovered which would help in watering the field easily, consume less water and reduce human efforts. These discoveries improved the standard of living of farmers. Agro-Technology is the process of applying the technology innovation occurring in daily life and applying that to the agriculture sector which improves the efficiency of the crop produced and also to develop a better Mechanical machine to help the agriculture field which reduces the amount and time of work spent on one crop. Hence in this work of project we decided to design a better mechanical machine which is available to the farmers at a cheaper rate and also which can sow and seed the crop at the same time. This project consists of the better design of the machine which can be used specifically for sowing of soybean, maize, pigeon pea, Bengal gram, groundnut etc. For various agricultural implements and non-availability of sufficient farm labor, various models of seed sowing implements becoming popular in dry land regions of India. The success of crop production depends on timely seeding of these crops with reduced dull work of farm labor. The ultimate objective of seed planting using improve sowing equipment is to achieve precise seed distribution within the row

SUBJECT DOMAIN

- This project consists of two parts. The first one is to make a buggy that will follow a line. Another part is to use the line follower to make a seed sower by installing the seed sowing feature. This is part of the subject domain of IOT (Internet of things)

- The Internet of Things (IoT) describes physical objects (or groups of such objects) with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks.

- The field has evolved due to the convergence of multiple technologies, including ubiquitous computing, commodity sensors, increasingly powerful embedded systems, and machine learning. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), independently

and collectively enable the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home" and valid in many cases of use in Agriculture.

SOCIETY RELEVANCE

- The Sustainable Development Goal to “End hunger, achieve food security and improved nutrition and promote sustainable agriculture” (SDG2) recognizes the inter linkages among supporting sustainable agriculture, empowering small farmers, promoting gender equality, ending rural poverty, ensuring healthy lifestyles

- Beyond adequate calories intake, proper nutrition has other dimensions that deserve attention, including micronutrient availability and healthy diets. Inadequate micronutrient intake of mothers and infants can have long-term developmental impacts. Unhealthy diets and lifestyles are closely linked to the growing incidence of non-communicable diseases in both developed and developing countries.

- By making the life of farmers easy by reducing effort needed to sow seeds, efficiency can be improved in turn which increases the time farmers have in hand and allow a larger part of land to be sown in shorter time with very fewer manual labor

- Agriculture systems worldwide must become more productive and less wasteful. Sustainable agricultural practices and food systems, including both production and consumption, must be pursued from a holistic and integrated perspective.
  Land, healthy soils, water and plant genetic resources are key inputs into food production, and their growing scarcity in many parts of the world makes it imperative to use and manage them sustainably. Boosting yields on existing agricultural lands, including restoration of degraded lands, through sustainable agricultural practices would also relieve pressure to clear forests for agricultural production. Wise management of scarce water through improved irrigation and storage technologies, combined with development of new drought-resistant crop varieties, can contribute to sustaining drylands productivity.

- Halting and reversing land degradation will also be critical to meeting future food needs. The Rio+20 outcome document calls for achieving a land-degradation-neutral world in the context of sustainable development. Given the current extent of land degradation globally, the potential benefits from land restoration for food security and for mitigating climate change are enormous. However, there is also recognition that scientific understanding of the drivers of desertification, land degradation and drought is still evolving.

- There are many elements of traditional farmer knowledge that, enriched by the latest scientific knowledge, can support productive food systems through sound and sustainable soil, land, water, nutrient and pest management, and the more extensive use of organic fertilizers.

- This application of automating the sowing process will bring about a quick end to the time taking task of sowing which in turn lets improve the farm's efficiency and reduce human labor.

BACKGROUND

A. LITERATURE SURVERY

s.no	Author	Title	Name of journal/conference	Year of issue	Algorithm/ method	Observations
1.	B R Jerosheja; C Mythili	Solar Powered Automated Multi-Tasking Agricultural Robot	IEEE	2020	PIR and image processing IOT based	Very versatile but high cost robot that accomplishes sowing .
2.	D. Yamunathangam; J. Shanmathi; R. Caviya; G. Saranya	Payload Manipulation for Seed Sowing Unmanned Aerial Vehicle through interface with Pixhawk Flight Controller	IEEE	2020	Semi automatic UAV by path	Might have Improper seed placement on unideal conditions
	R. Suganya , U. Jayaranjani	Design of Solar Powered Automatic Pesticide Sprayer, Grass Cutter and Seed Sower using	IJIRT	2022	IOT based and WIFI	It has low maintenance costs.

		WIFI				

B. IPR SEARCH

s no.	Patent number/ file	Inventor	Applications	status
1.	**312020**	**MURLIDHAR HAJARIMAL PATWARI.**	**MULTI-USE SOLAR AGRO ROBOT USE IN AGRICULATURE HOROTICULTURE.**	**REGISTERED**
2.	**1502207**	**EXCEL CROP CARE LIMITED**	**REMOTE SOWER AGRICULTURE, FORESTRY AND HORTICULTURE**	**REGISTERED**
3.	**1964670**	**NITTA GELATIN INDIA LTD**	**TREATED SEED IMPLANTATION, SEED GROUND FORTIFICATION**	**REFUSED**

C. SCOPE OF THE PROBLEM / OBJECTIVES

The Objectives are

- Implement seed sower in an efficient but effective manner.
- To potentially replace existing practices of sowing seeds.
- To promote the aid of sustainable goal 2 of ending world hunger
- To provide a simple UI that farmers can control to sow seeds
- To reduce the load of resources and attention the process of sowing takes.

D. CONSTRAINTS / LIMITATIONS

- The cost of the final product should be low as much as possible.
- The product should be easy to handle.

- The product should be fully automated.
- The product should be industrially approved.
- The battery power of the product should be long lasting.

DESIGN REQUIREMENTS / PROJECT SPECIFICATION

A. SCHEDULE / TIMECHART

Activities	Duration
Gathering of requirements and project approval	7 days
Setting up of workspace	12 days
Assembling the parts and making connections	30 days
Testing of the final design	4 days
Getting approval for the final design from stakeholders	12 days

B. BUDGET

Buggy cost should around 3000 rs

The mobile app is free

- Simple arduino costs around 500 rs
- 12 volted DC motor costs around 300 rs
- The power bank required for powering up the raspberry pi/arduino costs around 2000 rs
- The driller for sowing costs around 2100rs

C. RISK FACTORS

- Device is susceptible to power failures
- Pests could potentially disrupt functionality of device temporarily
- Interruption in the internet connectivity to the IoT kits.
- Very unstable terrain could make device tip over
- Potential device failure on exposure to water

D. TEAM MEMBERS ROLES AND RESPONSIBLITIES

- Dinesh R R (IOT KIT and Android app)
- Ajay S S (Android App)
- Sanjay M (IOT KIT)

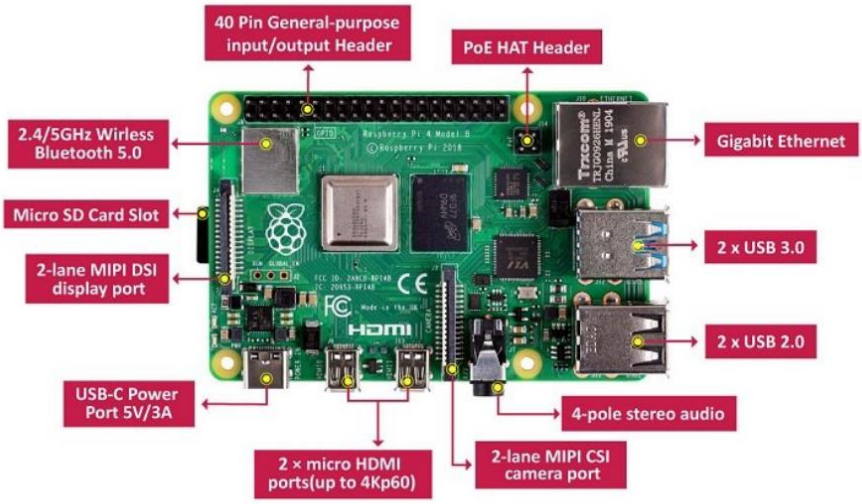
PROPOSED METHODOLOGY

The Problem statement is to build a Buggy which has an Automated seed sowing ability. The Buggy is also known as “SEED SOWER”. As the Problem solution has find its way by using a Locomotive Buggy, it is important that the Buggy should move in a specified path by the User.

