AN APPLICATION OF EMBEDDED SYSTEMS & ROBOTICS:
FIRE FIGHTING ROBOT CONTROLLED BY ANDROID DEVICE.

Submitted By
Md. Mostofa Ahmed
ID: 151-15-4964
Department of CSE
Daffodil International University

Supervised By
Mr. Naziour Rahaman
Lecturer
Department of CSE
Daffodil International University

Co-Supervised By
Mr. Soumik Das Bibon
Lecturer
Department of CSE
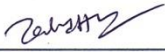Daffodil International University
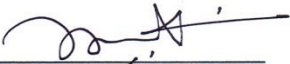
Submitted Date:
11-12-2018

DAFFODIL INTERNATIONAL UNIVERSITY
DHAKA, BANGLADESH

APPROVAL

This project title **"An Application of Embedded Systems & Robotics: Fire Fighting Robot Controlled by Android Device."** Submitted by MD. MOSTOFA AHMED, ID No: 151-15-4964 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of the Bachelor of Science in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 11 December 2018.
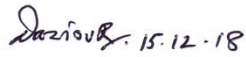
<u>BOARD OF EXAMINERS</u>

Dr. Syed Akhter Hossain   **Chairman**
Professor and Head
Department of Computer Science & Engineering
Faculty of Science & Information Technology
Daffodil International University

Dr. Sheak Rashed Haider Noori   **Internal Examiner**
Associate Professor & Associate Head
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Md. Zahid Hasan   **Internal Examiner**
Assistant Professor
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Dr. Mohammad Shorif Uddin   **External Examiner**
Professor
Department of Computer Science and Engineering
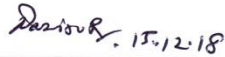Jahangirnagar University

DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Naziour Rahaman, Lecturer,** Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this project nor any part of this has been submitted elsewhere for award of any degree or diploma.

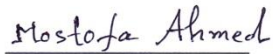**Supervised by:**

Daziour. 15.12.18

Naziour Rahaman
Lecturer
Department of CSE
Daffodil International University

Co- Supervised by:

Dasiour. 15.12.18

Soumik Das Bibon
Lecturer
Department of CSE
Daffodil International University

Submitted by:

Mostofa Ahmed

Md. Mostofa Ahmed
ID: 151-15-4964
Department of CSE
Daffodil International University

ACKNOWLEDGMENT

First expressing our heartiest thanks and gratefulness to almighty Allah for his diving blessing makes us possible to complete the final year project successfully.

I am really grateful and wish my profound my indebtedness to **Naziour Rahman, Lecturer**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge and keen interest of my supervisor in the field of "Robotics" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

I would like to express our heartiest gratitude to the Almighty Allah and Head Prof **Dr. Syed Akhter Hossain,** Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of Computer Science and Engineering department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Embedded System as name suggest that it is a combination of hardware and software systems, Robots which is architecture of controller and embedded in particular systems which is part of hardware and software system. In this project, propose a system which could be importance for the industrial buildings to stay safe from fire. Firefighting Robot will detect the fire and smoke if the fire happens and then robot will go to the fire place and then robot will spray the water (or gas) to the fire. In 21st Century everyone deserve a safe lifestyle ,because of the fire daily life could be occur any time by electricity, gas, etc. At present, Fireman comes with many tools to control the fire from outside, but there is no provision to control heavy fire from inside the buildings, this robot could be fill up that problem. By two ways robot could be controlled, one way is automatically start work after turn on the robot, another way is controlled by android device by android application, for connect robot to the android device used Bluetooth module, necessary sensor are added to the robot. In this project I used Arduino UNO microcontroller and android application for control this robot.

CONTENTS   PAGE

Chapter 5: Conclusion and Future Scope 23-24

LIST OF FIGURE

CHAPTER 1
INTRODUCTION

1.1 Introduction

Before 250 B.C a Greek inventor and mathematician Ctesibius invented 'Clepsydra or Water clock' that was one of the first robot. Earliest 1890's Nikola Tesla build a 'remote control vehicle', Tesla is best known as inventor of A.C electrical power, radio, induction motor and others electronics devices. The first industrial robot ware probably 'Unimates' created by George Devol and Josephe Engleberger between 1950,s to 60's. Engleberger started the first robotics company, called 'Unimation', and called him as a 'father of Robotics'. After Engleberger creation expectation of robotics field increases of multiple sector. Living 21'st century without advanced technology life will be stationary, peoples are depending on technology, robots, thinking for human alternatives. Being thought IoT, Robotics, AI, Machine Learning are the structure of future technology. Embedded system and Robotics is the most effective field for modern technology, we know that embedded system is a programmed controlling and operating system with a dedicated function. Combination of embedded system and robotics get real life workable engine or device. That engine or device could be operated by automatically or manually or using by command. Now we can talk about modern and future era of Robotics, Robot will simply replace people on the job in fact then can essential for us, if we see the Amazon Echo Smart Speaker that incredible device are combination of embedded system so on, robotics and AI, everyone knows about human robot Sophia, using robot for every sector are increasing, for industrial purpose implementation of robots are increasing even they thinking about for robot workers which alternative for humans. Everything is for better living life , safety is the main expectation of everyone daily life, Fire are the most danger things for everything, at present there are many source of occurs for fire but there is not enough arrangement for put down the fire, we see when the fire occurs in some big buildings authority has not enough arrangement for control the fire. Fire Fighting Robot can fulfill that gap, every industrial building has used carbon dioxide into the cylinder for put off fire but that cylinder need to use (carry) by humans but if we see when fire and fire smoke became more horrible for that moment human

body can not normal in that environment. For this purpose fire-fighting robot could be the alternative for humans and safety guard for the fire. Robot could be set up into the buildings for every floors, After that, when the fire occurred flame sensor will detect the exact fire by using sensor and by operating robot will go to that place and immediately will be start spray the water or gas to the fire for put off fire. Accidently, by electricity or gas problems fire could be occur, that moment staying in the building everyone will be panic except that robot, for that moment for using that robot risking of human life will be reduce (safe).

