A

Major Project

On

DESIGN OF AUTOMATIC SPEED BREAKER ON TIME DEMAND USING EMBEDDED SYSTEM

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by

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the project entitled "**DESIGN OF AUTOMATIC SPEED BREAKER ON TIME DEMAND USING EMBEDDED SYSTEM"** being submitted by **V.UMA (187R1A05N5), K.NAVYA (187R1A05L3) & S.HARI PRIYA (187R1A05N4)** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science and Engineering to the Jawaharlal Nehru Technological University Hyderabad, is a record of Bonafide work carried out by him/her under our guidance and supervision during the year 2021-22.

The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

The road transportation plays a major role, due to this number of vehicles is also increased and traffic is increased. To handle this traffic in intelligent way the automatic speed breaker is used. When there is no need of the speed breaker on the road, it deactivates and rotates inside the road making the road flat and when there is a need of the speed-breaker at certain time it activates and appears on the road. In implementation of this concept,we use an iron made hemi-cylindrical speed breaker which is capable of rotating itself using control circuitry of embedded systems.So, when the speed beaker is needed, it comes on the road by rotating itself from flat position and when not needed, it rotates itself again and gets flat and combines with flat road. In the system, real time clock is used to mention the required time for having the speed breaker on road. So, this type of speed breaker is useful when implemented before any building where there is certain time allocated for entry and exit of humans like schools, any organization etc. For the exceptional cases like emergency or for the Ambulance the RF is used. So that the RF will automatically disable the Speed breaking system. When the RF receiver, receives high signal strength then the micro controller will command the system to disable at that time.

LIST OF FIGURES

FIGURE NO.	FIGURE NAME	PAGE NO.
Figure 3.1	Project Architecture	7
Figure 3.2	Use case diagram	9
Figure 3.3	Class diagram	10
Figure 3.4	Sequence diagram	11
Figure 3.5	Activity diagram	12

LIST OF SCREENSHOTS

SCREENSHOT NO.	SCREENSHOT NAME	PAGE NO.
Screenshot 5.1.1	Powered On	20
Screenshot 5.1.2	Speed Breaker Activated	21
Screenshot 5.1.3	Emergency vehicle signal	22

TABLE OF CONTENTS

ABSTRACT i

LIST OF FIGURES ii

1. INTRODUCTION 1

1.1 PROJECT SCOPE 1

1.2 PROJECT PURPOSE 1

1.3 PROJECT FEATURES 1

2. SYSTEM ANALYSIS 2

2.1 PROBLEM DEFINATION 2

2.2 EXISTING SYSTEM 2

2.2.1 LIMITATIONS OF THE EXISTING SYSTEM 3

2.3 PROPOSED SYSTEM 3

2.3.1 ADVANTAGES OFPROPOSED SYSTEM 4

2.4 FEASIBILITY STUDY 4

2.4.1 ECONOMIC FEASIBILITY 4

2.4.2 TECHNICAL FEASIBILITY 5

2.4.3 SOCIAL FEASIBILITY 5

2.5 HARDWARE & SOFTWARE REQUIREMENTS 5

2.5.1 HARDWARE REQUIREMENTS 5

2.5.2 SOFTWARE REQUIREMENTS 6

3. ARCHITECTURE 7

3.1 PROJECT ARCHITECTURE 7

3.2 MODULES DESCRIPTION 8

3.3 USE CASE DIAGRAM 9

3.4 CLASS DIAGRAM 10

3.5 SEQUENCE DIAGRAM 11

3.6 ACTIVITY DIAGRAM 12

4. IMPLEMENTATION 13

4.1 SAMPLE CODE 13

5. RESULTS 20

5.1 SCREENSHOTS 20

6. TESTING 23

6.1 INTRODUCTION TO TESTING 23

6.2 TYPES OF TESTING 23
6.2.1 UNIT TESTING 23
6.2.2 INTEGRATION TESTING 23
6.2.3 FUNCTIONAL TESTING 24
6.3 TEST CASES 25
7. CONCLUSION & FUTURE SCOPE 26
7.1 PROJECT CONCLUSION 26
7.2 FUTURE SCOPE 26
8. BIBLIOGRAPHY 27
8.1 REFERENCES 27
8.2 WEBSITES 28
8.3 GITHUB LINK 28