Line follower is the name of the buggy which will move in a direction of a line. For laying seeds n a fertile land, farmers used to sow their seeds in a linear fashion. So it is necessary for the seed sower to move in a linear fashion. The line follower is the half completed project for the seed sower. The components of the line follower are:

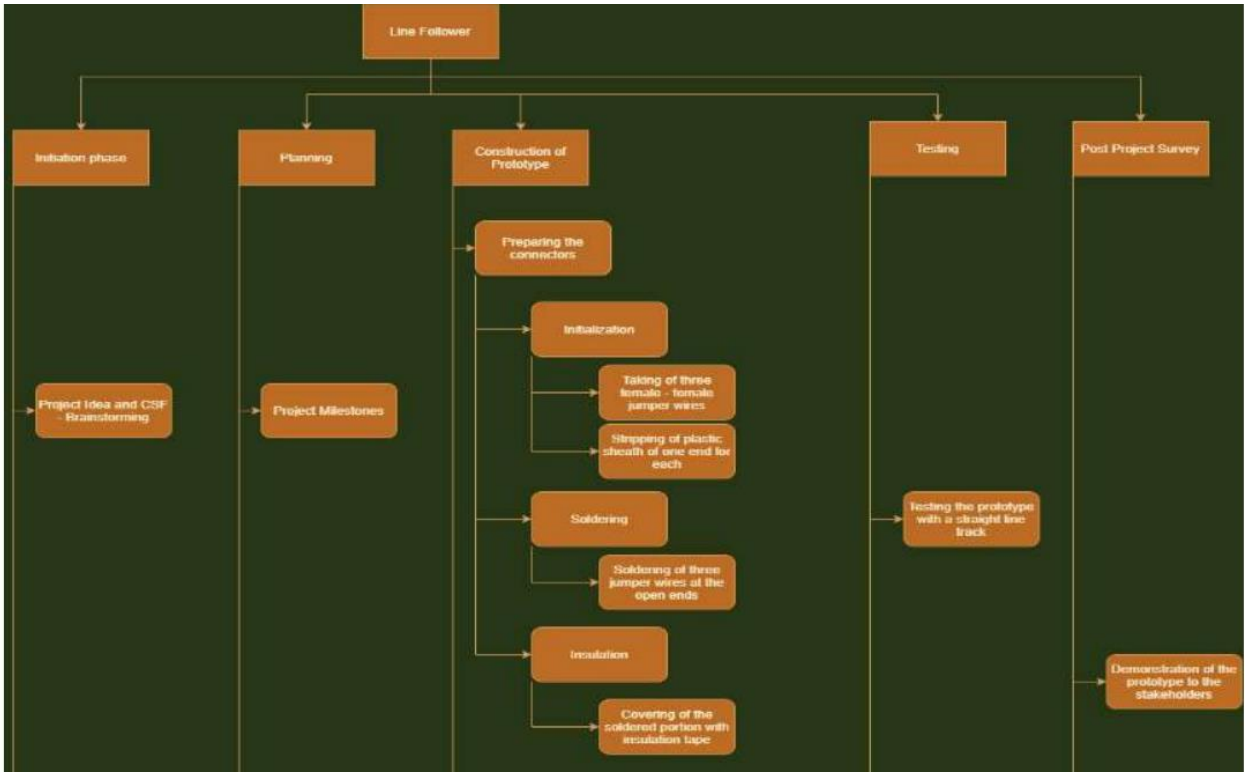
- Raspberry pi 4 IOT module
- Arduino Uno IOT module
- 1x Motor controller board
- 2x Hobby gear motors
- 2x Line Sensor

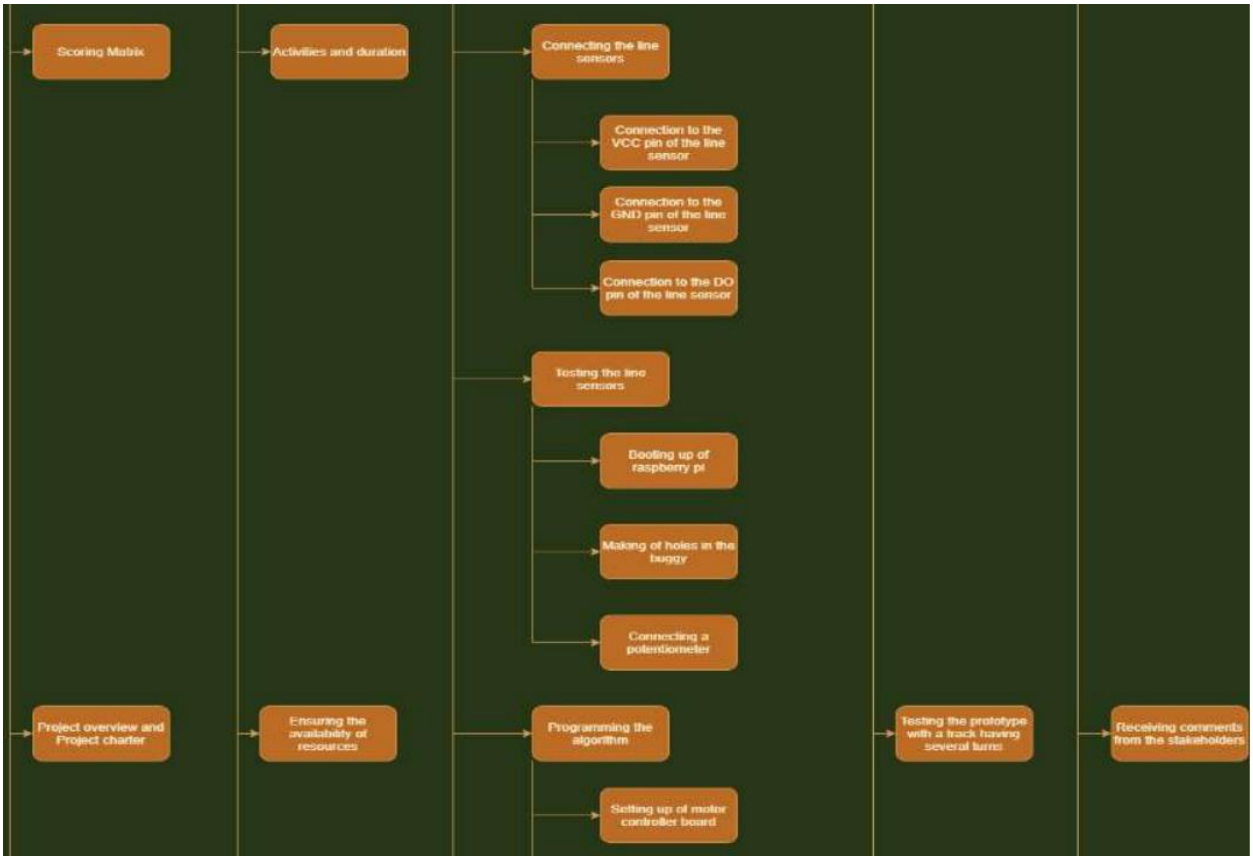
- 1x Set of jumper wires
- 1x Ultrasonic Distance Sensor

