“SPYING SWARM ROBOTS FOR MILITARY APPLICATIONS”

A PROJECT REPORT

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

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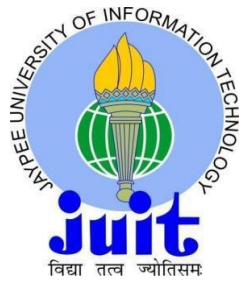

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SOLAN – 173234 HIMACHAL PRADESH, INDIA May-2019

CERTIFICATE

This is to certify that the work which is being presented in the project report titled **"SPYING SWARM ROBOTS FOR MILITARY APPLICATIONS"** in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Electronics and Communication Engineering and submitted to the Department of Electronics and Communication Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out during a period from July 2018 to December 2018 under the supervision of **Mr. Mohit Garg** Assistant Professor, Department of Electronics and Communication Engineering, Jaypee University of Information Technology, Waknaghat.

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This is to certify that the above statement made by candidate is true to the best of our knowledge.

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ABSTRACT

In this project we are going to explain swarm mechanism with the help of two robots which will be working as master slave. We are using a RF transmitter along with two robots. Here we are working with two robots but we can have N number of bots in order explain swarm mechanism. Now the bots are being controlled by a remote. On the remote we may select which bot we have to work with currently. Along with the swarm mechanism we are also working on techniques like bomb detection. Also, all the important information like heat detection using PIR sensor, humidity, latitude and longitude using GPS and all the data is sent over to user via Bluetooth module. The controlling device of the whole system is a Arduino. Due to that circuit complexity is reduced and performance speed is increased. Whenever, land mines or bombs are detected, it alerts through an SMS that contains information of the latitude and longitude of the bomb site. The Arduino used in the project are programmed using Embedded C language. Just by using a RF module enabled, the user can control the Arduino Military Spying and Bomb Detection Robot from anywhere area.GPS module tracks the movement and gives live location to the controller.

TABLE OF CONTENT

List of Figures

CHAPTER-1

INTRODUCTION

1.1 OVERVIEW

Specialized improvement together with the requirement for elite robots made quicker, progressively precise and increasingly canny robots utilizing new robots control devices and propelled system calculations. The exhibited bot controlling framework can be utilized for various complex bot calculations. This swarm mechanism is fully controlled and constrained by a remote and hence we get directions for the bot. Hence this covert operative and bomb identifying robot may be utilized in military applications. A large portion of military association currently takes the assistance of robots to do a large number of unsafe employments that is impossible by the fighter. These covert agent robots utilized in military are generally utilized with incorporated framework including cameras, video screens, sensors. The military robots likewise have various shapes as indicated by the reasons for every robot. In this way the proposed framework, an Intelligent Robot utilizing RF module spares human lives and diminishes manual blunder in protection side.

1.2 PROBLEMS DEFINITION

The configuration of Swarm spy and bomb identifying robot is completely controlled and constrained by the bot's remote and the directions give in the remote by means of RF transmitter were gotten by Arduino. This venture could be utilized in military and fighting.

1.3 INTRODUCTION TO SWARM ROBOTICS :

Swarm mechanical technology is at present a standout amongst the most significant application zones for swarm knowledge. Swarms give the likelihood of upgraded task execution, high dependability (adaptation to non-critical failure), low unit intricacy and diminished expense over conventional automated frameworks. They can achieve a few

errands that would be outlandish for a solitary robot to accomplish. Swarm robots can be connected to numerous fields, for example, adaptable assembling frameworks, space creates, assessment/upkeep, development, farming and medication work.

It is supposed that a desired collective behavior occurs from the interaction between the robots with the environment.

1.4 INTERNET OF ROBOTS

Web of Robot With the tight coordination of IoT, mechanical technology applications are effectively executed in various regions. Apply autonomy, in the cutting edge world, are firmly incorporated with detecting, processing, and correspondence equipment which empowers the robots to do a wide range of mind boggling and facilitated activities. With the incorporation of IoT in mechanical autonomy, a few units supplement the robot works like savvy objects, sensors in the field zones, servers, and a wide range of system correspondence equipment. IoT-based robots nowadays are actualized in medicinal services, mechanical plants, military applications, look into focuses, and even car based generation units. In reality, heaps of specialists around the globe are taking a shot at ongoing mechanization IoT apply autonomy item improvement for all things considered usage in assorted regio

1.5 SWARM ROBOTICS MECHANISM

- An adaptable assembling framework the movement (direction) arranging of the portable robots is a significant issue in the early time of mechanical autonomy just a single versatile bot was taken in the movement arranging. The one robot required a few measured to be performed so as to invent the objective without impact with barriers while meeting a few situations that are already known. Its effectiveness is less, since it is difficult to know the objective quickly and execute his errands since the data gotten by it was constrained. Also, if this single robot was hurt, the errand completely failed. Swarm mechanical self-sufficiency is a novel method to manage the coordination of significant amounts of respectably fundamental robots, which takes its inspiration from social bugs (ants, wasps or termites), as showed up in Figure (2). These dreadful little animals can encourage their practices to accomplish errands that are past the capacities of a singular individual. Ants can pass on broad preys to their home; termites can develop tremendous slopes from mud, etc. The ascent of such synchronized lead at the structure level is a wellspring of inspiration for experts working in the field of multi-administrator mechanized systems. The structure level movement of a swarm robotized system should show three helpful properties that are observed furthermore in the nature.

- **Robustness:** the framework ought to have the option to work regardless of unsettling influences from the surroundings or the breakdown of its users. Swarms are innately repetitive frameworks since the loss of an individual can be promptly repaid by another. Their coordination is decentralized and along these lines the annihilation of a specific piece of the swarm won't stop its activity. The people that make up the swarm are moderately basic, making them less inclined to disappointment.

