MULTIMEDIA UNIVERSITY®

FACULTY OF ENGINEERING

EPE3016 Capstone Project

TRIMESTER 1 SESSION 2015/2016

Outdoor Mobile Robotic Assistant

Micro-controller Module (Arduino), Firmware and Infrared Sensor Circuit Design and Implementation, Operating Principle and Usage of PIR Motion Sensor

Submitted by:

Name	ID	MAJOR
HM-Adnan Zami		CE

Group Members:

Name	ID	Major
Abdul Wali Abdul Ali		LE
Shahriar Mohsin Shohan		TE

Contents

I. List of Figures

II. List of Tables

1.0 Introduction

A robot is a machine designed to execute one or more tasks automatically with speed and precision. In this system sensors, control systems, manipulation, power supplies and software; all work together to perform a task. A robot should consist of four important characteristics which are sensing, movement, energy and intelligence.

Mobile robots are independent robots that are designed to perform specific tasks. They are very convenient in domestic, military, space and medical purposes. On the basis of the type of business functions, mobile robots are of two types; indoor and outdoor. Indoor mobile robots can be used for industrial applications, floor cleaning and material handling etc. Outdoor robots can be used for patrol, surveillance, exploring planets in space functions, water flowering and navigating obstacles on the ground etc.

The aim of this report is to introduce an outdoor mobile robot that has the ability to move inside the field which consists of an area with the dimensions 1800mm × 1800mm. There are two zones: Patrol Zone and Flowerpot Zone. Patrol Zone is an area with the dimension of 1100mm × 1100mm and Flowerpot Zone is an area that is extended 300mm beyond the boundary of the Patrol Zone. The boundary between the two zones is a black line with the width of 50mm. According to the rules and condition, this robot is not allowed to cross the boundary between the two zones. It has the ability to navigate within the Patrol Zone and search for flowerpots placed in Flowerpot Zone and dispense water into the flowerpots. The robot is also able to sense the motion and alarm while patrolling in Patrol Zone. An android phone with the aid of communication link can control this robot. In addition, a voltage detector is used to detect the battery voltage level of the robot.

To meet the above functionalities, IR sensor, Motion sensor, Ultrasonic sensor, Bluetooth, Linear Battery, DC geared motors and Arduino Uno Microcontroller were integrated together.

2.0 Overview of the Robotic System:

This robot is basically an outdoor mobile assistant which is designed to navigate within a Patrol Zone autonomously or via any electronic device. The purpose of the robot is to detect a flower pot located at the edge of the Patrol Zone while avoiding any moving objects in its way. It is able to establish a communication link with a computer or a smart phone via Bluetooth. This robot can automatically navigate within the patrol, detect the flowerpots and dispense water into the flowerpot. It also has built in alarm system that notifies the user when motion is detected.

The field consists of an area of 1800mm*1800mm which includes two zones: Patrol Zone and Flowerpot Zone. Patrol Zone is an area with dimension of 1100mm*1100mm which is separated by a 50mm surrounded drawn line from the Flowerpot Zone.

The robot is using a DC 12V LiPo battery as a power source. The total weight, excluding the water container, of the whole robot is around only 1 kg including all the circuits, sensors, mechanical structure, and battery. The dimension of the robot is designed to be 270mm (L)*210mm (W)*500mm (H).

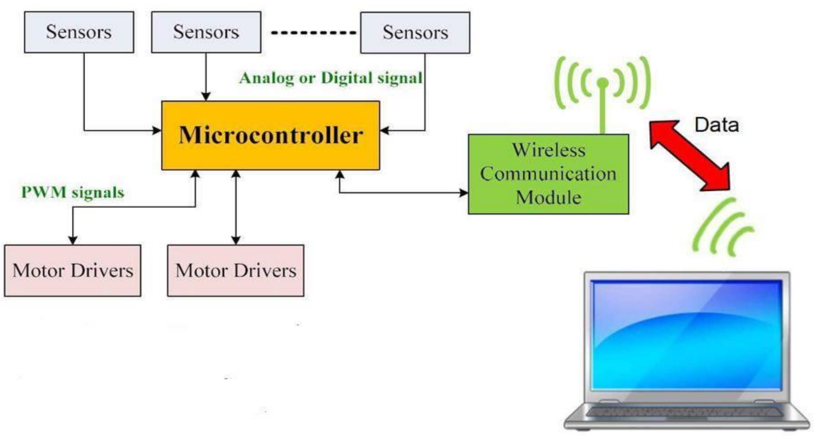

Figure 1: Basic Design of the Robot

Fig. 1 shows the basic design and the components of the robot which includes microcontroller, motor drivers, sensors and a wireless communication module to connect with a smart device or laptop. Arduino UNO is used in this robot to provide specific functionalities using the ATMega328 microcontroller. Two motors were used for the movement of the robot and for the water plan system servo motor was deployed. To sense the Patrol Zone and flower pots basically 3 types of sensors were used in this project: IR sensor, PIR sensor and ultrasonic sensor. For wireless communication module to connect with a smart device, HC-05 Bluetooth serial module was used in this robot.

3.0 Description

All the sensors and motors are integrated using an Arduino UNO. Arduino UNO is based on ATmega328 microcontroller and contains 14 digital I/O, 6 analog inputs, 32KB flash memory, 2KB SRAM, 1KB EEPROM and performs at 16MHz clock speed. It has two Vcc ports which provides 5V at 100mA and 3.3v at 50mA. The Arduino itself is connected to a 12V lithium polymer battery which is regulated to supply 5V to the Arduino. Arduino IDE 1.6.9 was used to write and burn the code, C++ language, onto the board. For the purpose of this project, the Arduino will be connected to several sensors to provide functions for an autonomous robot.