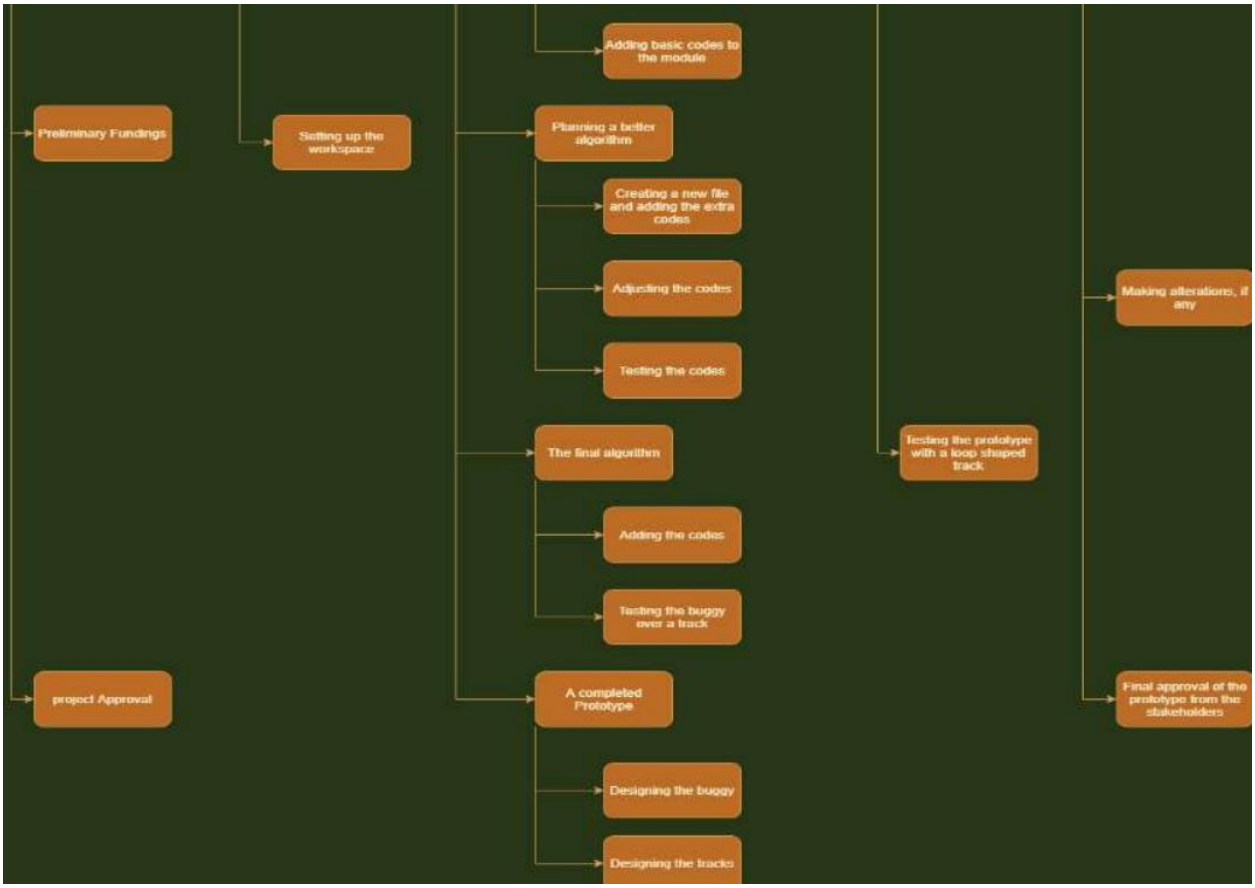


Raspberry pi 4 is a popular IOT module which is used tocreate various IOT projects. It can be used as a mini com puter.The line follower can be implemented through raspberrypi 4. To use raspberry pi, we should first install the Raspbian OS in a memory card and we have to insert in the raspberry pi. It is a linux variant. We have to use external monitor, keyboard and mouse to program raspberry pi. After we complete the configuration settings, we can use the rapberry pi to program. It can be programmed through scratch. It uses python language for programming. We can connect to a computer by using puTTy through SSL connection.

Arduino Uno is also an IOT module. It is of less applica tional uses than raspberry pi. Unlike raspberry pi, it uses c# and c++ for programming. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

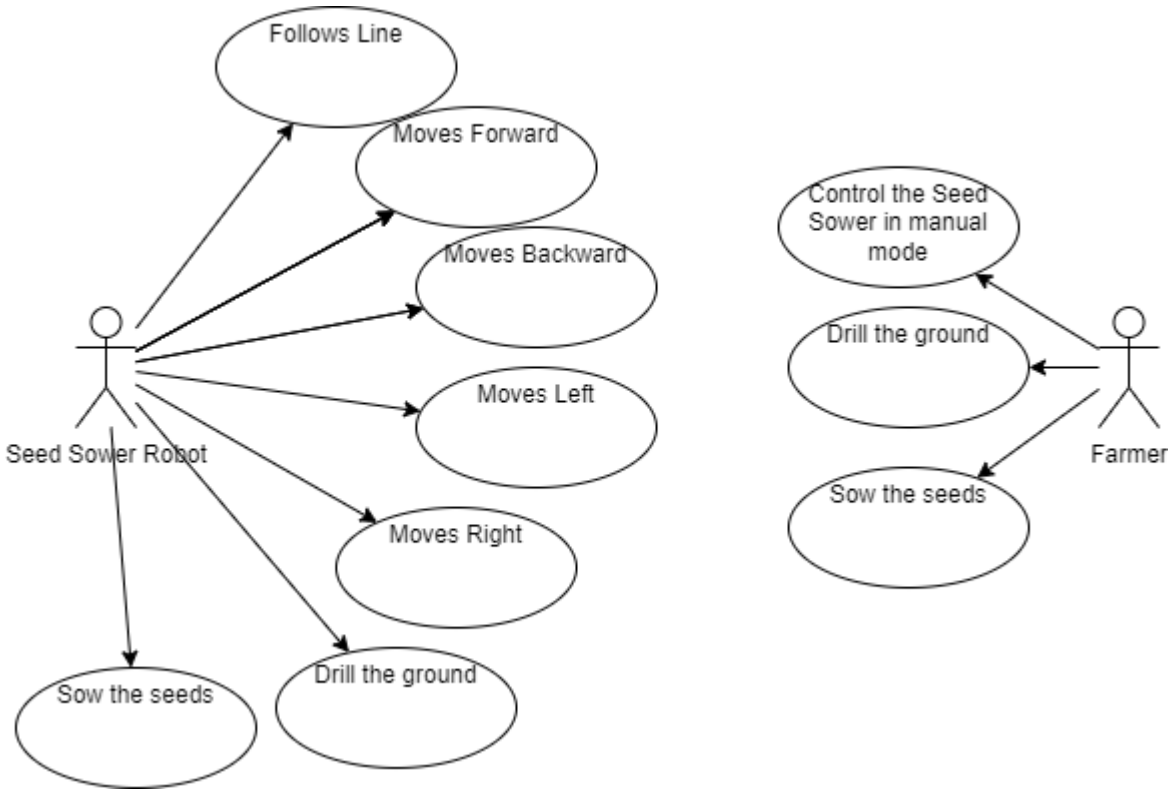

Line Follower
Initiation phase
Planning
Construction of Prototype
Testing
Post Project Survey
Preparing the connectors
Initialization
Taking of three female - female jumper wires
Stripping of plastic sheath of one end for each
Soldering
Soldering of three jumper wires at the open ends
Insulation
Covering of the soldered portion with insulation tape
Project Idea and CSF - Brainstorming
Project Milestones
Testing the prototype with a straight line track
Demonstration of the prototype to the stakeholders


Scoring Matrix
Activities and duration
Connecting the line sensors
Connection to the VCC pin of the line sensor
Connection to the GND pin of the line sensor
Connection to the DO pin of the line sensor
Testing the line sensors
Booting up of raspberry pi
Making of holes in the buggy
Connecting a potentiometer
Project overview and Project charter
Ensuring the availability of resources
Programming the algorithm
Setting up of motor controller board
Testing the prototype with a track having several turns
Receiving comments from the stakeholders

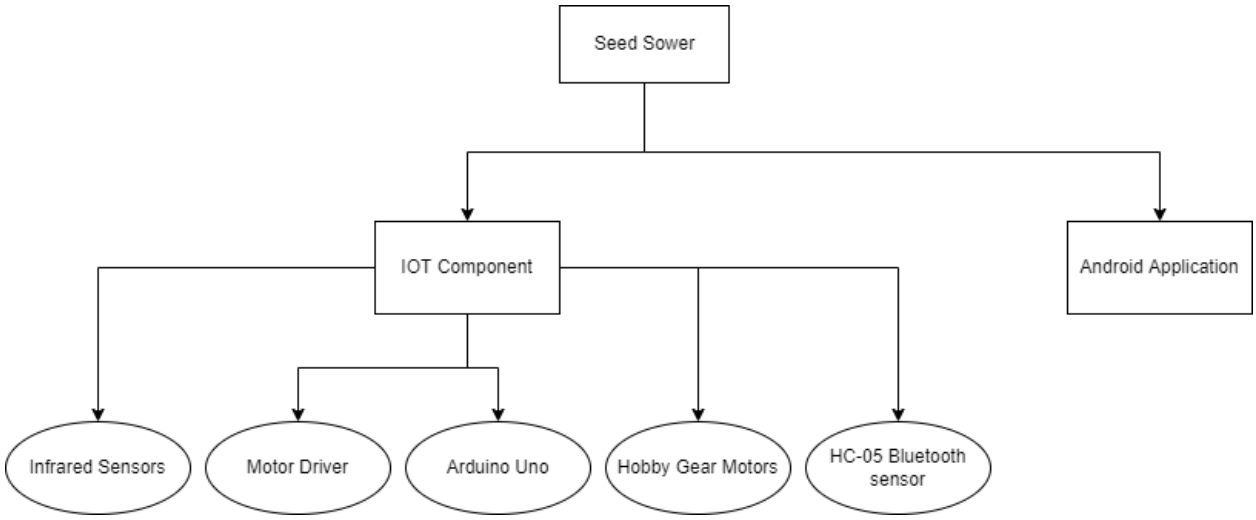

Adding basic codes to the module
Preliminary Fundings
Setting up the workspace
Planning a better algorithm
Creating a new file and adding the extra codes
Adjusting the codes
Testing the codes
Making alterations, if any
The final algorithm
Testing the prototype with a loop shaped track
Adding the codes
Testing the buggy over a track
project Approval
A completed Prototype
Final approval of the prototype from the stakeholders
Designing the buggy
Designing the tracks