- **Flexibility**: the general population of a swarm can encourage their practices to deal with assignments of different nature (the ants can all things considered find the briefest route to a sustenance source).

- **Scalability**: the swarm ought to have the option to work under a wide scope of gathering sizes and bolster a substantial number of people without diminishing the exhibition impressively. In this manner the coordination components and procedures

to be created for swarm mechanical frameworks ought to guarantee the activity of the swarm under changing swarm sizes.

The principle requirements for swarm automated frame work are:

• Optimized coordination between the individual which must connect with their condition.

• The solitary robots must be homogeneous, close undefined, at any rate at the element of correspondences.

• They must be fundamental, as concerning the limitations in their individual capacities in regard to the endeavor, and not the gear and programming multifaceted nature of the robots.

• The general population should have neighborhood association limits, which ensure that the coordination between the robots is dispersed, and that it will undoubtedly scale with the proportion of the swarm.

The key issue in swarm apply autonomy is the coordination instruments between the individual robots. Concentrates in physical and organic frameworks uncovered that there are a few coordination components referred to in nature which can go about as wellsprings of motivation for planning swarm mechanical frameworks. The most significant two such coordination systems are self-association.

Self-association is defined as a procedure where designs at the worldwide dimension of a framework rise exclusively from various collaborations among the lower level segments of the framework. Transaction of positive and negative feedback of nearby collaborations among the people is fundamental. Feedback is commonly created through autocatalytic practices, as execution of a conduct expands the activating of the exceptionally same conduct. Such a positive input cycle is then offset the negative feedback system.

The SWARM-BOTS are self-ruling portable robots with self-amassing abilities. They exploit from group and circulated ways to deal with guarantee heartiness to

disappointments and to hard condition conditions in errands, for example, route, inquiry and transportation in unpleasant landscape.

Figure 1: SWARM OF ANTS

Figure 2: Swarm of robots

1.6 Radio Frequency

Radiofrequency (RF) is an estimate of the fluctuation rate of the electromagnetic radiation range from 300 GHz to 9 kHz. With the use of radio cables and transmitters, an RF field can be used for many types of telecommunications centers and trunk exchanges.

Working of Radio Frequency

Radio frequencies are measured in the Hertz, Radio frequency is measured in the terms of cycles,one cycle is calculated as the distance between one trough and crest. Radio transmission is spread over full spread spectrum of the RF band. RF is not in the visible spectrum so RF waves just like IR could not be seen with bare eyes.

RF technology

In radio waves, the wavelength corresponds to recurrence. Randomly, f is the recurrence in Mhz and s is the wavelength in meters, at this point

$s = 300 / f$

Recurrence extends beyond the RF range, electromagnetic vitality appears in the form of infrared (IR), inimitable, luminous, X-ray and gamma rays.

Many types of remote devices use radio frequency fields. Wireless and mobile telephones, radio and broadcast stations, Wi-Fi and Bluetooth modules, satellite exchange frames and two-way radios operate in the RF range.

CHAPTER 2

LITERATURE REVIEW

2.1. LITERARTURE SURVEY :

- **Yogeswaran M. and Ponnambalam S. G.**

A machine stacking issue in adaptable assembling framework (FMS) is talked about with bicriterion goals of limiting framework unbalance and amplifying framework throughput in the event of mechanical requirements, for example, accessible machining time and instrument spaces. An effective developmental calculation by hybridizing the hereditary calculation (GA) and recreated toughening (SA) calculation called GASA is proposed in this paper. The exhibition of the GASA is tried by utilizing 10 test dataset and the outcomes are contrasted and the heuristics announced in the writing. Two machine choice heuristics are proposed and their effect on the nature of the arrangement is additionally considered. Broad computational tests have been completed to assess the exhibition of the proposed developmental heuristics and the outcomes are introduced in tables and figures. The outcomes plainly bolster the better execution of GASA over the calculations revealed in the writing.

Swarm mechanical autonomy is another way to deal with the coordination of expansive quantities of moderately straightforward physically epitomized robots, that are independent, not controlled midway, equipped for neighborhood correspondence and works dependent on some feeling of natural motivation (Sharkey and Sharkey, 2006a). Swarm mechanical frameworks have turned into a noteworthy research zone since 1980, as new arrangement approaches are being created and approved, usually conceivable to figure it out the benefits of swarm mechanical frameworks.

CONTROL APPROACHES:

• Centralized: the association of a framework having an automated operator (a pioneer) that is in charge of arranging crafted by different robots. The pioneer is related with the

Decision making process for the whole group, while different people act as indicated by the headings.

• Distributed: the association of the executive by self-controlled operators that are completely self-sufficient in the process of making decisions among themselves. In this class

- **Leo Louis**

In this article, the standard of work and the uses of an Arduino board. This seems to be the way to explore how it could be used as a study gadget and research work. The Arduino board can provide a quick gadget before the large-scale integration test, including sensors. The main focal points are dynamic planning and the basic interface. Nowadays, with an increasing number of people using programming and open source equipment for many years, the development is forming another conjecture by making things less complex and less interesting. These open sources generate free or essentially low costs, moderately reliable and reliable development. This document offers a general description of the Arduino sheets, the work indicators, the execution of the programming and its applications. Arduino is an open source microcontroller that can be adjusted, deleted and redoed successfully at any time. Introduced in 2005, it was assumed that the Arduino organization should grant authorities, duplicates and specialists a quick and easy way to have machines talk about their status using sensors and actuators. In perspective on transparent control sheets, this is an open source recording step that is used in electronics for the creation and programming of devices. It is also ready to function as a small PC, as well as for separate controllers, which take data sources and control the performance of a device design. It is also suitable to tolerate and send information to the Web using several Arduino shields, which are described in the document. Arduino uses the hardware known as the Arduino improvement block and the programming to structure the code called Arduino IDE (Integrated Advance Environment).