1.2 Motivation

Fire-fighting is a critical operation that currently performing regularly by humans, if we see around us some times during fire-fighting many fire fighters gave their lives for extinguish the fire. For reduce that occurrence fire-fighting robots are made. Fire-fighting robot is effective, reason are it is very easy to use and it is suitable for specialized workers and general purpose workers, and also this robot is effective because it extinguish small homes fire before burn the house, and also this robot is effective for building, industry. If we talk about usability, it is most useful things for home or industry, it will extinguish small fire before burn the building, most exciting part of this it is useful when no-body present in the building. If we talk about reliability, this robot is reliable, there are sensors and each performs for each own part, in these sensors there are flame sensor. Other part is, Robot are don't need to update, any-body can use it for the long times. We lost several lives every year for the fire, by using this robot that occurrence would be reduce. This robot is more easy to operate using android smart phone with android application, by Bluetooth connection to the android mobile phone easily we can control this robot.

By thinking about that types of problems I thought I can start a change for solve that types of problems so then I decide to develop a fire fighting robot which could be work with fire fighter or for private uses.

1.3 Objective

- The main objective of this project is during occur fire in the buildings of homes, robot will detect the fire location by sensors then robot will go to that location by wheels and then will spray the water or gas and it will extinguish from burn that place.
- Reduce the effort of human labor and reduce cost.
- Making an robot that will monitor the situation of occur from the fire.
- Reduce the risk for fire-fighters.
- To ensure safety.
- Start buzzer when fire will detect.
- Operate by android application.
- Extinguish homes, factories or industries from burning.
- For general purpose or industrial purpose this robot could be used.
- Fire causes heavy losses financial and taking live both, this fire-fighting robot could be the life guard.
- This types of robots will work with fire-fighters sooner or later.
- Before fire explosion robot will extinguish the burning things.

1.4 Expected Outcome

- ❖ Fire-fighting robot will be controlled by android application, when fire will be occurred flame sensor will detect the fire and will start the buzzer and by operating android device robot will go to the fire area.
- ❖ When fire in range the robot and detect the fire at the same time water pump will start for flow water and will extinguish the fire, at that moment if water level in the tank became downstairs Red LED will be turn on otherwise Green LED will be on for known the amount of water.

❖ This robot is capable for as long as there are water and battery charge are available, the robot will work.

❖ This robot could be used as industrial purpose and home purposes.

❖ Expecting less expensive for this Fire-fighting robot.

❖ Robot will be able to carry fire extinguish water with it.

CHAPTER 2
BACKGROUND

2.1 Introduction

Use of robotics in fire-fighting is being increasingly studied due to fire-fighters being manifested to dangerous situation to save the lives. Robotic system is mechanical device with computer programming to control its environment and a human operate device. There are two general types robotics systems that developed for fire-fighting field, Mobile systems and Fixed systems. Fixed system are such as automated system which inside microcontroller all program, logic, environment are given and robot work automatically whenever need to extinguish the fire. Mobile based system are more advanced features to operate and perform a wide range of task. Indoor or mobile based robotic system are vehicles with others features that are remote controlled by operator. Used wheels and truck module for robot structure for that carry for battery and enough water. In this robot communicate between controller device and robot used Bluetooth module.

2.2 Related Works

Nevon projects developed an android controlled fire-fighting robot, the robot consists of a water tank with a pump, they used an 8051 microcontroller, they also used Bluetooth module for their project. Fours Indian students developed a project, project name was 'Android Controlled Fire Fighting Robot' in that project they used Arduino UNO R3 microcontroller and they also used Bluetooth module for connect with android device, for detect fire they used smoke sensor and for spray water they used motor with relay, But only with smoke sensor robot can not be perfect for fire-fighting need to be detect for fire sensor, in my project I used flame sensor for detect fire. Prof.Dr. S.N. Kini and his team develop a fire-fighting robot they named their project is 'Fire-Fighting Robot Controlled using android application' they used PIC 16F877A microcontroller

and they used WiFi module, they used light sensor , fire detection sensor and their project are automated ,all function will work automatically without operator. Snehal Adsul and his team develop 'Android controlled firefighting robot using arduino' they used Arduino UNO R3 microcontroller, gas sensor for detect the fire gas , they used Bluetooth module for connect with android device. Md. Azhar develop a fire fighting robot that is 'Bluetooth controlled fire-fighting robot', several of fire fighting robots are made , every robot systems has difference of functions. With Arduino UNO microcontroller Home-Automation like voice controller system with, IOT based project and many more project are already developed and many systems are developing. Android device are more then IOS, 21st century people can not want to trouble for any things, expect easy things, controlled everything by own smart phone like android operator, for that expectation many devices are developed for controlled by android devices or IOS, Amazon Alexa, Google Home, Xbox, control AC, Play-station App, Remote, fan light Smart TV remote controller, Monitor Bank account, Control vehicles, Work and earning and many more, everything are related to android and IOS devices and microcontroller. Controlling electronics devices by android application, Arduino microcontroller, Raspberry Pi microcontroller and many microcontroller are used for develop new Robot, new devices, new IOT systems.