DESIGN

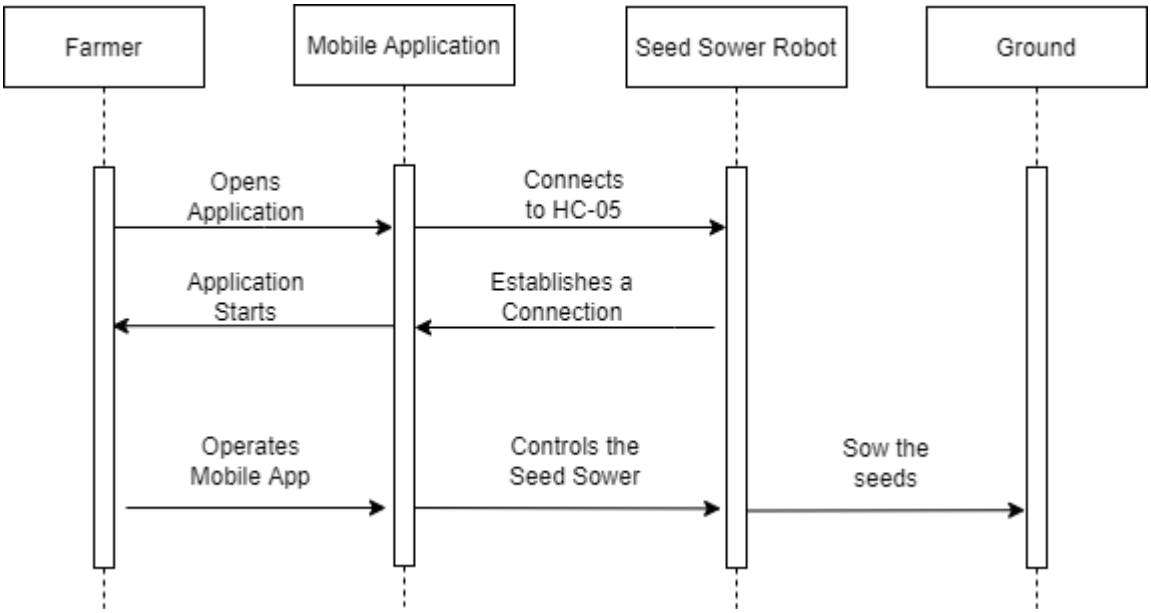
A. USE CASE DIAGRAMS



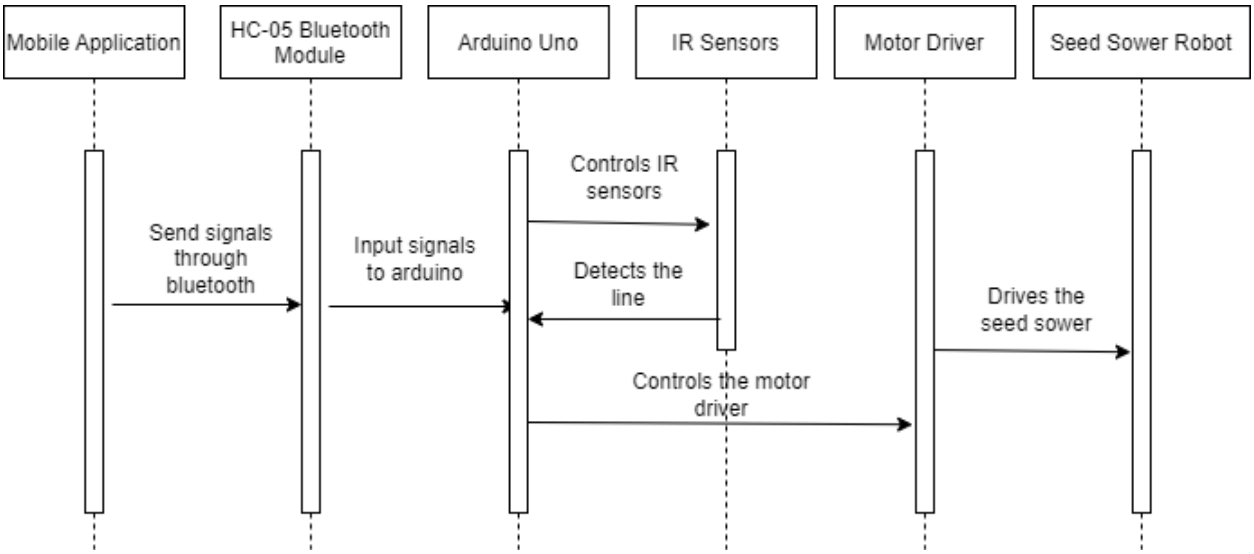
B. CLASS DIAGRAM



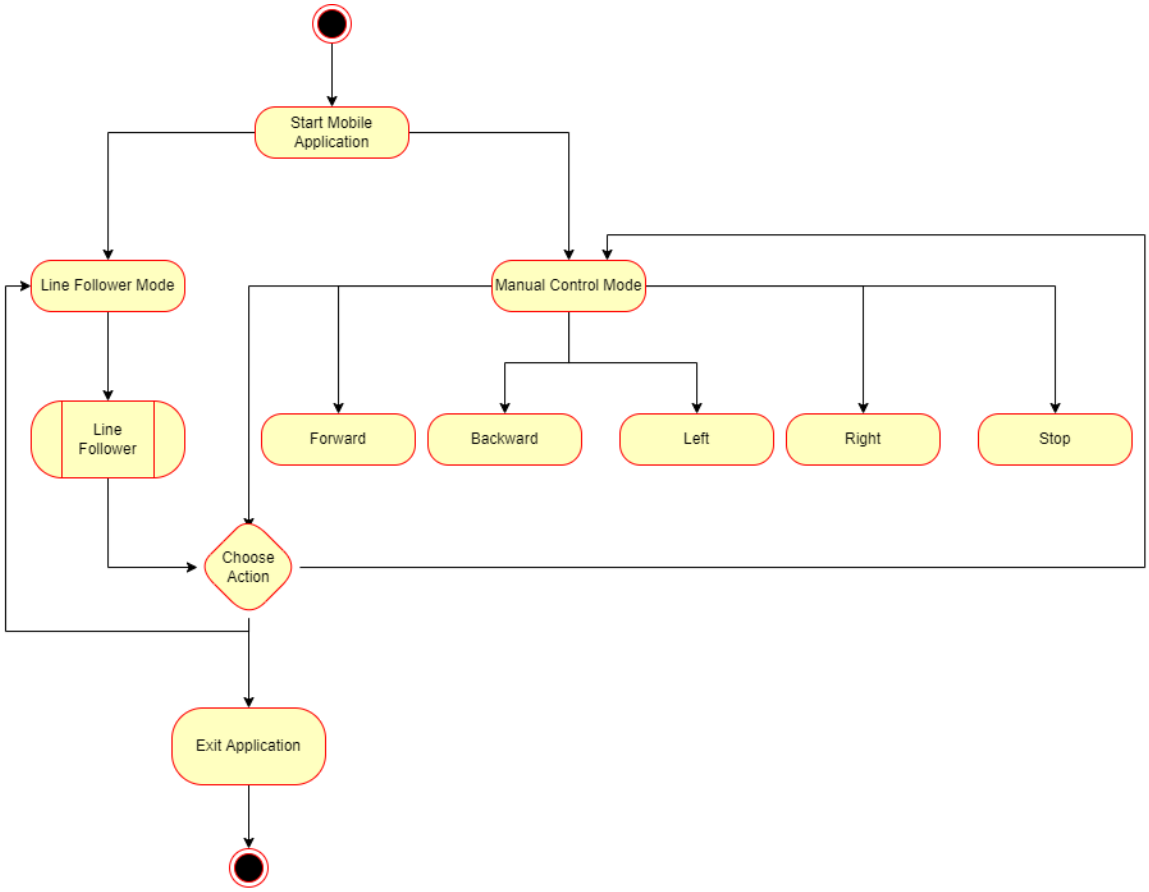
C. SEQUENCE DIAGRAM



D. STATECHART DIAGRAM



E. ACTIVITY DIAGRAM



DESIGN VERIFICATION MATRIX

s.no	requirement	Verification description	Testing	Analysis	Observation	Reference
1.	Detection of line using IR sensors	IR sensor should correctly detect the line	✓	✓	✓	✓
2.	Sending of signals from mobile app to arduino	HC-05 bluetooth sensor should capture the signals from the mobile app and send it to the arduino	✓	✓	✓	✓