This research article also helped us learn Arduino programming:

Each sketch will always have two main parts:

1) Void Configuration (): this is the main program that starts when Arduino starts working. This function is executed once throughout the program. The installation work contains the installation of each key that we hope to use in our information or

performance project. Before using the factors for programming, it is important to characterize them in relation to the "void setup ()" capability

2) Empty loop (): this is the function that follows the significant function in the code. Understands that part of the code that must be systematically executed

- **M. Narayanan, M. Ashok Kumar, A. Ranjith Kumar , K. Raja (2017)**

This document examines the use of the RF signal to control electrical charges later through a remote control. In order to save the essential, to change the batteries inevitably, to maintain a vital separation of unnecessary human movements and to release electrical charges from the capacities of the cables with individual switches, a negligible effort motorization structure is proposed. The proposed strategy uses a 16F877A PIC controller, an encoder, a decoder and the RF module to control the electric weights. You can control about 15 batteries within a 30-meter partition.

The movement of equipment and the propulsion by correspondence have made robotization an essential element of all methods. From the family to the company, power and methodology will dare to keep the essential, develop the adequacy of human work by reducing strenuous movements, improve profits and save time, computerization is proposed. This is done using the RF signal to control the remote electrical loads. Remote correspondence between electronic objects has come to life due to the imaginative improvement of radio (RF) and infrared (IR) frequencies. RF remote controls are very typical; They are used in equipment such as garage door openers, remote controlled toys and a remote vehicle section key, remote splitter connections, etc. The problem with RF remote controls is the large number of radio signals that fly through the air at any time.

The RF module has the RF transmitter and the RF receiver. The square diagram of the RF transmitter is taken into account and the associated modules are: PIC 16F877A, encoder, radiofrequency transmitter, battery, voltage controller and key lock.

- **Chiara Buratti , Andrea Conti , Davide Dardari and Roberto Verdone**

This paper deals with the wireless sensor networks(WSN) empower new applications & require ideal models for convention structure because of few imperatives. Inferable from the necessity for low devices multifaceted the nature together with low vitality utilization , a legitimate harmony among correspondence and sign/information preparing capacities must be found. Specifically, some unconventional applications, for example, those dependent on natural checking, are talked about and plan methodologies featured; a contextual analysis dependent on a genuine usage is additionally announced. Patterns and potential advancements are followed. Accentuation is given to the IEEE 802.15.4 innovation, which empowers numerous uses of WSNs. Some case of execution attributes of 802.15.4-based systems are appeared and talked about as a component of the measure of the WSN and the information type to be traded among hubs.

The paper gives a study of the WSNs advances, principle applications & models, included in WSNs structure with contextual analysis, and developments. Specifically case of execution dependent on trial outcome will be accounted for. Concerning the writing this paper bargains not just with the applications and highlights of WSNs, or just on the structure of WSNs,assembles every one of these viewpoints, adding the consideration on advancements as well as benchmarks.

CHAPTER 3

SYSTEM COMPONENTS

3.1 ARDUINO UNO

Arduino UNO is an open source microcontroller card that is based on the ATmega328P Microchip microcontroller and created by Arduino.cc. The board is equipped with advanced (digital) and simple (analog) information / output (I / O) strips that can be interfaced with different extension sheets (shields) and different circuits. The board has 14 digital, 6 analog and programmable pins with the Arduino IDE (Integrated Development Environment) via a USB B-type link. It can be controlled via a USB link or an external 9V battery, however, recognizes voltages somewhere in the range of 7 and 20 volts. The Arduino Uno ATmega328 is already paired with a bootloader that allows you to transfer new codes without using the services of an external hardware software engineer. Transmits using the first STK500 convention. Uno also contrasts with all first cards because it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 to R2) modified as USB / sequential converter.

3.1.2 Pins

Pin functions

• LED: there is a working LED controlled by the computerized pin13. At the point where the pinis high, the indicator is lit, when the pinis LOW, it is off.

• Vin: the information voltage on the Arduino board when an external power source is used (instead of 5 volts of the USB or other directed power supply). You can supply voltage through this pin or, if you do it through the power connector, access it through this pin.

• 5V: this pin produces a 5V managed controller on the board. The card can be powered by the DC control socket (7-20 V), the USB connector (5 V) or the VIN key of the card (7-20V).

Providing voltage using the 5 V or 3.3 V pins bypasses the controller and can damage the card.

• 3V3: a 3.3 volt power supply created by the integrated controller. The most extreme power consumption is 50 mA.

• GND: ground terminals.

• IOREF: this pinon the Arduino board provides the voltage reference on which the microcontroller is working. Properly designed shielding can analyze the voltage of the IOREF pinand select the appropriate power source or allow voltage operators to supply the outputs to operate at 5 V or 3.3 V.

• Reset: usually used to add a reset lock to the shields that interfere with the card lock.