The primary sensor that will contain the car within the bounded, patrol region is the optical reflex sensor which is made of infrared (IR) light emitting diodes. This sensor detects the intensity of reflected light. Patrol zone for the robot is bounded by a black line whereas the ground is a lighter shade of blue. The difference in color allows the sensor to recognize the 2 states of light intensity.

The second sensor attached to the robot is the Pyroelectric infrared (PIR) sensor also known as a motion sensor or passive infrared sensor. Basically, they are made of piezoelectric sensor which is divide into two halves. This sensor detects heat in the form of radiation from moving sources. Although heat is present in every object with temperatures above absolute zero, it will only respond to radiation emitted or reflected from an object which can only occur when there is a change in the environment i.e. some kind of movement. In autonomous mode, the robot will be using this sensor to distinguish moving objects from stationary objects which will assist it in detecting plants. There is a fourth sensor called the ultrasonic sensor attached to the robot that is used to detect the plant, but that is beyond the scope of this report.

4.0 Project Management

4.1 Planning

No		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
1	Planning, Understanding and Design														
2	Prototype Building		B												
3	Basic Hardware/Software Integration (Milestone 1)		R												
4	Improvements (Milestone 2)		E												
5	Assembly & Application Development		A												
6	Documentation		K												
7	Demonstration and Interview (Milestone 3)														

Figure 2: Planner

4.2 Gantt Chart

No		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
1	Planning & Understanding - Distribution of task - List of components to buy														
2	Prototype Building - Breadboard circuit of motor driver and IR sensors		B												
3	Basic Integration - Coding and debugging of IR sensors and motor drivers		R												
4	Improvements - Transfer of IR sensors and motor driver circuit from breadboard to veroboard - Designing and building voltage regulator circuit on veroboard		E												
5	Assembly & Application Development - Transfer all circuits, sensors and Arduino onto the wooden board		A												
6	Documentation - Distribution of workload and preparation of report		K												
7	Demonstration and Interview - Final adjustments to the robot														

Figure 3: Gantt Chart

4.3 Project Delivery and Time Management

The project was broken down into few stages to ensure smooth workflow and efficient time management. The first stage of the project consisted of the construction of the driver circuit and the IR sensor circuit. From week 3 till week 5, I applied the circuit design provided onto the breadboard. Although the motor driver circuit was completed with ease, the IR sensor circuit wasn't responding properly. After troubleshooting the circuit, the problem found was with the design in the circuit itself. The IR sensor was connected backwards, for which the signal from comparator was being grounded resulting in no connection.

From week 6 to week 7, the motor driver circuit and IR sensor circuit were integrated together along with the Arduino UNO. After coding and troubleshooting, the motors were responding to the sensors inputs. This was the second stage, which was presented during Milestone 1.

The third stage was adding Bluetooth for the communication purpose and transferring all circuits onto the veroboard as well as making improvements in the existing design. The first challenge was to come up with an integrated driver circuit (on veroboard). To overcome that challenge, the driver circuit was first designed on a blank paper keeping in mind all of the constraints involved. After the final design, it was soldered onto the veroboard that fulfilled the criteria. As an extra feature, a voltage detector circuit was designed and built on a veroboard. From weeks 8 till 10, the circuits were assembled and adjusted onto the wooden platform along with the wheels and water dispenser holder. The robot was then coded and debugged to be presentable for Milestone 2.

The final stage of the robot consisted of integrating the PIR and ultrasonic sensors and the report. The sensors were integrated, coded and debugged according to the specifications. Minor adjustments were made to the appearance of the robot at this stage. Report workload was distributed and completed by the members within week 14.

4.4 Budget

Table 1: Motor Driver

No	Value	Description	Qty
1.	1N4007	Diode	8
2.	0.1u	Capacitor	2
3.	100u, 25V	Polarized Capacitor	1
4.	100u, 10V	Polarized Capacitor	1
5.	Green	LED	1
6.	1k	Resistor	1
7.	2.2k	Resistor	5
8.	Red	LED	1
9.	L298	Dual Full Bridge Driver	1

Table 2: IR Sensor Driver

No	Value	Description	Qty
1.	220,330	RESISTOR, 220x 6, 330 x 6	2
2.	100k	POTENTIOMETER	2
3.	100k,560k	RESISTOR, 100k x 5, 560k x 1	6
4.	LM339N	Voltage Comparators	2
5.	TCRT5000	IR Reflex Sensor	6
6.	0.1u	CAPACITOR	2
7.	10k	RESISTOR	4

Table 3: Electro-Mechanical Parts

No	Value	Description	Qty
1.	Robot Platform	Compressed wood, dimension 225mm x 297mm, thickness = 3mm	1
2.	Plastic Wheel	Plastic Wheel, diameter = 75mm	2
3.	Caster Wheel	Wheel diameter = 25mm, height = 35mm	2
4.	DC Geared Motor	SPG30-30K or equivalent	2
5.	Rechargeable Battery LiPo 3-cell (11.1V) battery		1
6.	M3 Screws	Length = 10mm, 16mm, 30mm	As Required
7.	M3 Washer & Nuts	M3 Washer and Hex Nut	As Required

Table 4: Components for extra Features

No.	Product	Description	Qty	Price (RM)
1.	HC05	Bluetooth Module	1	35.00
2.	Project Board	-	1	12
3.	Servo Motor	-	1	7.50
4.	Strip Board	-	1	2.00
5.	DC Gear Motor Bracket	-	2	22.00
6.	LED	-	12	2.40
7.	Jumper Wires	-	65	15.00
8.	Diodes	Zener diode and diode	2	1.4
9.	Ultrasonic Sensor	(Recycled)	1	-
10.	Resistors	(Collected)	~30	-
11.	Servo Motor	(Recycled)	-	-
	Grand Total			97.3

The budget provided for extra components was limited to 100RM. The list above shows the list of items purchased which totaled for 97.30RM. The receipts are attached at the end of this report.