BUSINESS ASPECTS

FINAL IMPLEMENTATION

Technology Stack

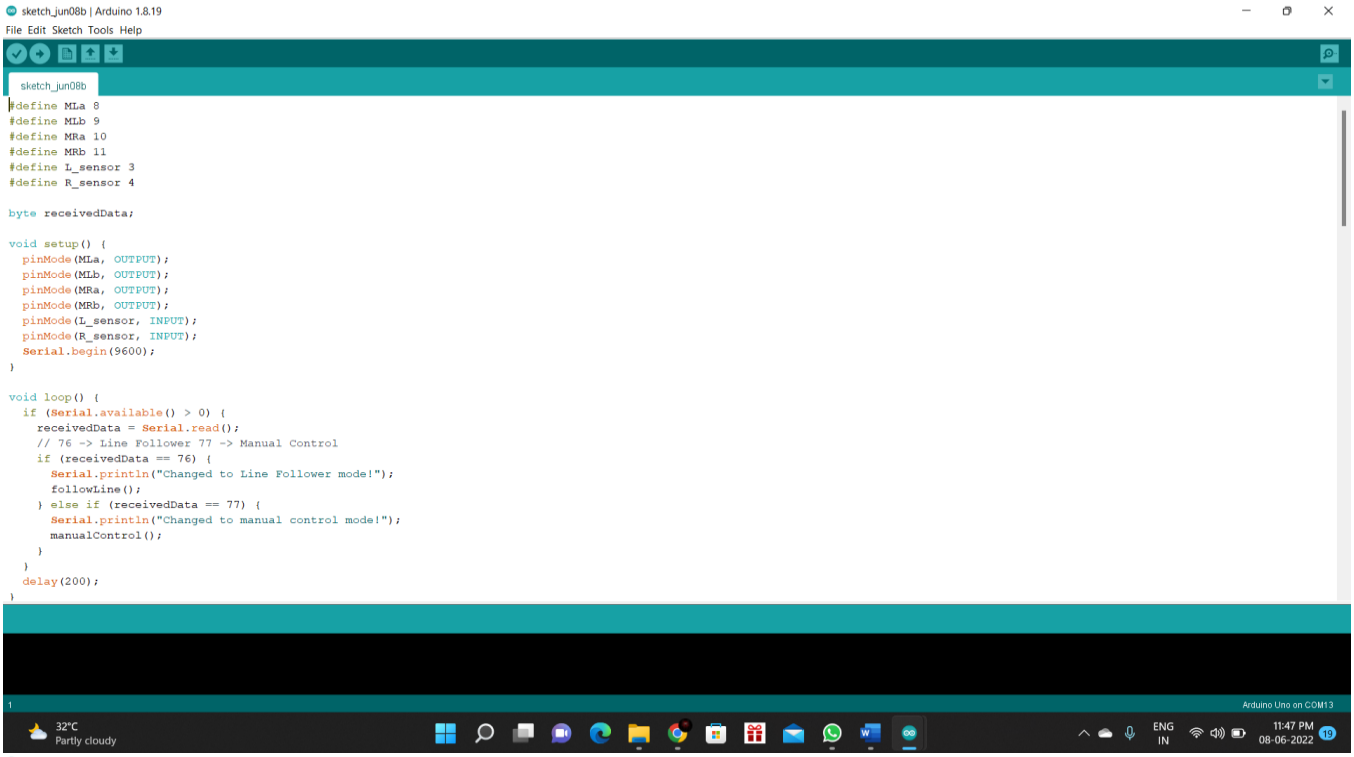
1. FrontEnd- Java, XML (Android Studio)

2. Backend – Arduino, C++

TESTING AND VALIDATION

Case no.	Type of testing	Test case	Expected result	Actual result
1.	Acceptance testing	Line is kept on path of buggy/seed sower	seed sower follows the line and moves positioning its axle perpendicular to direction of line	seed sower moves as expected
2.	Non Functional Testing	Mobile Application is handled by a kid	Intuitive UI makes it easy to control the robot	UI is simple to handle as expected
3.	Unit Testing	void forward()	Buggy should move in forward direction	Buggy moves in forward direction
4.	Integration Testing	void followLine()	The buggy should follow the line	The buggy is moving along the line.