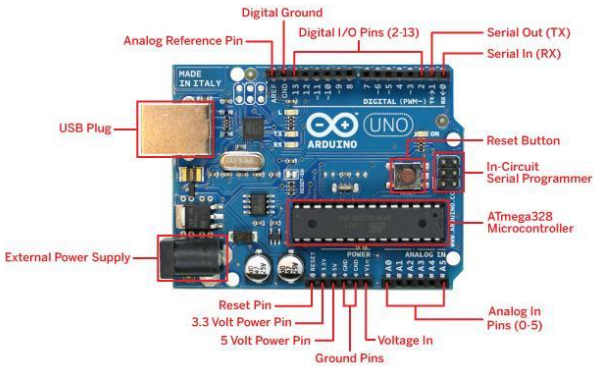


Figure 3: Arduino UNO

3.2 HT12E Encoder IC

3.2.1 Datasheet

The HT12E is an encoder circuit connected in 2 to the switching power of 12 encoders. They are combined with 2 to power 12 permutations of the decoder for use in remote control system applications. It is usually used to interconnect RF and infrared circuits. The chosen encoder / decoder pair must have the same number of addresses and data collection.

Basically, the HT12E changes relative to the parallel commitments of successive performances. It encodes the 12-bit parallel data for transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits.

HT12E has a drive pin which is low dynamic. Only when an enable signal is skipped on the TE pin, reduced addresses / data are transmitted with the header bits by methods for an RF or infrared transmission medium. The HT12E initiates a 4-word perpetual transmission of a transmission authorization. This cycle is repeated every time TE is low. As TE becomes high again, the performance of the encoder ends its last cycle, and then simply stops.

3.2.2 Pin Diagram

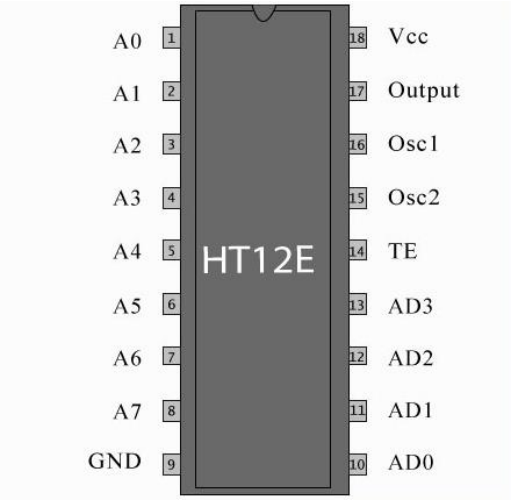


Figure 4: HT12E Pin Diagram

3.2.3 Pin Description

Pins 1-8 are bit Address pins for i/p i.e. A0-A7.

Pin 9 is Ground at 0 Volts.

Pins 10-13 are 4 bit Data pins AD0-AD3.

Pin 14 Active low is TE.

Pin 15 Oscillator i/p is Osc2.

Pin 16 Oscillator o/p is Osc1.

Pin 17 Serial Data o/p is Poutput.

Pin 18 supply voltage of 5V is Vcc.

3.3 HT12D Decoder IC

HT12D is a coordinate decoder circuit with a decoder arrangement. This range of decoders is mainly used for remote work applications, similar to theft alert, vehicle entry controller, security structure, etc. It mainly gives the RF interface and infrared circuit arrangements. They are combined with an array of encoders. The chosen encoder / decoder pair must contain an equal number of addresses and information positions. Basically, the HT12D changes with the sequential contribution to the parallel performances. It deciphers the sequential locations and the information obtained by an RF receiver in parallel information, and sends them to generate the information pins. The sequential information is contrasted and the residential areas are constantly dubbed. The information code is decoded if no erroneous

or inconsistent code is found. Significant transmission is demonstrated by a high signal on the VT pin.

HT12D is equipped to unlock 12 bits, of which 8 are location bits and 4 information bits. Information about the 4-bit hook-type performance pins remains unchanged until the new is gotten.

3.3.1 Pin Diagram

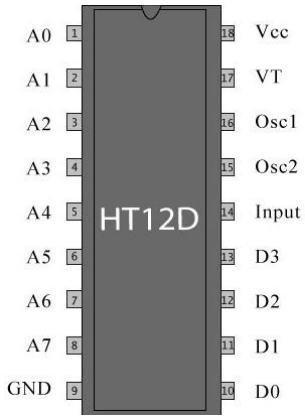


Figure 5: HT12D Pin Diagram

3.3.1 Pin Description

Pins 1-8 are bit Address pins for i/p i.e. A0-A7.
Pin 9 is Ground at 0 Volts.
Pins 10-13 are 4 bit Data pins D0-D3.
Pin 14 Serial Data i/p is Input.
Pin 15 Oscillator o/p is Osc2.
Pin 16 Oscillator i/p is Osc1.
Pin 17 Active High is VT.
Pin 18 Supply Voltage 5V (2.4V-12V) is Vcc.

3.4 GPS Module

It is a device that receives information from GPS satellites. The device is in sight of around 1-4 satellites depending on its geographical position and the availability and location of satellites in the atmosphere. It then calculates the device's exact geographical position. With the help of Google Maps API we can plot the latitude and longitude on the google maps itself.

Features

- Very quick TTFF (Time To First Fix) at low signal level
- Inbuilt Antenna Patch
- Inbuilt Connection Cable
- 5V supply of dc is provided.
- Its Dimensions are 30mm * 30mm * 10mm
- It has a tracking sensitivity of 159 dBm.

3.5 HC-06 Bluetooth Module

Features

• The sensitivity (BER) can reach -80dBm.

• The range of power change o / p: -4 - + 6dBm.

Descriptive function

• it has an EDR module; and the range of the change of depth of setting: 2 Mbps - 3 Mbps.

• has a 2.4 GHz receiving cable work; the customer does not need to test the radio cable

• Is the 8Mbit external flash

• Can operate at low voltage (3.1V ~ 4.2V). The matching current is between 30 and 40 mA.

• The corresponding current is 8mA.