5.0 Methodology

5.1 Arduino UNO

The Arduino UNO is the central processing unit of this robot. A total of 10 digital inputs and 2 analog inputs were used to connect the sensors, motors and Bluetooth. Since it

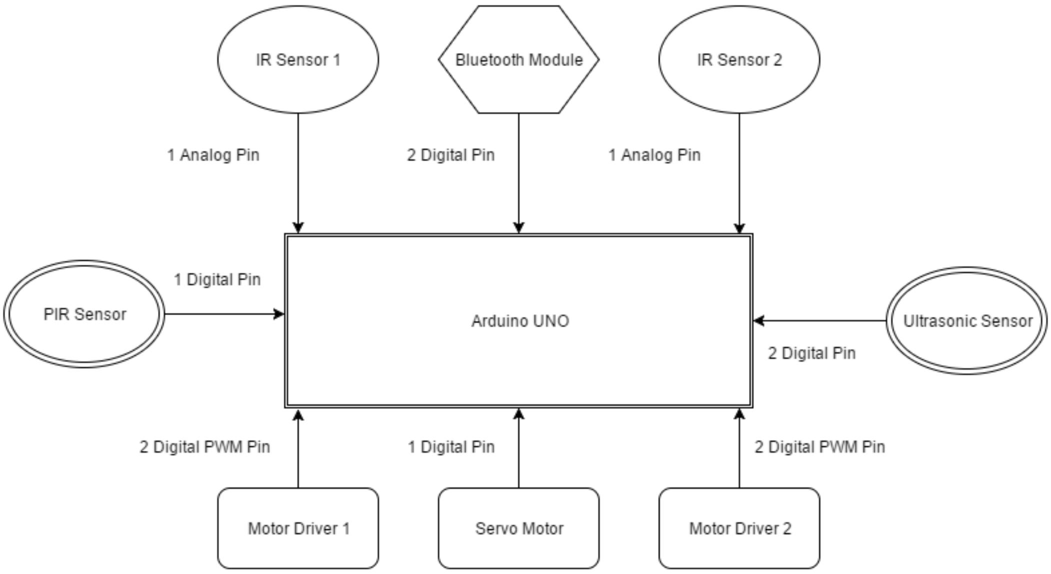

Figure 4: Block Diagram of Arduino Connections

contains only one 5V output and 3 grounds, wires have been extended into a cut breadboard to provide a 5V power line which is used by all three sensors. Figure 4 above shows the block diagram of all the components connection and pin types to the Arduino.

The software aspect of the Arduino is divided into 2 parts: autonomous mode and manual mode. Using Arduino IDE 1.6.9, the code was written and burned onto the Arduino. As per the requirement, the robot can run manually or autonomously. In manual mode, the robot will only be using the servo motor and the driver motors to move and water the plant. The user will be sending commands to the Arduino using the Bluetooth. In the autonomous mode however, the sensors will take over car guiding it throughout its journey. The coding for the motor driver, IR sensor and PIR sensor will be discussed later on in the report.

5.2 IR Sensor

The TCRT5000 IR sensor used consists of an IR Emitter and IR phototransistor. Two IR sensors were used which were connected to analog pins of the Arduino. These sensors will send signals from 0V to 5V. The Arduino board will then read the signal and, using an analog-to-digital converter, convert the value to a number between 0 and 1023. After several trials, the ideal value for the detection of a black line was found to be 300.

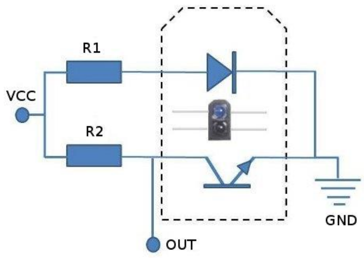

Figure 5: IR Sensor Internal Design

Figure 6 shows the schematic of one of the circuit of the IR sensor. A LM339N comparator was used to integrate the 2 sensor circuits. Sensor 1 was connected to pin 5 whereas sensor 2 was connected to pin 6. Pins 4 and 7 were connected to 5V. LEDS were added to the outputs at pins 1 and 2 to give a visual signal when the sensors detect the black line. The outputs from pin 1 and 2 were added to the Arduino's analog pins.