DELIVERABLES


sketch_jun08b | Arduino 1.8.19
File Edit Sketch Tools Help
sketch_jun08b
#define MLa 8
#define MLb 9
#define MRa 10
#define MRb 11
#define L_sensor 3
#define R_sensor 4
byte receivedData;
void setup() {
pinMode(MLa, OUTPUT);
pinMode(MLb, OUTPUT);
pinMode(MRa, OUTPUT);
pinMode(MRb, OUTPUT);
pinMode(L_sensor, INPUT);
pinMode(R_sensor, INPUT);
Serial.begin(9600);
}
void loop() {
if (Serial.available() > 0) {
receivedData = Serial.read();
// 76 -> Line Follower 77 -> Manual Control
if (receivedData == 76) {
Serial.println("Changed to Line Follower mode!");
followLine();
} else if (receivedData == 77) {
Serial.println("Changed to manual control mode!");
manualControl();
}
}
delay(200);
}
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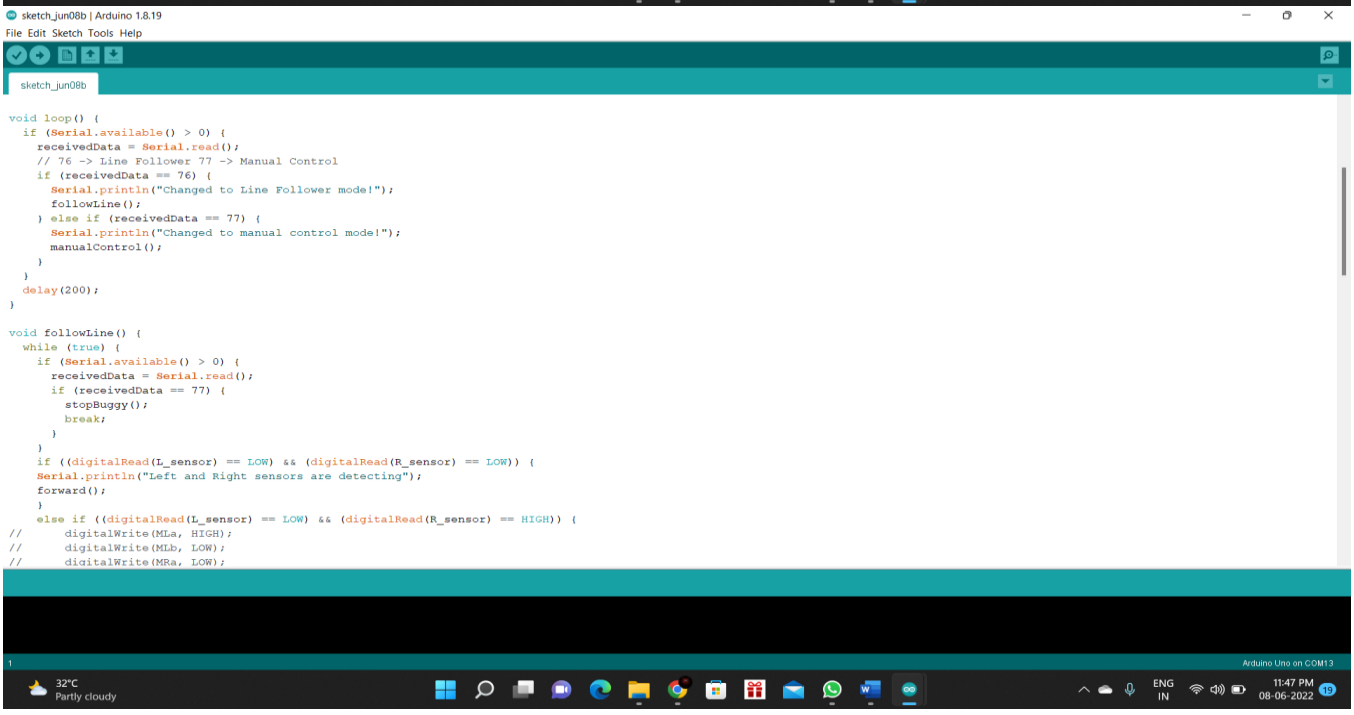
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if (receivedData == 76) {
Serial.println("Changed to Line Follower mode!");
followLine();
} else if (receivedData == 77) {
Serial.println("Changed to manual control mode!");
manualControl();
}
}
delay(200);
}
void followLine() {
while (true) {
if (Serial.available() > 0) {
receivedData = Serial.read();
if (receivedData == 77) {
stopBuggy();
break;
}
}
if ((digitalRead(L_sensor) == LOW) && (digitalRead(R_sensor) == LOW)) {
Serial.println("Left and Right sensors are detecting");
forward();
}
else if ((digitalRead(L_sensor) == LOW) && (digitalRead(R_sensor) == HIGH)) {
// digitalWrite(MLa, HIGH);
// digitalWrite(MLb, LOW);
// digitalWrite(MRa, LOW);
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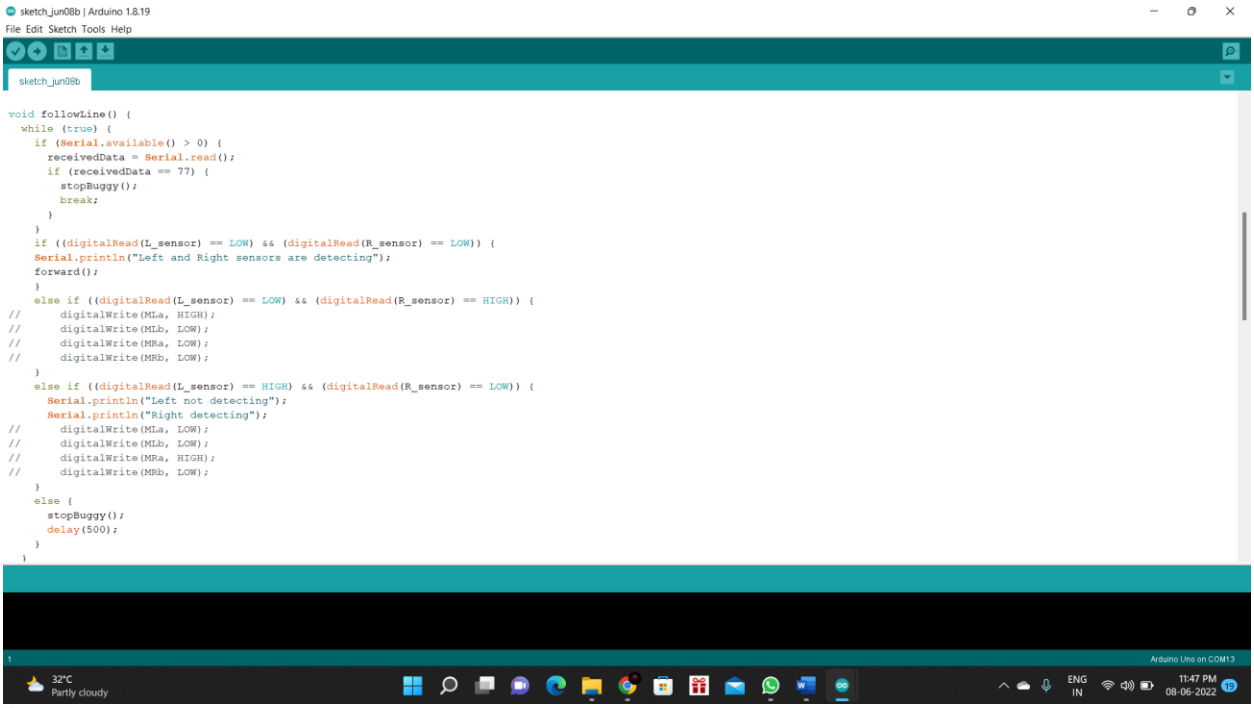
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while (true) {
if (Serial.available() > 0) {
receivedData = Serial.read();
if (receivedData == 77) {
stopBuggy();
break;
}
}
if ((digitalRead(L_sensor) == LOW) && (digitalRead(R_sensor) == LOW)) {
Serial.println("Left and Right sensors are detecting");
forward();
}
else if ((digitalRead(L_sensor) == LOW) && (digitalRead(R_sensor) == HIGH)) {
// digitalWrite(MLa, HIGH);
// digitalWrite(MLb, LOW);
// digitalWrite(MRa, LOW);
// digitalWrite(MRb, LOW);
}
else if ((digitalRead(L_sensor) == HIGH) && (digitalRead(R_sensor) == LOW)) {
Serial.println("Left not detecting");
Serial.println("Right detecting");
// digitalWrite(MLa, LOW);
// digitalWrite(MLb, LOW);
// digitalWrite(MRa, HIGH);
// digitalWrite(MRb, LOW);
}
else {
stopBuggy();
delay(500);
}
}