• Standard HCI port (UART or USB)

• USB protocol: USB 1.1 full speed, 2.0 compatible

This module can be used in the SMD.

• This is done via the RoHS process.

• The PIN of the plate is the estimate of half the difference.

• It has an advanced 2.4 GHz remote headset.

• Basics on Bluetooth CS0 innovation BC04.

• Has versatile repeat bounce capability.

• Small (27mm × 13mm × 2mm)

• The peripheral circuit is simple.

• It is in the control dimension of the Bluetooth class 2.

• Expansion of the storage temperature: - 40 - 85, working temperature: - 25 - + 75

• Faulty interference: 2.4 MHz, transmission intensity: 3 dBm

• Bit error rate: 0. Only the sign rots in the transmission interface, a bit error can be created. For example, when handling RS232 or TTL, some signs may rot.

Figure 6: Bluetooth Module

3.6 HCSR04

This sensor is an Ultrasonic Sensor. It transmits a sound pulse when we apply active high on the trigger pin and when the trigger is set on active high the echo pin becomes high to listen to the sound pulse which is reflected by the nearest obstacle in its range.

This working principle is similar to SONAR.

The time is noted from the transmission time to the receiving echo time.

Thus it calculates the distance between itself and the obstacle since the speed of sound is a universal quantity.

For practical purposes we keep the delay time to 1000ms.

Figure 8: HCSR04

3.7 L293D Motor Driver

3.7.1 Datasheet

L293D is a H-associate motor driver infused Integrated circuit-IC. L293D contains 2 inbuilt H-bridge circuits. In its practical strategy for directional movement, 2 actuators can be driven simultaneously, both in forward and switch heading.

The working is based on a truth table when i/p is (0,0) bot moves forward, when i/p is (1,1) the bot moves backward, when i/p is (0,1) the bot turns right and when i/p is (1,0) the bot turns left.

Other than this the when the enable pins 1,2 is high this helps in movement of one motor, when enable pins 3,4 is high this drives the other part of the bot for the movement of motors the microcontroller code should be such that at the time of need both the enable pins could be simultaneously be put on high or low as per the requirements.

3.7.2 Pin Diagram

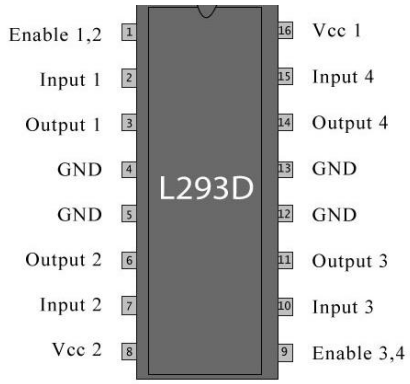


Figure 9: L293D Pin Diagram

3.7.3 Pin Description

Pin 1 is enable pin for active high as enable 1.2
Pin 2 is I/p 1 for motor 1 as I/p 1.
Pin 3 is O/p 1 for motor 1 as O/p 1.
Pin 4 & 5 are ground at 0 Voltage.
Pin 6 is O/p 2 for motor 1 as O/p 2.
Pin 7 is I/p 2 for motor 1 as I/p 2.
Pin 8 is Supply Voltage for motors at 9-12V upto 36V as Vcc.
Pin 9 is enable pin for motor 2 active high.
Pin 10 is I/p 1 for motor 1 as I/p 3.
Pin 11 is O/p 1 for motor 1 as O/p 3.
Pin 12 & 13 are ground at 0 Voltage.
Pin 14 is O/p 2 for motor 1 as O/p 4.
Pin 15 is I/p 2 for motor 1 as I/p 4.
Pin 16 is Supply Voltage of 5V upto 36V as Vcc.

3.8 PIR Sensor

3.8.1 General

SB-0061 is a pyro-electric sensor module which produced for human body discovery. A PIR locator joined with a fresnel focal point are mounted, SB-0061, and constrained parts to frame the module. Abnormal state yield of variable width is given.

3.8.2 Features and Electrical Specification

- The size of the module is 0.28*0.38cm.
- The supply of the module ranges from 5vDC to 20vDC.
- Delay time of the module range from 5secs to 18min.
- Blockade time of the module ranges from：0.5s-50s
- Infrared sensor: dual element, low noise, high sensitivity

Figure 10: PIR Sensor

3.9 IC7805

3.9.1 Datasheet

The IC 7805 is a voltage co-ordinated circuit. It is a member of 78xx series of Linear Voltage Regulators. The Voltage Source in a circuit may have fluctuations and would not give the desired O/p. The IC maintains the o/p voltage at the desired value. The IC 7805 provides +5V regulated voltage supply. Capacitors of suitable values can be connected at i/p and o/p pins depending upon the respective voltage levels.

3.9.2 Pin Diagram

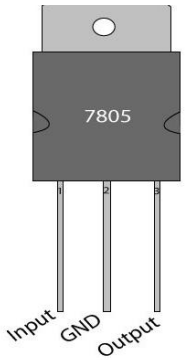


Figure 11: IC 7805 Pin Diagram

3.9.2 Pin Description:

Pin 1 is I/p Voltage from 5V to 18V as I/p.

Pin 2 is Ground at 0 Voltage.

Pin 3 is Regulated O/p at 5V as O/p.