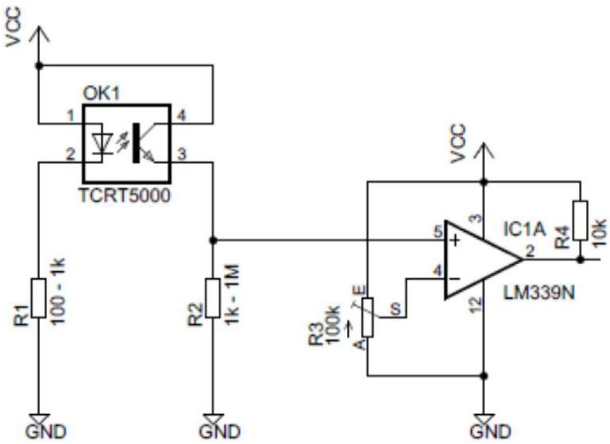

Figure 6: IR Sensor Circuit

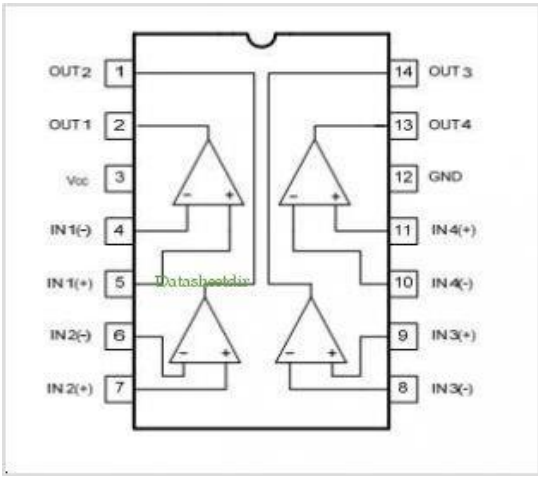

Figure 7: LM339N Schematic

5.3 PIR Sensor

The Pyroelectric sensor needs a supply voltage of 5V. The output from the sensor ranges from 0V (LOW) to 3.3V (HIGH). The sensors output was directly connected to one of the analog pins of the Arduino. Sensitivity and delay time can be adjusted using the potentiometers which can be seen in Figure 8. It has a sensing angle of <110 degree which can be adjusted by capping the sensor and a sensing distance of < 7 meters. The purpose of this sensor is to prevent the robot from considering moving objects as plants. The ultrasonic sensor used for detecting the plant will detect anything that comes within its range. PIR sensor will act as a filter which will keep the robot away from moving objects. Once the coast is clear, the robot will proceed and if the ultrasonic sensor gets triggered, the servo motor will drop the pipe to water the plant.

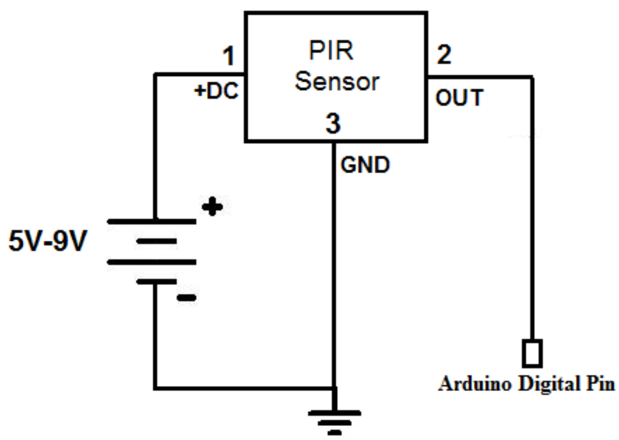

Figure 6: PIR Sensor Schematic

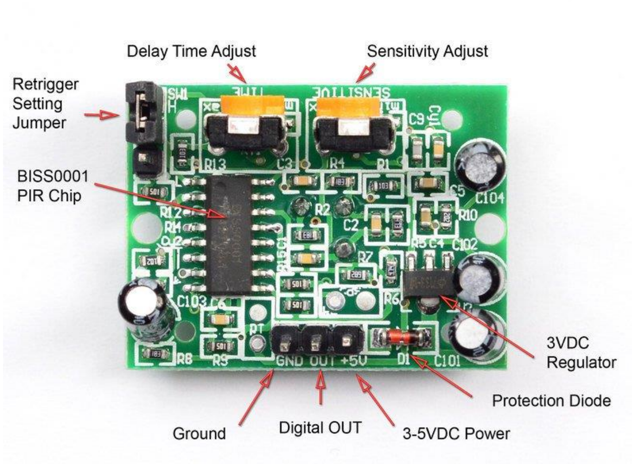

Figure 7: PIR sensor

6.0 Results and Discussion

The sensors, motors and Bluetooth has all been integrated with the Arduino to provide specific functionalities. These functionalities were set and adjusted using Arduino IDE 1.6.9. The code for this robot has been divided into 2 segments: autonomous mode and manual mode. Modes can be switched by using the Bluetooth app. The source code is attached at the end of this report.

6.1 Manual Mode

The code for the manual mode consists of the motors only: servo and driver motors. Using the Bluetooth app, the user will send commands on moving forward, backward, left and right. The driver motors are using PWM inputs on the Arduino. Using a ‘for’ loop, the PWM is incremented by 5 from ‘0’ to ‘255’ with a delay of 5ms to accelerate and decelerate smoothly. The Bluetooth is coded in a way that while the button is pressed, the car will keep moving in the direction assigned. The servo motor is using a digital pin and initially positioned at 90º with respect to the wooden board. Once the user presses the button to lower the pipe, the servo motor will go through a ‘for’ loop code that will decrement the angle of the motor from 90º to 0º. Figure 10 shows the program flow of the manual mode with the exception of the servo motor for watering the plant.