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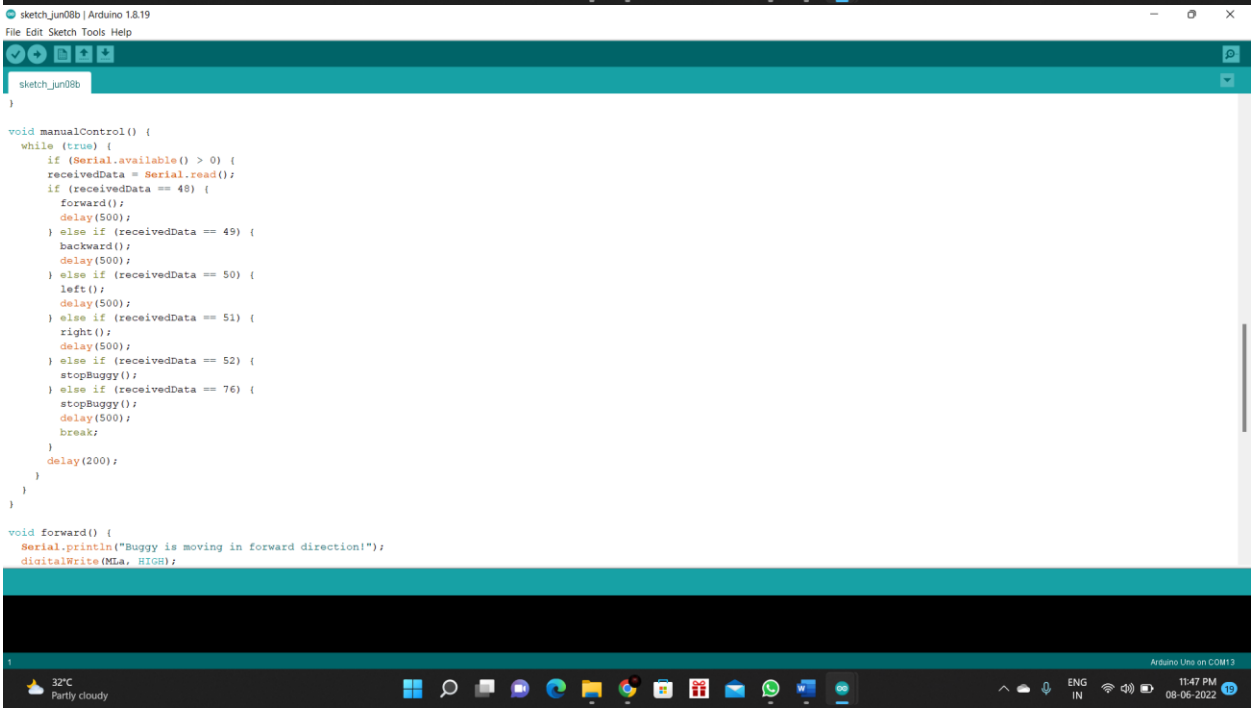
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}
void manualControl() {
while (true) {
if (Serial.available() > 0) {
receivedData = Serial.read();
if (receivedData == 48) {
forward();
delay(500);
} else if (receivedData == 49) {
backward();
delay(500);
} else if (receivedData == 50) {
left();
delay(500);
} else if (receivedData == 51) {
right();
delay(500);
} else if (receivedData == 52) {
stopBuggy();
} else if (receivedData == 76) {
stopBuggy();
delay(500);
break;
}
delay(200);
}
}
}
void forward() {
Serial.println("Buggy is moving in forward direction!");
digitalWrite(MLa, HIGH);
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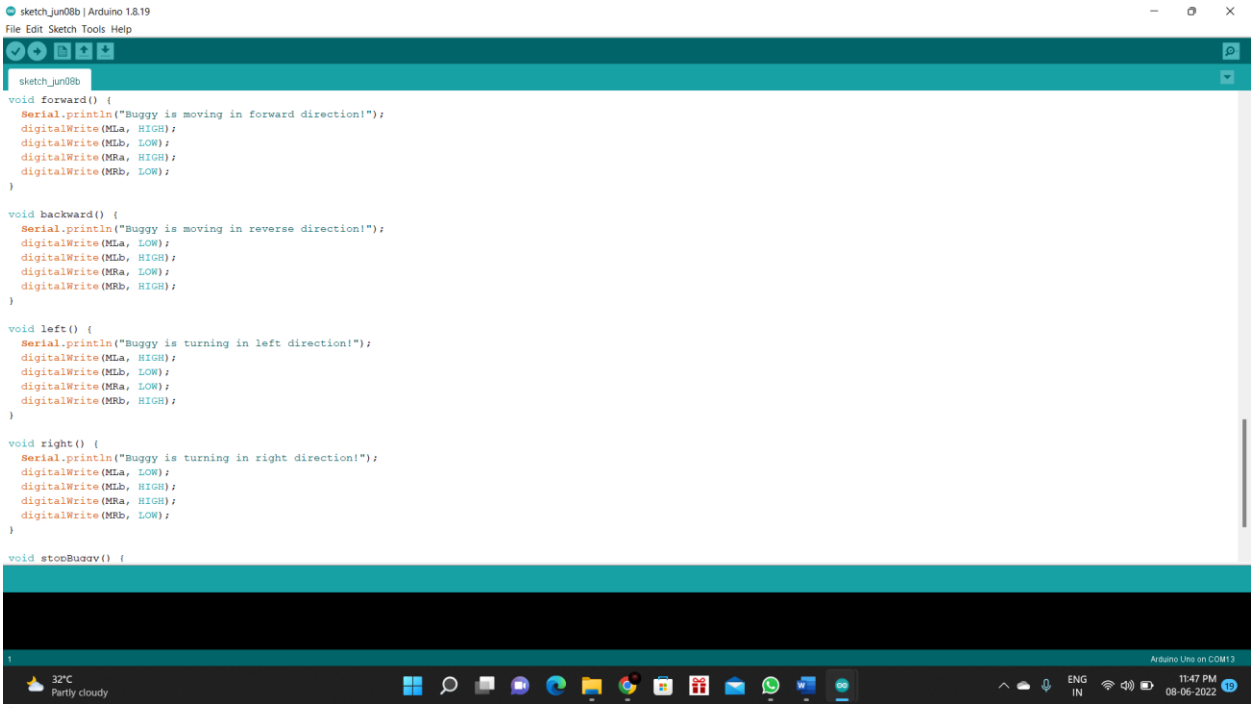
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Serial.println("Buggy is moving in forward direction!");
digitalWrite(MLa, HIGH);
digitalWrite(MLb, LOW);
digitalWrite(MRa, HIGH);
digitalWrite(MRb, LOW);
}
void backward() {
Serial.println("Buggy is moving in reverse direction!");
digitalWrite(MLa, LOW);
digitalWrite(MLb, HIGH);
digitalWrite(MRa, LOW);
digitalWrite(MRb, HIGH);
}
void left() {
Serial.println("Buggy is turning in left direction!");
digitalWrite(MLa, HIGH);
digitalWrite(MLb, LOW);
digitalWrite(MRa, LOW);
digitalWrite(MRb, HIGH);
}
void right() {
Serial.println("Buggy is turning in right direction!");
digitalWrite(MLa, LOW);
digitalWrite(MLb, HIGH);
digitalWrite(MRa, HIGH);
digitalWrite(MRb, LOW);
}
void stopBuggy() {
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Arduino Uno on COM13
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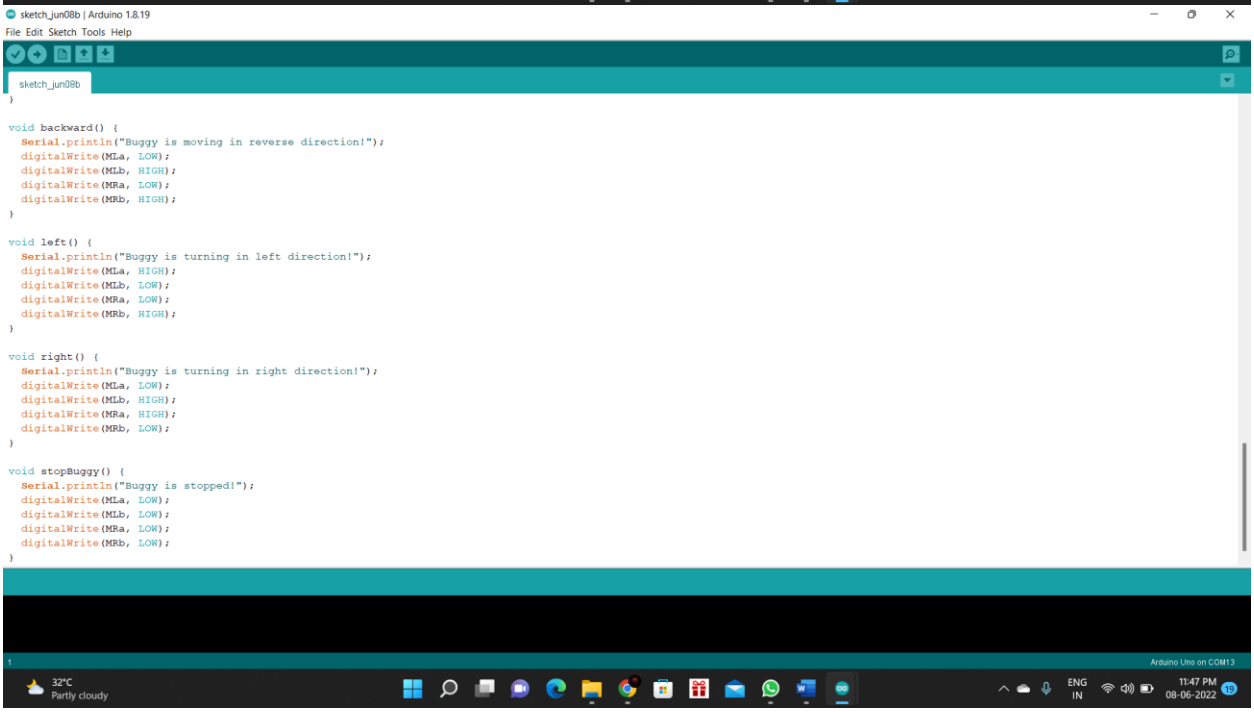
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digitalWrite(MLb, LOW);
digitalWrite(MRa, LOW);
digitalWrite(MRb, HIGH);
}
void right() {
Serial.println("Buggy is turning in right direction!");
digitalWrite(MLa, LOW);
digitalWrite(MLb, HIGH);
digitalWrite(MRa, HIGH);
digitalWrite(MRb, LOW);
}
void stopBuggy() {
Serial.println("Buggy is stopped!");
digitalWrite(MLa, LOW);
digitalWrite(MLb, LOW);
digitalWrite(MRa, LOW);
digitalWrite(MRb, LOW);
}
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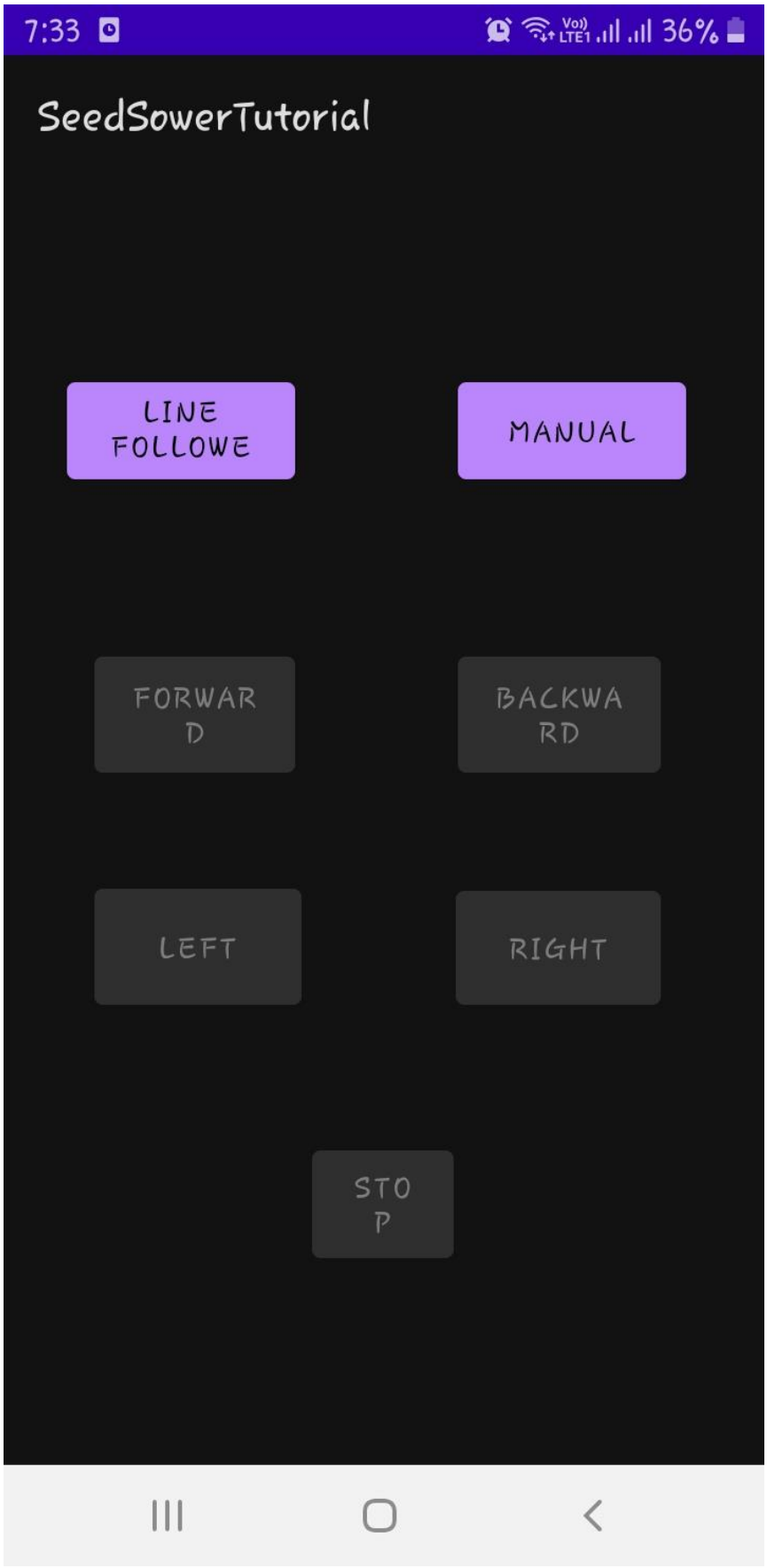
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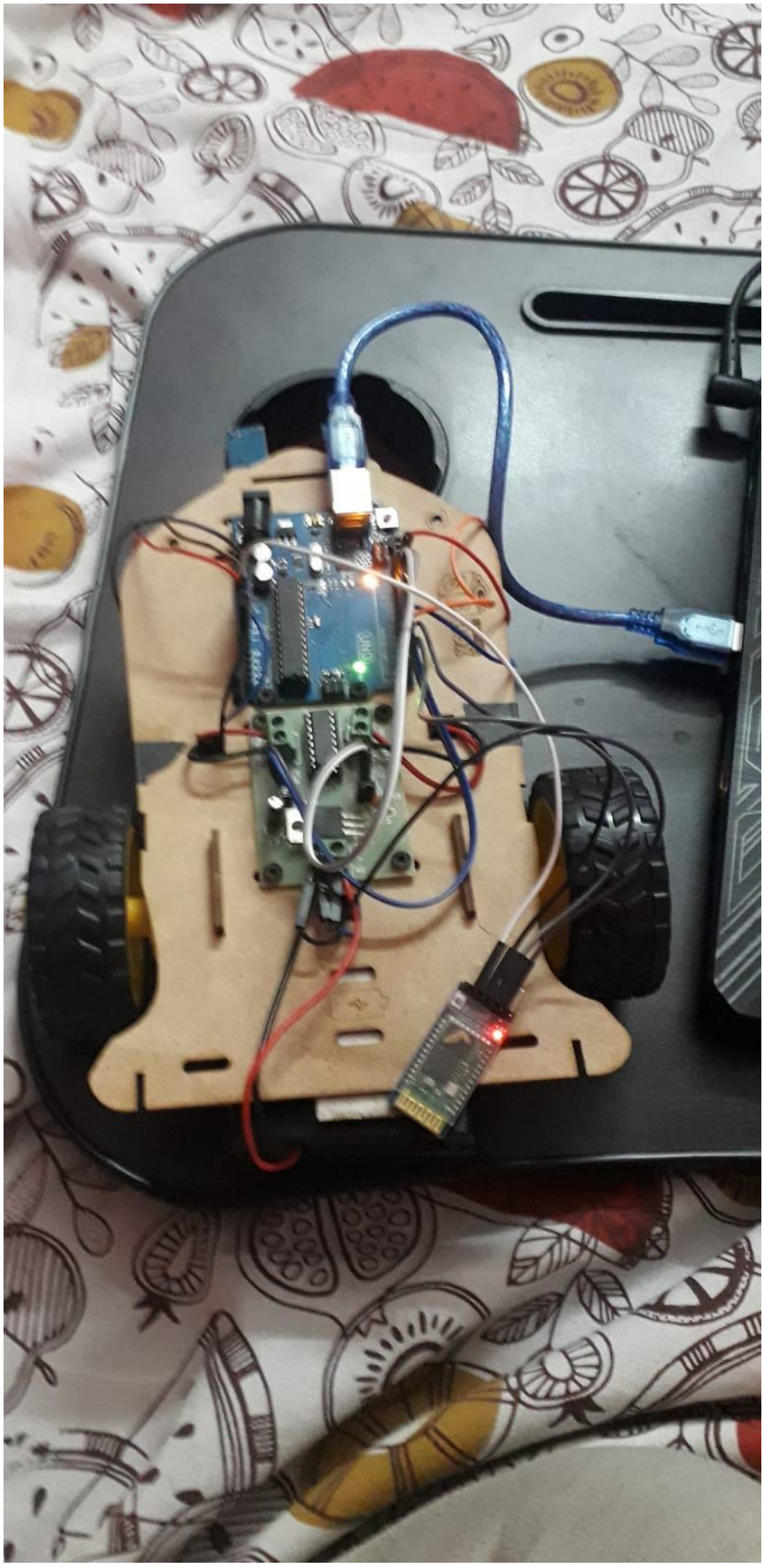
SeedSowerTutorial
LINE FOLLOWE
MANUAL
FORWAR D
BACKWA RD
LEFT
RIGHT
STO P