2.3 Scope of the Problem

Fire Fighting robot controlled by Android device is the name of this project, there are many scope for fire-fighting robot

- ➢ This fire-fighting robot mainly designed for inside activities, for home, Industrial purpose robot could be used.
- ➢ Commercial building fire-fighting security this robot could be used.
- ➢ Apartment for living this robot could be used.
- ➢ Monitoring fire safety for all times.
- ➢ With industrial and private purpose robot could be used with govt. fire-fighters.
- ➢ All institute can be used this robot for get safety from the fire.
- ➢ Private and govt. for both purpose this robot could be used.

- ➢ This robot could be the benefited for robotics company, this types of robots are useful and necessary for safety life.
- ➢ For manufacturing this robot needs peoples for developed, work for that will be create a field for their job.
- ➢ For use this robot will extinguish the place from burning.
- ➢ Develop this robot for real life implementation it could benefit for living life and also for country prestigious.

2.4 Challenges

The main challenge of this robot is to build an autonomous android device controlled robot that can find its way to detect the fire and then extinguish the fire in the shortest time. This task simulate for the real world operation to protect buildings from a fire. Choose advanced and affordable and available robot technology is one of the challenges, many types of microcontroller are in the shop, functions are difference for microcontroller and sensor for every controller. This robot can successfully operate in the real world not just for demo part that is one of the big challenges. Demo robot and real life robot size are most important for get absolute outcome. Once robot turned on robot must need to connect with android device via Bluetooth connection and then robot need to operate by hand via android application. If we talk about robot weight- there are no restrictions on the weight of this robot. Similarly for robot construction materials- there are no restriction on the materials used in the construction for the robot. Sensor use for robot – flame sensor for detect fire of the environments. Other challenge is running time- when robot will go for the fire robot speed is needed to control for that matter for that android device with controlling robot application which used for control that easily we could control by our hand and which we are seeing the path so that deserving without any mistake we could reach to the fire area. Moving everywhere in the place is most critical challenge, need to think that for which place robot will do work for that purpose material are need to be added for that.

Chapter 3
Requirement Specification

3.1 Business Process Modeling

I have been developing a fire-fighting robotic process for business module, how are this business process modeling are implemented, how are suitable process identified and how are the service charged? How this project is for essential for in this part I will elaborate on the process. First, what is robotic process for business purpose, A technology designed for rules-based business process which demand for modern technology, this project is totally modern expectation based project that for business process match to the industry. For customer satisfaction, added every modern controller and affordable tools and first working robot that will be customer satisfaction. Used right technology which are available for the users, can mention that- you are not only the buying the product you are buying your safety. For everyone satisfaction BPM will be attached below.
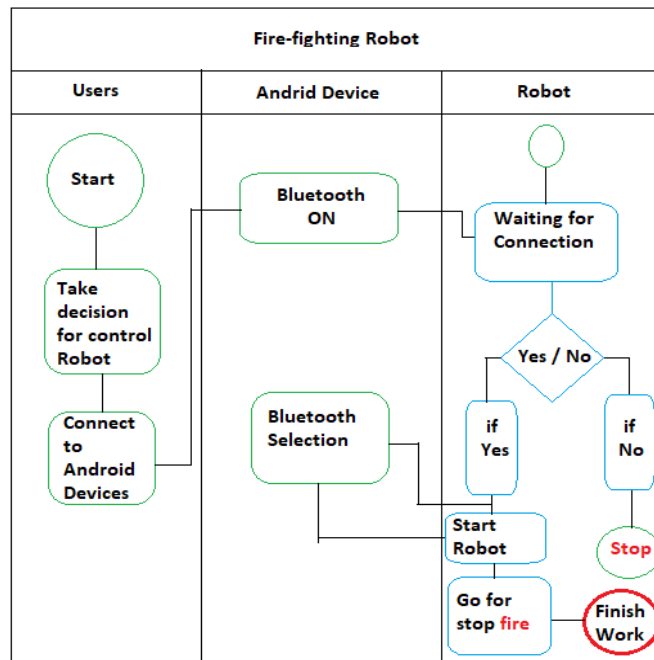

Fig 3.1: BPM for Fire Fighting Robot controlled by Android Device.

3.2 Requirement Collection

Hardware:

To conduct this project we need sensors, microcontroller, robot casing, wheels, motors, LED and some hardware equipment that will be describe following.

1) **Flame Sensor:** A flame sensor is sensor designed for detect and response to the presence of fire, flame sensor is a analog device. If we see the specification of flame sensor, power supply indicator lamp, spectrum range 760nm ~ 1100nm, detection angle 0 – 60 degree, power 3.3V ~ 5.3V, operating temperature -25 degree C ~ 85 degree C, dimension 27.3mm * 15.4mm, mounting holes size 2.0mm. If we see the how to use flame sensor, 4pin are attached in flame sensor, 4 pin are VCC, GND, AOUT, DOUT, working process of this 4pin are, VCC- 3.3V ~ 5.3V DC, GND- power supply ground, AOUT- MCU.IO (analog output), DOUT- MCU.IO (digital output). The flame sensor is used for detecting fire without any protection itself.

Fig 3.2: Flame sensor Module.