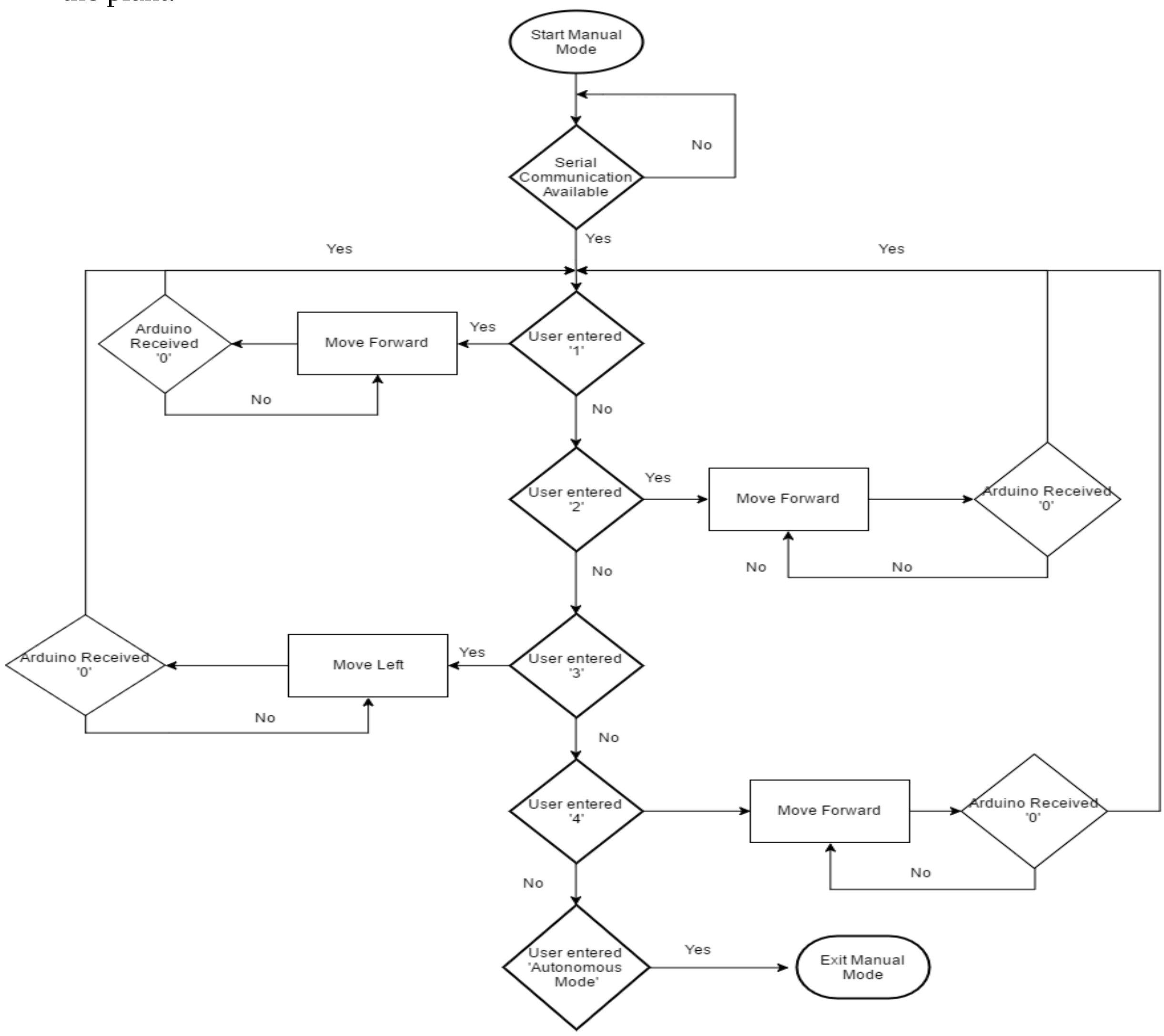

Figure 8: Manual Mode Program Flow

6.2 Autonomous Mode

The autonomous mode is a bit more complicated as the sensors determine the robots movements. In this mode, the car initially starts moving forward using PWM of 155. The IR sensor and PIR sensors constantly checks for the black line on the floor and movement. If the robot reaches the black line, the IR sensor will trigger to a value less than 300 and stop the car. The car will then back up using PWM which will start at 155 and decrement by 1 until it reaches 0. A delay of 250ms will take place before it turns left using the same PWM format as reversing and then continue forward. If the PIR sensor detects motion, the car will stop and the buzzer will beep. Figure 11 shows the program flow of this mode excluding the ultrasonic sensor.