PERFORMANCE TEST RESULTS

Performance monitoring for Line Following Feature

- The buggy follows the line as expected. The IR sensors are not efficient in sensing the lines.
- The line follower robot is much more reliable

Performance monitoring for manual mode

- Maximum range supported by the buggy is very low
- The driller sows the seed as expected

Architectural design

- Since the driller is made up of iron, the driller becomes a heavy part
- Since the buggy is made of cardboard, it slows down due to the weight of the driller.
- There is very less space for storing the seeds inside the sower

FINANCIAL CONSIDERATIONS

- Simple arduino costs around 500 rs
- 12 volted DC motor costs around 300 rs
- The power bank required for powering up the raspberry pi/arduino costs around 2000 rs
- The driller for sowing costs around 2100rs

DEPLOYMENT

USER MANUAL REPORT

- Download and install the seed sower app in your android phone
- Enable bluetooth in your android device
- Start the application
- Now the seed sower and mobile app is connected through bluetooth
- Whenever you start the application, make sure to enable bluetooth beforehand
- Control the buggy using manual mode or line follower mode

CODE REPORT

```
#define MLa 8
#define MLb 9
#define MRa 10
#define MRb 11
#define L_sensor 3
#define R_sensor 4

byte receivedData;

void setup() {
  pinMode(MLa, OUTPUT);
  pinMode(MLb, OUTPUT);
  pinMode(MRa, OUTPUT);
  pinMode(MRb, OUTPUT);
  pinMode(L_sensor, INPUT);
  pinMode(R_sensor, INPUT);
  Serial.begin(9600);
}

void loop() {
  if (Serial.available() > 0) {
    receivedData = Serial.read();
    // 76 -> Line Follower 77 -> Manual Control
    if (receivedData == 76) {
      Serial.println("Changed to Line Follower mode!");
      followLine();
    } else if (receivedData == 77) {
      Serial.println("Changed to manual control mode!");
      manualControl();
    }
  }
  delay(200);
}

void followLine() {
  while (true) {
    if (Serial.available() > 0) {
      receivedData = Serial.read();
      if (receivedData == 77) {
        stopBuggy();
        break;
      }
    }
    if ((digitalRead(L_sensor) == LOW) && (digitalRead(R_sensor) == LOW)) {
```

```
    Serial.println("Left and Right sensors are detecting");
    forward();
    }
    else if ((digitalRead(L_sensor) == LOW) && (digitalRead(R_sensor) == HIGH)) {
      digitalWrite(MLa, HIGH);
      digitalWrite(MLb, LOW);
      digitalWrite(MRa, LOW);
      digitalWrite(MRb, LOW);
    }
    else if ((digitalRead(L_sensor) == HIGH) && (digitalRead(R_sensor) == LOW)) {
      Serial.println("Left not detecting");
      Serial.println("Right detecting");
      digitalWrite(MLa, LOW);
      digitalWrite(MLb, LOW);
      digitalWrite(MRa, HIGH);
      digitalWrite(MRb, LOW);
    }
    else {
      stopBuggy();
      delay(500);
    }
  }
}

void manualControl() {
  while (true) {
      if (Serial.available() > 0) {
      receivedData = Serial.read();
      if (receivedData == 48) {
        forward();
        delay(500);
      } else if (receivedData == 49) {
        backward();
        delay(500);
      } else if (receivedData == 50) {
        left();
        delay(500);
      } else if (receivedData == 51) {
        right();
        delay(500);
      } else if (receivedData == 52) {
        stopBuggy();
      } else if (receivedData == 76) {
        stopBuggy();
        delay(500);
        break;
      }
```

```
      delay(200);
    }
  }
}

void forward() {
  Serial.println("Buggy is moving in forward direction!");
  digitalWrite(MLa, HIGH);
  digitalWrite(MLb, LOW);
  digitalWrite(MRa, HIGH);
  digitalWrite(MRb, LOW);
}

void backward() {
  Serial.println("Buggy is moving in reverse direction!");
  digitalWrite(MLa, LOW);
  digitalWrite(MLb, HIGH);
  digitalWrite(MRa, LOW);
  digitalWrite(MRb, HIGH);
}

void left() {
  Serial.println("Buggy is turning in left direction!");
  digitalWrite(MLa, HIGH);
  digitalWrite(MLb, LOW);
  digitalWrite(MRa, LOW);
  digitalWrite(MRb, HIGH);
}

void right() {
  Serial.println("Buggy is turning in right direction!");
  digitalWrite(MLa, LOW);
  digitalWrite(MLb, HIGH);
  digitalWrite(MRa, HIGH);
  digitalWrite(MRb, LOW);
}

void stopBuggy() {
  Serial.println("Buggy is stopped!");
  digitalWrite(MLa, LOW);
  digitalWrite(MLb, LOW);
  digitalWrite(MRa, LOW);
  digitalWrite(MRb, LOW);
}
```

OUTCOME

This project of the Seed Sower is meant to be a paper presented at a reputed conference which will be evaluated on the metrics of said conference and get deserving citations and be added and adjusted according to the needs and innovations of forthcoming research prospects.

CONCLUSION

- ✓ The main focus of this system is its Automatic way of sowing the seeds
- ✓ The automatic way of sowing seeds using a robot reduces the labor requirement.
- ✓ This robot will help the farmers to do the farming process efficiently.
- ✓ The project can be enhanced to any other kinds of crop such as fruits, paddy, sugarcane etc.
- ✓ The robot can be designed with chain roller instead of normal wheel.
- ✓ Hence, it can be applicable to the real time agricultural field.

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