2) **Arduino Motor Shield:** Control motors with Arduino you don't need to spend a lot of money, with many motor shield select the L298N H-bridge IC that can allows you to control the speed and also direction of two DC motors. Used this L298N H-Bridge motor shield for control the car, L298N H-bridge module cover voltage between 5 to 35V DC. For use L298N need Arduino microcontroller, DC power supply 7-35V , motor that use for L298N and some jumper wires. For connection motor shield to Arduino general 4pin are must needed others digital pins are not required for general purpose, for Motor to motor shield connection there have 4 pins ,for each motor have 2pins OUT1 and OUT2, for connection to power one have for power pin and another have for GND. Specification of L298N H-bridge motor derive is- Logical voltage 5V-35V, Logical current- 0-36mA, Drive current- 2A (MAX single bridge), Max power- 25W, Dimension- 43 * 43 * 26mm, weight 26g. PWM pin for Arduino UNO is 3,5,6,9,10 and 11.
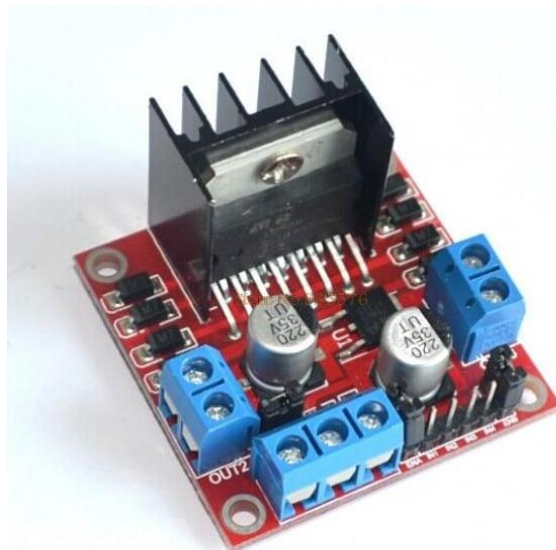

Fig 3.3: L298N Dual H-bridge Motor Controller.

3) **Water Pump and Relay Module:** Water pump with relay module and relay module with Arduino microcontroller, pump used for supply water and relay module used for control high voltage, A relay is actually a switch which is electrically operated by an electromagnet and electromagnet is activate with a low voltage and then convert it to high

voltage. Pump used in this project which is- min water flow rate 0.5L per minute, suitable voltage 4 ~ 12V. For Relay module working voltage is 5V.
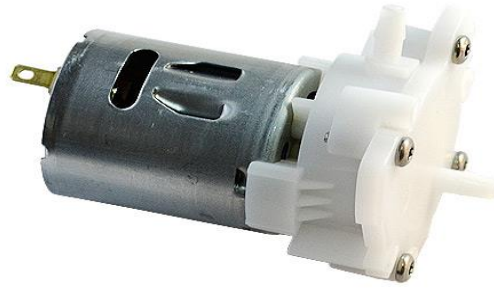

Fig 3.4.1: Water Pump.

Fig 3.4.2: Relay Module.

4) **Buzzer:** Buzzer is like alarming device, buzzer is use for somethings represents. For this project buzzer used for combine with flame sensor that is when fire will detect buzzer will start buzzing and also when water level will be increase buzzer will be start buzzing also.

Fig 3.5: Buzzer.

5) **Bluetooth Module:** HC-05 Bluetooth module used for this project. Communicate between android device and robot Bluetooth module will work for medium. Bluetooth specifications is: Bluetooth protocol- Bluetooth specification v2.0+EDR, frequency 2.4GHz ISM band, sensitivity- <= -84dBm at 0.1% BER, speed- asynchronous: 2:1mbps (Max) / 160 kbps, Synchronous: 1mbps/1mbps, Security- Authentication and encryption, power supply: +3.3V DC 50mA, working temperature: -20 ~ +75 centigrade, Dimensions: 15.2*35.7*5.6mm.For this project with any Bluetooth support device could be communicate with this HC-05 Bluetooth module.
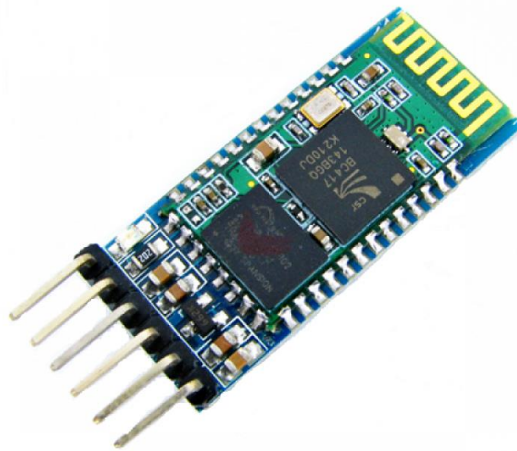

Fig 3.6: HC-05 Bluetooth Module.

6) **Arduino Microcontroller:** For this project used Arduino UNO microcontroller, UNO Rev3 is a ATmega328P microcontroller board based, an 8bit microcontroller with 32kb flash memory and 2kb RAM. UNO contains everything needed to support as microcontroller, simple connection it to a computer with USB cable, Arduino board has analogue and digital both of pins. Uno is open-source hardware, for import the software code use IDE. If we see the technical specifications- microcontroller is ATmega328, this operate voltage 5V, Input voltage(recommended) 7-12V and Input voltage(Limit)6-20V, Digital I/O Pins is 14, PWM Digital I/O Pins is 6, Analog Input Pins is 6, DC current per I/O pin 40mA, DC current for 3.3V 50mA, Flash memory 32kb, SRAM 2kb, EEPROM 1kb, Clock Speed- 16MHz,

Fig 3.7: Arduino UNO microcontroller.