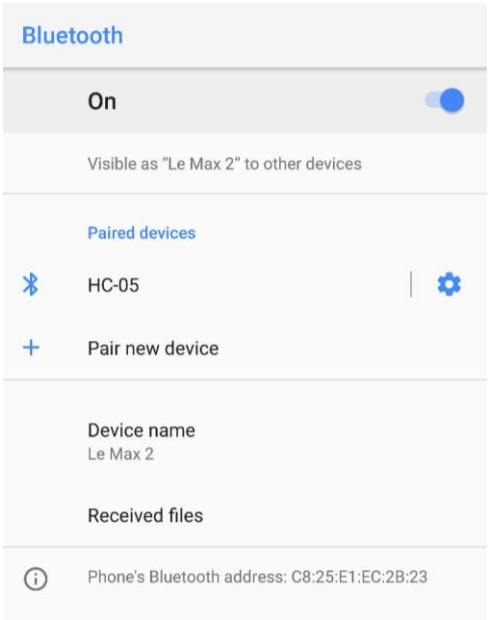
3.10 Ardutooth App

The easiest way to visually experience Arduino sensor data directly on your smartphone is using Ardutooth App.

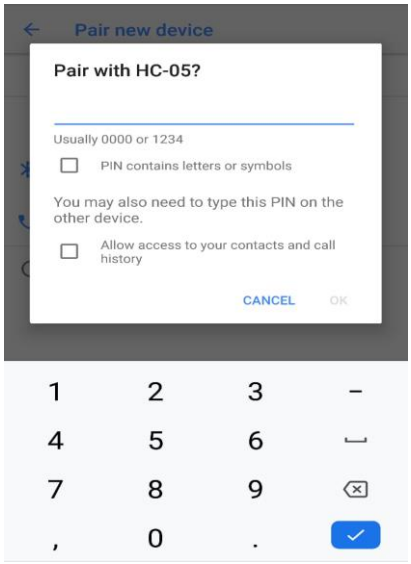
The App will establish a wireless Bluetooth Connection between Arduino and Smartphone.

Steps to use Ardutooth :

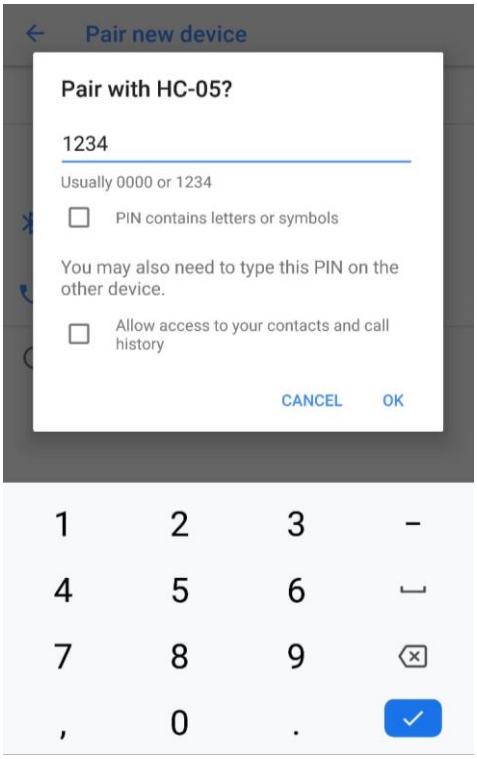
Step 1 : Open Bluetooth of your android device.



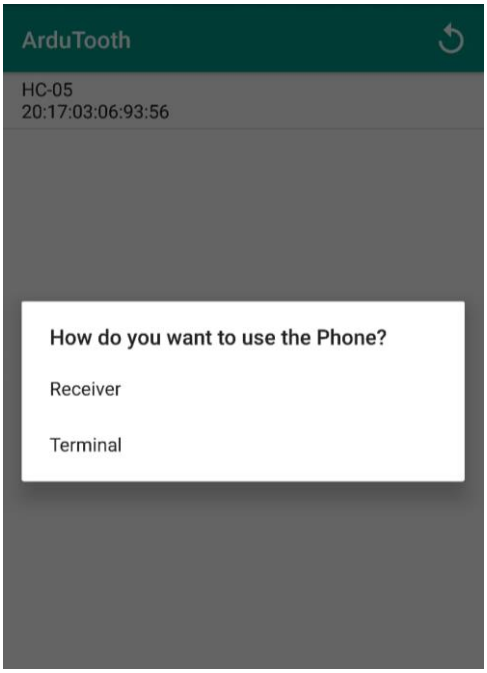
Step 2 : Click on HC-05.



Step 3 : Enter passcode 1234.



Step 4 : Choose device as Receiver.



CHAPTER 4

System Design

4.1 Layout

The system design is simple the robot is connected via a RF remote control to control its movements a laptop is interfaced with Raspberry pi for the video playback feature GPS module is integrated to know the location of the robot GSM is used to send the link to the Google Maps to the registered mobile number.ESP8266 Wi-Fi module is the backbone of this project the robot is connected to the data services via this module to perform the tasks and to display the data of the sensors for the user to take appropriate decisions.