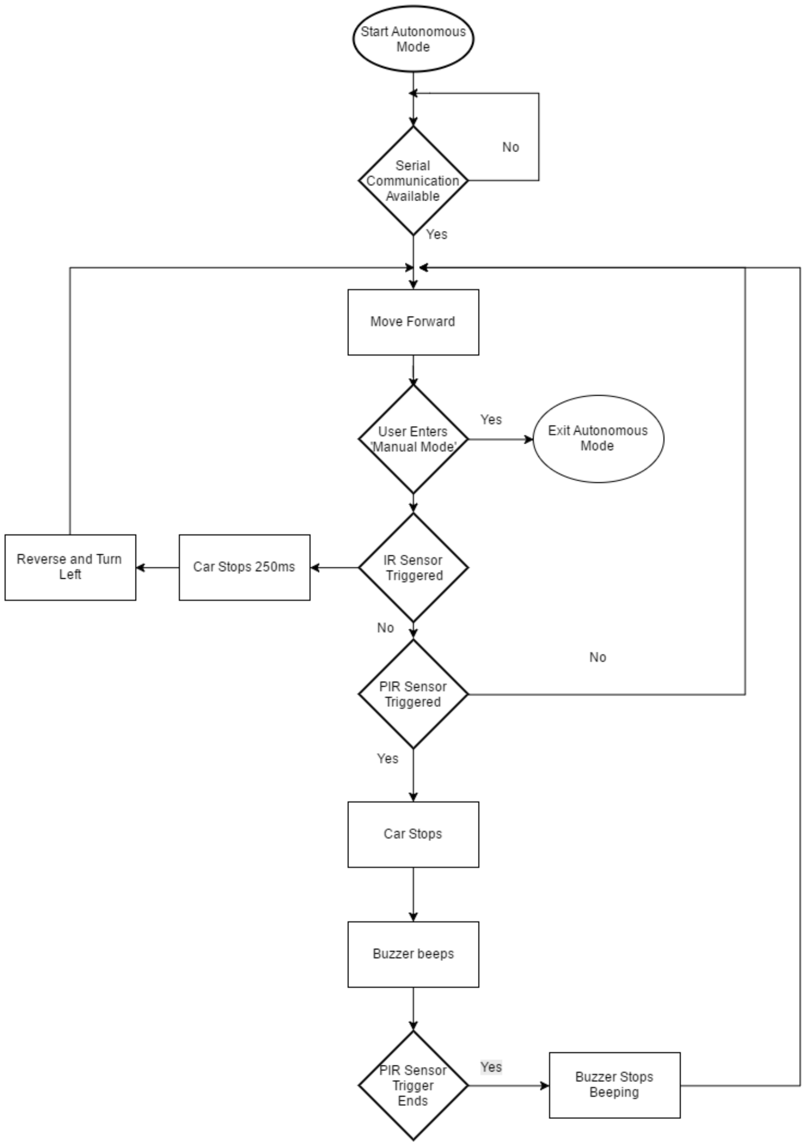

Figure 9: Autonomous Mode Program Flow

6.3 Results of the robot as a whole:

This outdoor mobile robot is able to move forward, backward, turn left and right at a controllable speed. It can be controlled remotely using an android phone and is able to make communication with it. It is designed to patrol only in the patrol zone. With the help of the sensors, it can distinguish sense motion in the surrounding and the ‘border’ of the two zones inside the field and send an alarm. The can navigate within the bounded field. It can also navigate for flowerpots placed in the flowerpot zone and dispense water. Its battery voltage level can also be detected. This robot is environmentally friendly and is not violent in any form.

7.0 Conclusion

Overall this autonomous robotic is equipped to water maximum 2 plants in an area as its size and weight can only afford to hold no more than 600ml water. This robot is quite primitive in the context of current technological advancement. Its autonomous mode can only water limited plants within its scope, in this case an area bounded by a black tape. This system can be improved to meet other bounded regions but its limited size makes it suitable for small areas to perform in. However, the manual mode can be used to remotely water plants in a radius of 9 meters. The biggest advantage of this robot is that it’s 100% eco-friendly. The Li-PO battery doesn’t emit carbon. The other mechanical components provided also doesn’t produce any RoHS by products.

8.0 References

[1] Adafruit, "PIR motion sensor Tutorial," Instructables.com. [Online]. Available: http://www.instructables.com/id/PIR-Motion-Sensor-Tutorial/. Accessed: Sep. 20, 2016.

[2] "What is an IR sensor?,". [Online]. Available: http://education.rec.ri.cmu.edu/content/electronics/boe/ir_sensor/1.html. Accessed: Sep. 20, 2016.

[3] "Introduction," 2016. [Online]. Available: https://www.arduino.cc/en/Guide/Introduction. Accessed: Sep. 18, 2016.

[4] "What is an Arduino?,". [Online]. Available: https://learn.sparkfun.com/tutorials/what-is-an-arduino. Accessed: Sep. 21, 2016.

[5] "Autonomous robots," springer.com, 2016. [Online]. Available: http://www.springer.com/engineering/robotics/journal/10514. Accessed: Sep. 25, 2016.

[6] "Serial port Bluetooth module (master/slave): HC-05 - ITEAD Wiki,". [Online]. Available: https://www.itead.cc/wiki/Serial_Port_Bluetooth_Module_(Master/Slave)_:_HC-05. Accessed: Sep. 22, 2016.

[7] M. Media, "Arduino," Maker Shed, 2004. [Online]. Available: http://www.makershed.com/collections/arduino. Accessed: Sep. 22, 2016.

[8] "Arduino articles on Engadget," Engadget, 2016. [Online]. Available: https://www.engadget.com/tag/arduino/. Accessed: Sep. 20, 2016.

[9] "Newest ‘arduino’ questions," 2016. [Online]. Available: http://stackoverflow.com/questions/tagged/arduino. Accessed: Sep. 22, 2016.