7) **Others Hardware Components:** With the above discussion needs more hardware components:

    i.   Jumper Wires

    ii.   Pipe (For Flow Water)

    iii.   Plastic Container

    iv.   Motors & Wheels

    v.   Chasses

    vi.   Resistors

    vii.   Led

    viii. Buzzer

    ix.   Battery

    x.   Breadboard

    xi.   Others Tools

Software:

    i.   Android operating system device.

   ii.   Robot controlling android application: "Bluetooth RC controller" application are available on google plays store, this application is available for everyone and this application is more advantages and more efficient for controlled robot.
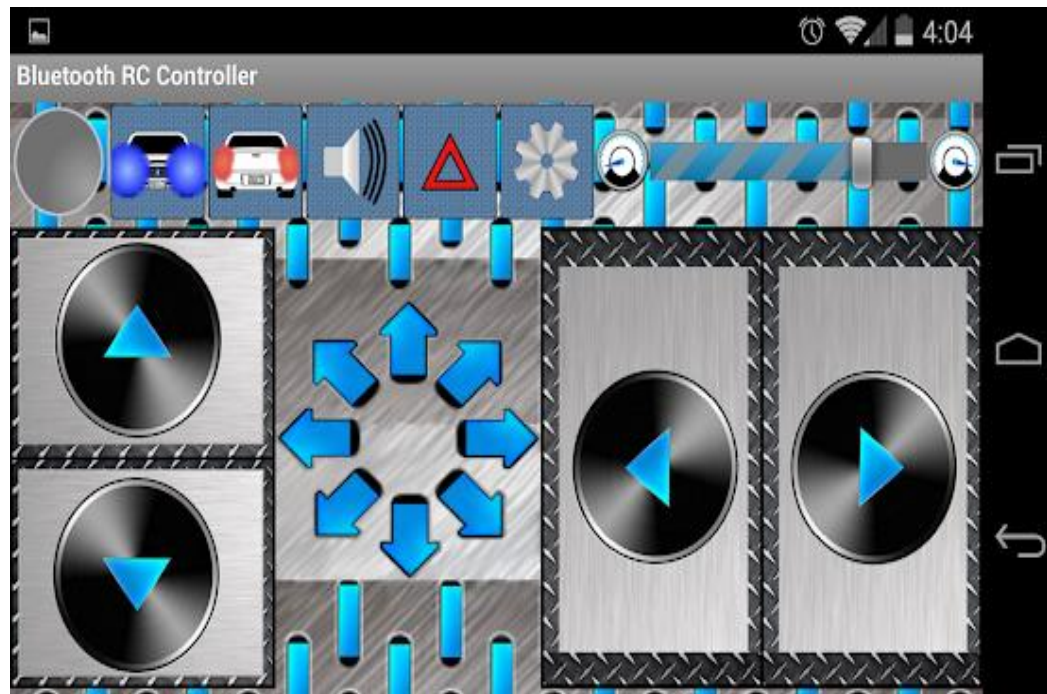

Fig 3.8: Bluetooth RC Controller Android Application.

3.3 Use Case Diagram

A use case diagram is a graphical representation among the elements of a system. Use care is a methodology used in system analysis to identify, clarify and organize system requirements. For this 'Fire Fighting Robot controlled by Android Device' use care representing below.
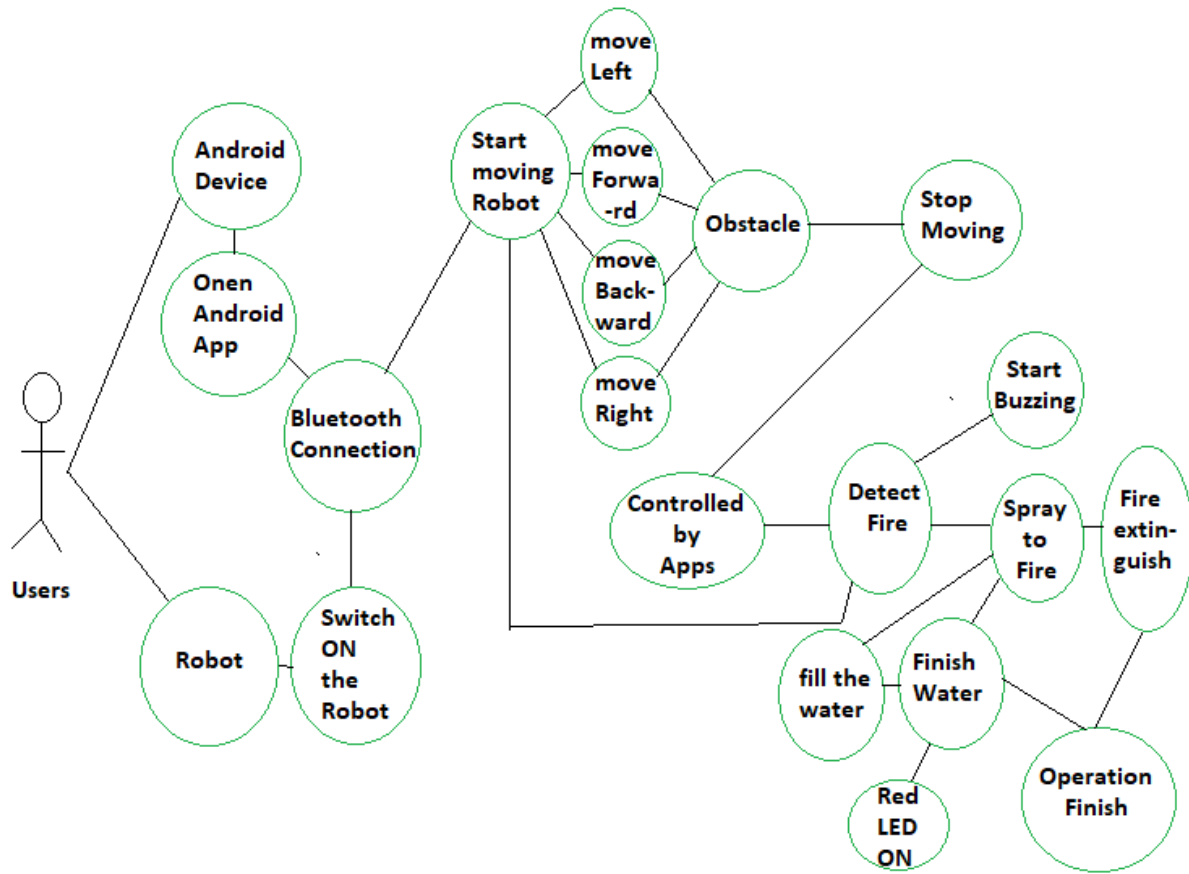