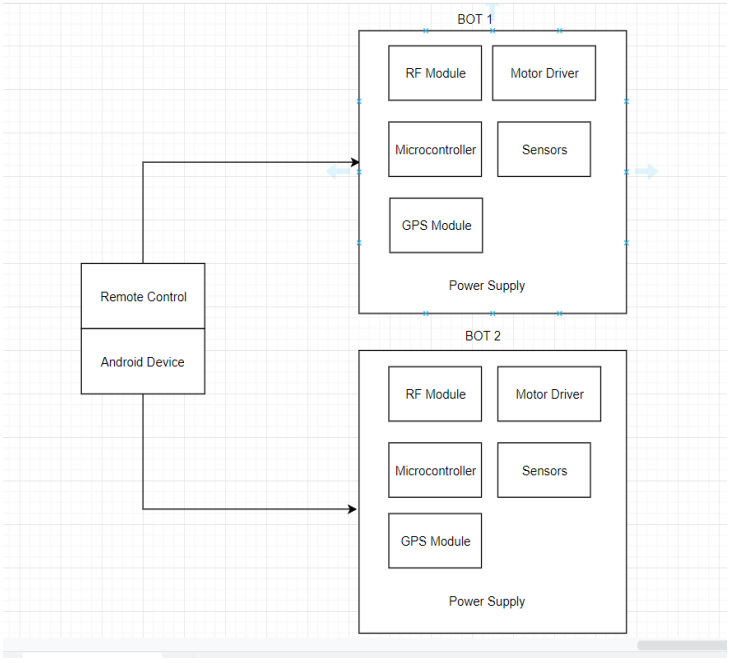


Figure12: Project Layout

4.2 Transmitter

Transmitter consists of an encoder and RF transmitter module the O/p from the switches is encoded and is transmitted. The frequency of the transmitter is 433.92 MHZ. Transmitter remote takes i/p from the user. The robotic arm and the robot movement i/ps are encoded and sent.

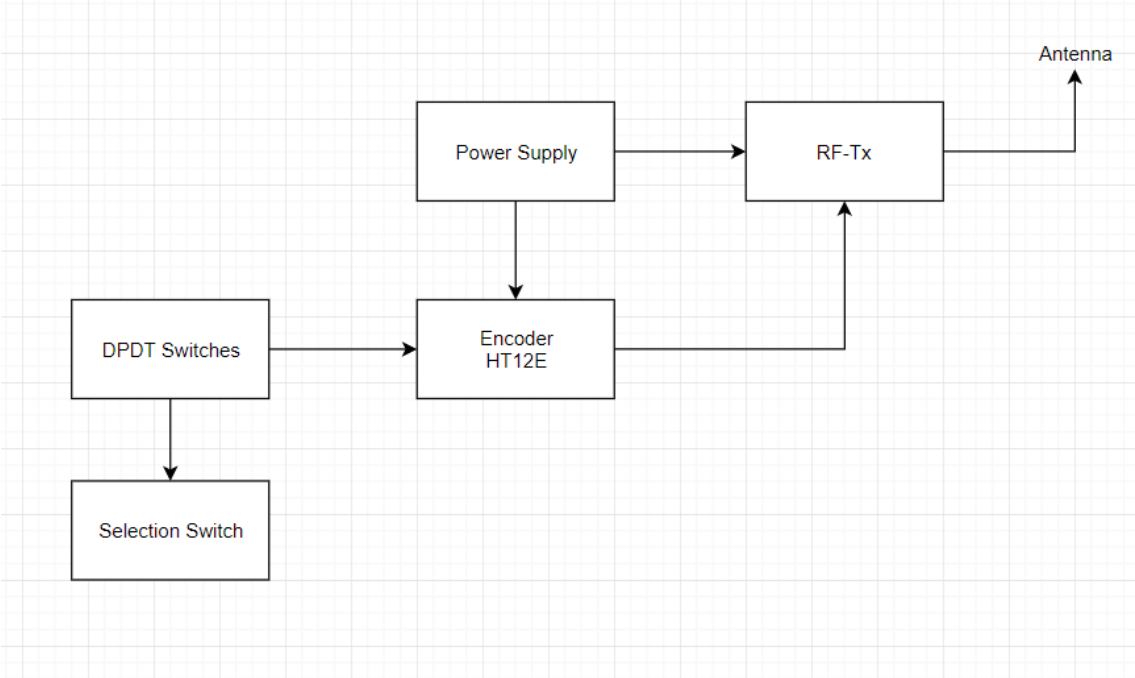


Figure13: Transmitter

4.3 Receiver

Receiver module consist of a RF-Rx and a decoder which takes encoded data from the transmitter decodes it and send it to the Arduino which in turn is responsible for the movement of the robot, different set of sensors are used which provide feedback to the Arduino.

Sensors and modules used are as follows:

- Temperature Sensor: LM35 is used to measure the temperature of the surroundings
- Gas Sensor: To get information of any poisonous gas leaks
- PIR Sensor: It senses any human movement within its range
- GPS module: To get live location of the bot
- Ultrasonic sensor: HCSR04 is used to measure distance of the nearby objects in its range.