9.0 Source Code

```
#include <SoftwareSerial.h>

SoftwareSerial BTserial(2, 3); // RX | TX

// Connect the HC-05 TX to Arduino pin 2 RX.

// Connect the HC-05 RX to Arduino pin 3 TX through a voltage divider.

//Motor Driver inputs

char c = ' ';

const int in_4 = 9 ;

const int in_5 = 5;

const int in_6 = 6;

const int in_7 = 10;

//IR Sensor

int sensor_1 = 0;     //initialize sensor_1

int sensor_2 = 0;     //initialize sensor_2


int ir_level = 300;   //IR sensor level

int turn_rate = 220;  //Reverse and turn rate

//PIR Sensor

int ledPin = 13;              // choose the pin for the LED

int inputPin = 8;             // choose the input pin (for PIR sensor)

int pirState = LOW;           // we start, assuming no motion detected

int val = 0;                  // variable for reading the pin status


void setup()

{

  Serial.begin(9600);

  Serial.println("Arduino is ready");

  pinMode(in_4,OUTPUT) ;  //Logic pins are also set as output
```

```
  pinMode(in_5,OUTPUT) ;
  pinMode(in_6,OUTPUT);
  pinMode(in_7,OUTPUT);
  pinMode(c, INPUT);
 pinMode(ledPin, OUTPUT);      // declare LED as output
 pinMode(inputPin, INPUT);     // declare sensor as input
  BTserial.begin(9600);
}
void loop()
{
  // Keep reading from HC-05 and send to Arduino Serial Monitor
  if (BTserial.available())
  {
    c = BTserial.read();
    Serial.println(c);


   if ( c == '0') //STOP
  {
   digitalWrite(in_4,LOW) ;//motor1 input 1
   digitalWrite(in_5,LOW) ;//motor1 input 2
   digitalWrite(in_6,LOW) ;//motor2 input 1
   digitalWrite(in_7,LOW) ;//motor2 input 2
   }
  if ( c == '2')  //BACKWARD
  {
  for ( int pwm = 0 ; pwm < 255; pwm++){
   digitalWrite(in_4,LOW) ; //motor1 input 1
   analogWrite(in_5,pwm) ; //motor1 input 2
```

```
  digitalWrite(in_6,LOW) ; //motor2 input 1
  analogWrite(in_7,pwm) ; //motor2 input 2
  delay(1);
  }
}

if ( c == '1') //FORWARD
{  for ( int pwm = 0 ; pwm < 255; pwm++){
  analogWrite(in_4,pwm) ; //motor1 input 1
  digitalWrite(in_5,LOW) ; //motor1 input 2
  analogWrite(in_6,pwm) ; //motor2 input 1
  digitalWrite(in_7,LOW) ; //motor2 input 2
  delay(1);
}
}

 if ( c == '3') //TURN LEFT
{  for (  int pwm = 0 ; pwm < 255; pwm++){
  analogWrite(in_4,pwm) ;  //motor1 input 1
  digitalWrite(in_5,LOW) ; //motor1 input 2
  digitalWrite(in_6,LOW) ; //motor2 input 1
  digitalWrite(in_7,LOW) ; //motor2 input 2
  delay(1);
  }
}

 if ( c == '4') //TURN RIGHT
{ for (int pwm = 0 ; pwm < 255; pwm++){
```

```
    digitalWrite(in_4,LOW) ;  //motor1 input 1
    digitalWrite(in_5,LOW) ;  //motor1 input 2
    analogWrite(in_6,pwm) ;   //motor2 input 1
    digitalWrite(in_7,LOW) ;  //motor2 input 2
    delay(1);
    }
  }

//AUTONOMOUS
  while ( c == 'a'){ //Autonomous using IR sensor

   sensor_1 = analogRead(A0);   //Sensor connection to the arduino
  sensor_2 = analogRead(A1); //Sensor connection to the Arduino

//PIR Sensor
val = digitalRead(inputPin);  // read input value
 if (val == HIGH) {           // check if the input is HIGH
   (ledPin, HIGH);  // turn LED ON
    digitalWrite(in_4,LOW) ;//motor1 input 1    //Stop car
    digitalWrite(in_5,LOW) ;//motor1 input 2
    digitalWrite(in_6,LOW) ;//motor2 input 1
    digitalWrite(in_7,LOW) ;//motor2 input 2
  delay(1000);
 }
 digitalWrite(ledPin, LOW);
 delay(5000);
 if ((sensor_1 < ir_level) || (sensor_2 < ir_level)){
  for ( int pwm = turn_rate  ; pwm > 0; pwm--){ //REVERSE
```

```
  digitalWrite(in_4,LOW) ; //motor1 input 1
  analogWrite(in_5,pwm) ; //motor1 input 2
  digitalWrite(in_6,LOW) ; //motor2 input 1
  analogWrite(in_7,pwm) ; //motor2 input 2
   delay(5);
  }
  delay(250);

  for ( int pwm = turn_rate ; pwm > 0; pwm--){ //Turn left
  digitalWrite(in_4,LOW) ; //motor1 input 1
  digitalWrite(in_5,LOW) ; //motor1 input 2
  digitalWrite(in_6,LOW) ; //motor2 input 1
  analogWrite(in_7,pwm) ; //motor2 input 2
   delay(5);
  }
   delay (250);
}
else if ((sensor_1 < ir_level) && (sensor_2 < ir_level)){
 for ( int pwm = turn_rate  ; pwm > 0; pwm--){ //REVERSE
  digitalWrite(in_4,LOW) ; //motor1 input 1
  analogWrite(in_5,pwm) ; //motor1 input 2
  digitalWrite(in_6,LOW) ; //motor2 input 1
  analogWrite(in_7,pwm) ; //motor2 input 2
  delay(5);
  }

  delay(250);
```

```
for ( int pwm = turn_rate ; pwm > 0; pwm--){ //Turn left
digitalWrite(in_4,LOW) ; //motor1 input 1
digitalWrite(in_5,LOW) ; //motor1 input 2
digitalWrite(in_6,LOW) ; //motor2 input 1
analogWrite(in_7,pwm) ; //motor2 input 2
delay(5);
}
delay (250);

else    {
analogWrite(in_4,100) ; //motor1 input 1
digitalWrite(in_5,LOW) ; //motor1 input 2
analogWrite(in_6,100) ; //motor2 input 1
digitalWrite(in_7,LOW) ; //motor2 input 2
}
} //End of Autonomous

} //End of Bluetooth
}//End of Loop
```