Fig 3.9: Use Case Diagram of 'Fire Fighting Robot Controlled by Android Device'.

3.4 Design Requirements

Fire Fighting Robot consists of the following units,

➢ A rectangular base to support whole robot structure and attached to four wheels for motion.

➢ For this robot used plastic heard board for design the structure of robot.

➢ Used four DC motors to provide movements for the robot.

➢ In this Robot power is provided for difference power for difference part, for motor driver used 4/5/6V, Arduino and others sensor used 7/8/9V, for water pump used 12V batter.

➢ Used water tank for extinguish water and setup that to the back part of robot, and used plastic pipe for flow water.

➢ Used breadboard for connect all required wires.

➢ Hardboard and bold paper used for cases for the robot.

➢ Consist flame sensor, Bluetooth module, some resistors, LEDs and some jumper wires.

➢ Used Arduino Uno microcontroller for control and program the robot.

3.5 Interaction Design and UX

Interaction design is the design of the interaction between users and products. Now, as we know the goal of interaction design is to develop things that enable the user to achieve their objectives with the best way possible, the interaction between a user and a project is involves elements like motion, sounds, space time, behavior and many more, and of course this project is mostly fulfill this requirement for user to project connection.

UX design is about shaping up the experience of using a product. As we know there are huge overlap between interaction design and UX design.

3.6 Implementation Requirements

    i.   Laptop or Desktop

    ii.   Bluetooth Module

    iii.   Flame Sensor

    iv.   Motor Shield

    v.   Relay

    vi.   Buzzer

    vii.   Battery

    viii.   LEDs

    ix.   Jumper wires

    x.   Required Tools

    xi.   Arduino UNO microcontroller (with USB cable)

    xii.   Water tank (for reserve water)

    xiii.   Arduino IDE (for write code)

Fig 3.10: Arduino IDE.

17

Chapter 4
Implementation and Testing

4.1 Implementation Robot Design

Before start developing a project need to a complete design implementation for the project, 'Fire Fighting Robot Controlled by Android Device' required design for inside the full design is below, anyone can developed this fire-fighting robot by following this instruction.
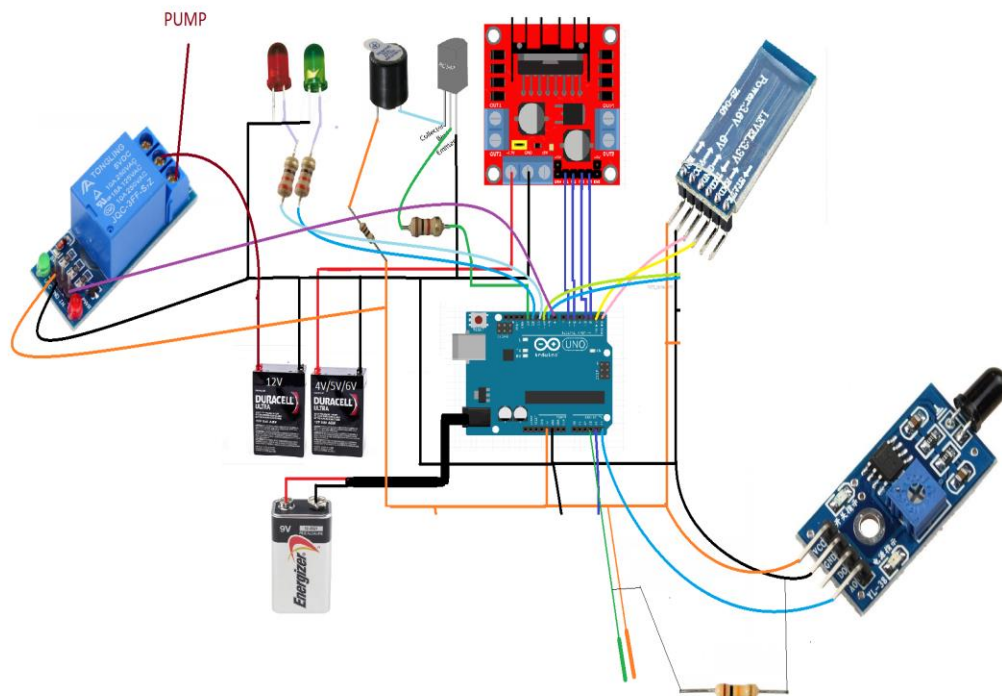

Fig 4.1: Design of Fire Fighting Robot.