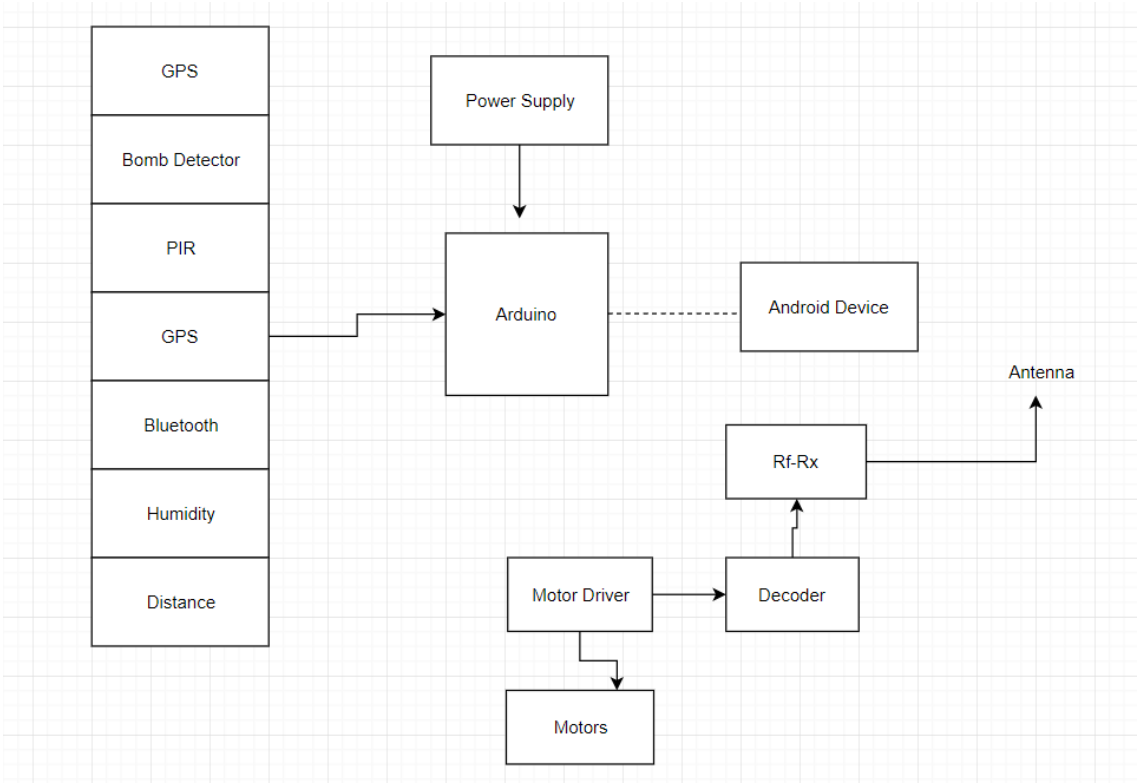


Figure 14: Receiver

CHAPTER 5

SYSTEM PROGRAMMING

```
#include <SoftwareSerial.h>
#include <Gpsneo.h>
#include <dht.h>
#define DHT11_PIN 7
SoftwareSerial BTserial(10, 11);
constint trigPin = 9;  //HCSR04 setup trigger pin
constint echoPin = 10; // HCSR04 setup echo pin
long duration; // variable defination for HCSR04
int distance; // VARIABLE defination FOR HCSR04
char latitud[15]; // GPS MODULE SETUP
char latitudHemisphere[2];
char longitud[15];
char longitudMeridiano[15];
int led = 13;          //PIR Setup
int sensor = 2;
int state = LOW;          // Initial state of sensor
```

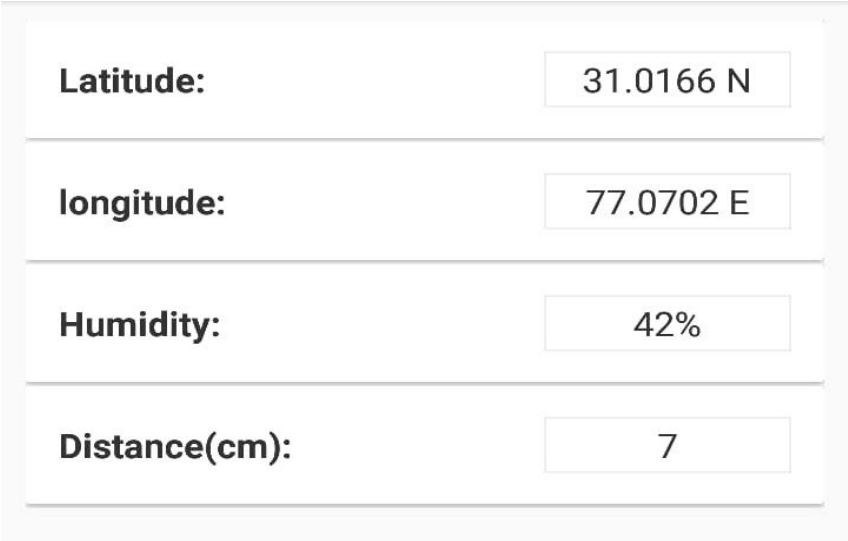
```
17 int val = 0;        // Initial value of sensor
18 dht DHT;
19 voidsetup()
20 {
21 BTserial.begin(9600);
22 }
23 voidloop()
24 {
25 {
26 pinMode(trigPin, O/P); // Sets the trigPin as an O/p
27 pinMode(echoPin, I/P); // Sets the echoPin as an I/p
28 // Clears the trigPin
29 digitalWrite(trigPin, LOW);
30 delayMicroseconds(2);
31 // Sets the trigPin on HIGH state for 10 micro seconds
32 digitalWrite(trigPin, HIGH);
33 delayMicroseconds(10);
34 digitalWrite(trigPin, LOW);
35 // Reads the echoPin, returns the sound wave travel time in microseconds
36 duration = pulseIn(echoPin, HIGH);
37 // Calculating the distance
38 distance= duration*0.034/2;
39 BTserial.print(distance);
40 BTserial.print(",");
41 gps.getDataGPRMC(latitud,latitudHemisphere,longitud,longitudMeridiano);
42 BTserial.print(latitud);
43 BTSerial.print(longitud);
44 BTserial.print(",");
45 int chk = DHT.read11(DHT11_PIN);
46 BTserial.println(DHT.humidity);
47 delay(1000);
48 BTserial.print(";");
49 delay(1000);
```

```
50 }
```

Chapter 6

Test Result

This result was obtained on the android device when we test ran the program.



Chapter 7

Conclusion

In this project we have successfully shown the swarm mechanism with the help of two robots working as master slave. These robots are controlled by a remote and the sensors with the help of a RF transmitter are giving the results as shown above. with the help of remote we may control the bots individually or simultaneously. The controlling device of the whole project is Arduino. Heat detection is done by the PIR sensor and humidity, latitude and longitude is done by the GPS. When the RF module is enabled the robots can bre controlled by the user from anywhere lying within the range of module. GPS tracks the movement and gives live location to the controller.

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