10.0 Receipts

8/30/2016 www.lelong.com.my - Order Confirmation

MY ROBOT EDUCATION SDN. BHD. ((1116429-U))
MY ROBOT EDUCATION SDN. BHD.
LOT 2.67, 2ND FLOOR, SOUTH CITY PLAZA,
PERSIARAN SERDANG PERDANA,
SERI KEMBANGAN 43300
Selangor, Malaysia
Tel : -
Emel : robotshop.lelong@gmail.com

Order Confirmation

Sold to:
HM-Adnan Zami (adnanzami)
The ARC, Block A 19-05, Persiaran Bestari
Cyberjaya 163000
Selangor, Malaysia
Tel : +60162940289 / +60162940289
Email : adnan_wca2013@yahoo.com

Order No : 6697770
Order Date : 30 Aug 2016

ProductID	Product Description	Qty	Unit Price (RM)	Total (RM)
175076476	Arduino Tower Pro 9g SG90 Plastic Gear Micro Servo Motor with parts SKU: sg90	1	7.50	7.50
				7.50
			Shipping :	8.00
			Net Total :	**15.50**

Note: This document is computer generated and no signature is required.

OFFICIAL RECEIPT

MY ROBOT EDUCATION SDN. BHD.
LOT 5, JLN ..., SEKSYEN 10,
KAWASAN PERINDUSTRIAN MIEL,
43650 BANDAR BARU BANGI, SELANGOR.
TEL. 03-89570357
E-MAIL: admin@roboteducation.com.my

MYBOTIC (JM0684971-P) "Your Robotic Solution"

MYBOTIC
47, JALAN UNIVERSITI 1
TAMAN UNIVERSITI, PARIT RAJA,
BATU PAHAT 86400
Johor, Malaysia
Tel : -
Emel : admin@mybotic.com.my

Order Confirmation

Sold to:
HM-Adnan Zami (adnanzami)
The ARC, Block A 19-05, Persiaran Bestari
Cyberjaya 163000
Selangor, Malaysia
Tel : +60162940289 / +60162940289
Email : adnan_wca2013@yahoo.com

Order No : 6663868
Order Date : 23 Aug 2016

ProductID	Product Description	Qty	Unit Price (RM)	Total (RM)
171687962	DC Gear Motor Bracket Ship within 1-3 working days SKU: MT-BR-DC	2	11.00	22.00
				22.00
			Shipping :	8.00
			Net Total :	30.00

MYBOTIC JM0684971-P

新马（吉）有限公司 (381214-V)

SIGMA COMPONENTS SDN. BHD.

85, Jalan Pasar, Pudu, 55100, Kuala Lumpur, Malaysia. GST ID No: 002119180288
Tel: 603-92263396, 92247919, 92262901 Fax : 603-92263464 Email: sigmacompt@gmail.com

Tax Invoice
(CASH SALES)
№ 112083

M/S: ....

Date: 2/8/16

Item	Description	Qty	U/price	Amount
1	1/4w Resistor	48	0.05	2.40
	3mm LED	12	0.20	2.40
	1N4 Diode x2, 1N4148 x2	4		1.40
	7805	1	1.50	1.50
	LM 339	3	1.20	3.60
	Tact switch	6	0.50	3.00
	10k	3	0.20	0.60
	100uF 25V	5	0.30	1.50
	Strip Board (8x)	1	2.00	2.00
	3m Proto	6	0.50	3.00
			Total (included GST)	21.40
			GST 6%	1.21
			Total (excluded GST)	

Goods sold are not subject to return.

Signature

NO. 622505

日期 Date: 24 July 2016

M/S HM-ADNAN ZAMI
CYBERJAYA SELANGOR
016-2940289

NO	摘要 PARTICULARS BUTIR-BUTIR	数量 QUANTITY KUANTITI	价格 UNIT PRICE HARGA	银额 AMOUNT NILAI
1	65pcs Jumper Wire	1	8 00	RM 8 00
2	Shipping & Handling	1	7 00	RM 7 00
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
			TOTAL / 总额 JUMLAH	RM 15 00

货物出门，恕不退换 Goods sold are not returnable / Barang yang dijual tidak boleh dikembalikan

ARDUIBUDI ENTERPRISE
(JM0741288-W)
8872, Jalan Nuri 29, Bandar Putra, 81000 Kulai, Johor.

Received by / Terima Oleh / 收货人

新马（吉）有限公司 (381214-V)
SIGMA COMPONENTS SDN. BHD.
85, Jalan Pasar, Pudu, 55100, Kuala Lumpur, Malaysia. GST ID No: 002119180288
Tel: 603-92263396, 92247919, 92262901 Fax : 603-92263464 Email: sigmacompt@gmail.com

Tax Invoice
(CASH SALES)

№ 112084

M/S: ....

Date: 2/8/16

Item	Description	Qty	U/price	Amount
1	GL-12 Project Board	1	12.00	12.00
2	HC-05 Bluetooth	1 set	35.00	35.00
3	Arduino Nano	1 set	35.00	35.00
4	L298	1	10.00	10.00

Goods sold are not subject to return.

Total (included GST)	92.00
GST 6%	~~82.00~~
Total (excluded GST)	~~76.64~~ 5.21

Signature