4.2 Implementation Testing

Implementation testing refers to the process of testing that implementations of project specification.

Sample code for Fire-fighting Robot:

For entire project below are some implemented code for this project. First Arduino board pin no defined code:

```
#define trigPin1 9
#define echoPin1 10
const int load1=2;
const int load2=3;
const int load3=5;
const int load4=6;
char junk;
String inputString="";
long  distance,duration;
```

Then if we want to see the water pump main implemented code, that is:

```
if (pump>100){
   digitalWrite(12,HIGH);
   digitalWrite(11,LOW);
}
if (pump<100){
   digitalWrite(11,HIGH);
   digitalWrite(12,LOW);
}
```

As a fire-fighting robot, detect the fire is the main responsibility for this robot so main part of this fire-fighting robot is Flame sensor, sample flame sensor implemented code are below:

```
if (flame<900){
 digitalWrite(8,LOW);
  digitalWrite(13,HIGH);
  delay(200);
  digitalWrite(13,LOW);
  delay(200);

}
if (flame>800){
  digitalWrite(8,HIGH);
  digitalWrite(13,LOW);
}
```

If robot are like vehicle type then it's important to run that vehicle, how vehicle move to forward, backward, left, right it's very important so below are some implemented code this vehicle coding part:

```
if(inputString == "F"){
digitalWrite(load1, HIGH);
digitalWrite(load2, LOW);
digitalWrite(load3, HIGH);
digitalWrite(load4, LOW);
}


else if(inputString == "B"){
 digitalWrite(load1, LOW);
 digitalWrite(load2, HIGH);
 digitalWrite(load3, LOW);
 digitalWrite(load4, HIGH);
}

else if(inputString == "R"){
 digitalWrite(load1, HIGH);
 digitalWrite(load2, LOW);
 digitalWrite(load3, LOW);
 digitalWrite(load4, LOW);
}

else if(inputString == "L"){
 digitalWrite(load1, LOW);
 digitalWrite(load2, LOW);
 digitalWrite(load3, HIGH);
 digitalWrite(load4, LOW);
}
if(inputString == "S"){
 digitalWrite(load1, LOW);
 digitalWrite(load2, LOW);
 digitalWrite(load3, LOW);
 digitalWrite(load4, LOW);
```

There have some required basic code on the complete program, above sample program are used for this fire-fighting robot.

Hardware Implementation:

All objects are part of the developing project, for 'Fire Fighting Robot controlled by Android Application' used Sensors, microcontroller, power, LED, jumper wires, Bread board. Now, if we want to know about implementation of all components for this project then, after connection every hardware part of this project all works like what was expected.

Software Implementation:

After connect all hardware part, the project need software implementation into it for run, Coding implementation by Arduino IDE which some sample code were shown above pages, then that code uploaded to the Arduino microcontroller and finally after uploaded code to microcontroller need an operator for control that robot, for that an Android application is needed which are available in google play-store, the apps name is 'Arduino Bluetooth RC car' that apps install to any android device (like mobile/tab), then open the apps and then turn on the Bluetooth of that device then search for Bluetooth module which implementation into Fire-Fighting robot, then select the right HC-05 module Bluetooth module and connect Android device to the robot and then start operate the robot, by using that process Robot are absolutely work what was expected, combine Hardware and Software implementation Robot are extremely work.
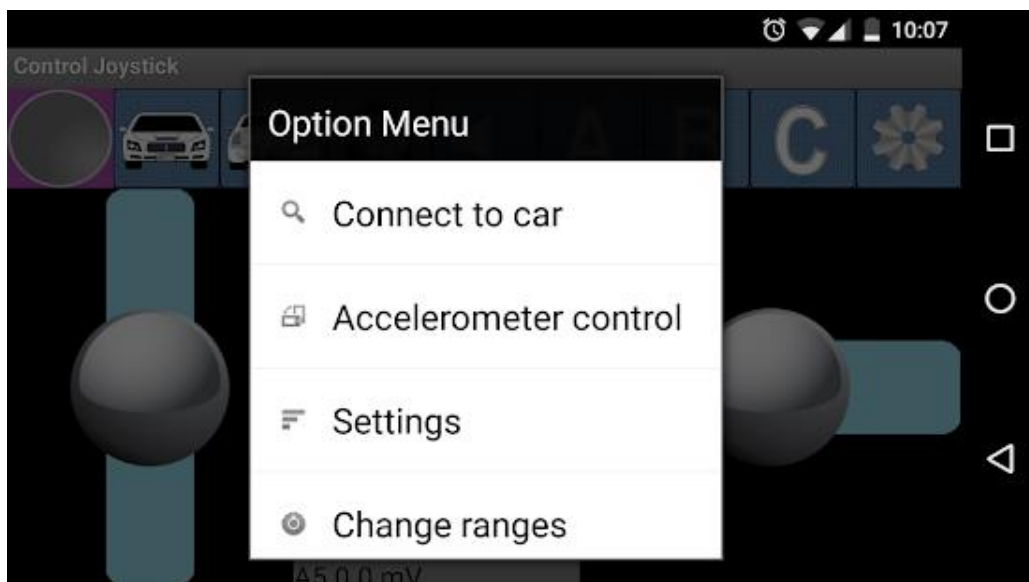

Fig 4.2: Interface of android apps which waiting for searching Bluetooth device of car.

4.3 Limitations

> ➢ Sensor life is short, power range is limited, accidently if power capacity cross the limit then sensor could be damage immediately.
>
> ➢ Robot would not work under water.
>
> ➢ This robot will work only for extinguish fire.
>
> ➢ This robot will work only when power is on and when robot are connect with android device through Bluetooth.
>
> ➢ This robot will work only that time when operator will control robot through android device.
>
> ➢ Robot will not measure any obstacle by any obstacle measurement sensor like ultrasonic sensor, all are need to control by operator.

Chapter 5
Conclusion and Future Scope

5.1 Discussion and Conclusion

Overall, an android device controller fire-fighting robot has been successfully built. Robot could be the future competitor of humans, there are three types of AI which used for advanced robot General AI, Intermediate AI, Advanced AI, for normal robot like this fire fighting robot which language is used for developed c, embedded c etc. For future technology Robot is the main pillar. For every field every type of technology are needed robot field is one of them. Above description all about are this fire-fighting robot, part by part all described clearly within whole robot. This robot is more efficient for daily life. Arduino is more easy for implementation for average robot, implement condition for robot is more clear for understanding. As a demo of a robot used all necessary components for developed to this robot that which could be the real life best effective device. Fire-fighting robot controlled by android apps this project could not be completed without giving full afford, without components tools impossible to complete full project. For hardware connection if anyone want to developed this project I would recommended that use PCB board for connection wires one to others connections, as a developer of this project if anyone want to developed this project it's not very difficult to implement and developed this type of robots just need to give some times above it.

Robot Behavior

The aim of the project is to make the robot to move around in the occurred place using the wheel, detect the fire then start spray water and stop the fire. The planning of the behavior is starts by configuring the major movement probability of the robot such as following the right wall and following the left wall, the route of the robot must also be planed which will decide operator. In order to archive this, the robot needs to perform several programmed subroutines

such as follow the fire, spray water. Then, these subroutines are combined in a main program where the strategy button is configured.

5.2 Scope for Further Developments

- ❖ For future scope want to add smart ambulance with this robot, for that want to add sim card with this robot for when fire will detect that moment the robot will inform to near fire-service.
- ❖ For future scope operate this robot connection media WiFi would be add for more availability.
- ❖ For future another smoke sensor want to add with this robot for more sensitive for operate.
- ❖ For future with industrial and home purpose it could be used with fire service.
- ❖ Use for every home, every private purpose and for less expense for everyone can use easily that would be the one of the future implementation.
- ❖ Now robot body is not a fire proof for that body could be damage so that in future, will work for this robot body as a fireproof body.
- ❖ For future want to add automatic obstacle measurement sensor which would detect obstacle automatically and vehicle will stop automatically if vehicle detect any obstacle in any side of the robot (like Ultrasonic sensor).
  .

REFERENCES

[1] https://www.elprocus.com/projects-on-fire-fighting-robotic-vehicle

[2] https://www.sfpe.org/page/FPE_ET_Issue_100/Robotics-in-Firefighting.htm

[3] http://nevonprojects.com/android-controlled-fire-fighter-robot-project

[4]https://www.scribd.com/document/351345684/Android-Controlled-Fire-Fighting-Robot

[5]https://www.ijirset.com/upload/2016/may/138_Fire.pdf

[6] https://www.irjet.net/archives/V5/i6/IRJET-V5I658.pdf

[7]https://www.tomsguide.com/us/pictures-story/494-android-tv-remote-apps.html

[8]http://robogames.net/rules/fire-fighting.php

[9]https://www.arjenvanberkum.nl/innovation/business-model-for-robotic-process-automation-rpa

[10]https://en.wikipedia.org/wiki/Flame_detector

[11]https://www.instructables.com/id/Arduino-Modules-L298N-Dual-H-Bridge-Motor-Controll

[12]https://www.interaction-design.org/literature/article/what-is-interaction-design

[13]https://slideshare.com/fire-fighting-robot

[14] http://bdspeedytech.com

Document Viewer

Turnitin Originality Report

Processed on: 22-Nov-2018 18:14 +06
ID: 1043533436
Word Count: 5058
Submitted: 1

151-15-4964 By Md. Mostofa Ahmed

Similarity Index	Similarity by Source		
	Internet Sources:		12%
12%	Publications:		2%
	Student Papers:		9%

include quoted   include bibliography   excluding matches < 1% ▼   download
refresh   print   mode: [quickview (classic) report   ▼]

2% match (student papers from 07-Apr-2018)   ☒
Class: Article 2018
Assignment: Journal Article
Paper ID: 942534661

2% match (Internet from 21-Sep-2018)   ☒
http://dspace.library.daffodilvarsity.edu.bd:8080

2% match (student papers from 09-Apr-2018)   ☒
Class: Article 2018
Assignment: Journal Article
Paper ID: 943495148

1% match (student papers from 04-Apr-2018)   ☒
Class: Article 2018
Assignment: Journal Article
Paper ID: 940850308

1% match (Internet from 16-May-2015)   ☒
http://www.wvshare.com

1% match (student papers from 05-Apr-2018)   ☒
Class: Article 2018
Assignment: Journal Article
Paper ID: 941584057

1% match (publications)   ☒
Peter Kopacek. "Automation in Sports and Entertainment", Springer Handbook of
Automation, 2009