1. INTRODUCTION

1. INTRODUCTION

1.1 PROJECT SCOPE

In the rapidly changing world, speeding has become an habitual factor in a human's life. Everyone wants to get fast as much as possible. In the fast speed world, there are two perspectives, one is keeping speed and another is to maintain safety mediums as well[1]. So keeping speed is quite easy for a person and in case of safety mediums, there must be a lot of attention. For safety purpose, preventing accidents on road, there is a conventional method of having concrete speed breakers on road. In case of conventional concrete speed breakers, they are found firm all the time on the road[10]. These types of speed breakers are very useful on road but at the same time, these cause a great change in performance of the vehicles as well. That's why there is a need of an automatic breaker on time demand according to the requirements.Means when there is no need of the speed breaker on the road, it disappears from the road and the road becomes flat and when there is a need then the breaker comes on the road from ground and it starts its working of slowing speed of vehicles[3].

1.2 PROJECT PURPOSE

So here we are implementing an automatic speed breaker on time demand according to the requirements. we use an iron made hemi-cylindrical speed breaker which is capable of rotating itself using control circuitry of embedded systems. So, when the speed beaker is needed, it comes on the road by rotating itself from flat position and when not needed, it rotates itself again and gets flat and combines with flat road. In the system, real time clock is used to mention the required time for having the speed breaker on road[5]. When time gets started, breaker comes on the road and remains until the countdown gets zero.

1.3 PROJECT FEATURES

The main feature of this project is when there is any emergency situations, to save the human's life there is a need for an ambulance that reaches the hospital in time. But speed breakers are the major obstacles on the road that the ambulance is in need to deal with because it doesn't provide a free flow path for any vehicles and also increases the time delay in reaching the hospital This paper is based on the concept automatic speed breaker flattening system which includes RF module, RTC & motors.

2.SYSTEM ANALYSIS

2. SYSTEM ANALYSIS

SYSTEM ANALYSIS

System analysis is the important phase in the system development process. The system is studied to the minute details and analyzed. In analysis, a detailed study of these operations performed by the system and their relationships within and outside of the system is done. A key question considered here is," what must be done to solve the problem? ". The system is viewed as a whole and the inputs to the system are identified. Once analysis is completed the analyst has afirm understanding of what is to be done.

2.1 PROBLEM DEFINITION

There are many speed breakers on the roads. But at some places there is no need of speed breakers. Many accidents may occur for this we are creating a solution is when there is no need of the speed breaker on the road, it disappears from the road and the road becomes flat and when there is need then the speed breaker comes on the road by rotating itself from its flat position and it starts its working of slowing speed of the vehicles[8].

2.2 EXISTING SYSTEM

In the rapidly changing world, speeding has become an habitual factor in a human's life. In this fast world for safety purposes and to prevent accidents taking place on the road, there is a concrete speed breaker placed on roads to limit the speed of vehicles[6]. They are always found firm on the road. These types of speed breakers are laid at service road junctions and residential roads. As per the IRC-99 guidelines, speed breaker should have a radius of 17 meters, width of 3.7 meters and a height of 0.1 meters. The speed breakers can reduce the speed of the vehicle up to 25km/h. The distance between one hump to the other can vary from 100 to 120 meters. These speed breakers are very useful on road, but at the same time, they are the major obstacles for emergency vehicles like an ambulance[5]. The patients who are met with an accident or any sudden medical issues are taken to hospitals using an ambulance. In such a hectic situation, the time is an important factor to be considered, because the ambulance needs to reach the hospital in time to save a patient[3]. As mention above, the speed breaker reduces the speed of every vehicle to a certain range which causes the time delay.

2.2.1 LIMITATIONS OF THE EXISTING SYSTEM

Following are the limitations of the existing system:

- The existing speed breaker like speed humps, speed bumps & speed rumbles are fixed to ground and placed in unnecessary places.
- If the speed breakers are not painted, then it might not be visible in night, and running over it blindly may injure the motorists.
- Every vehicle are supposed to break their speed to cross the speed breaker safely. This is a major disadvantage for emergency vehicles like Ambulance, Fire Brigades, etc.

2.3 PROPOSED SYSTEM

In Proposed system,we are using an iron made hemi-cylindrical speed breaker which is capable of rotating itself using control circuitry of embedded systems[2]. So, when the speed beaker is needed, it comes on the road by rotating itself from flat position and when not needed, it rotates itself again and gets flat and combines with flat road. In the system, real time clock is used to mention the required time for having the speed breaker on road.When time gets started, speed breaker comes on the road and remains until the countdown gets zero.In the Embedded systems we can clock any time and date that can be stored on which the speed breaker is required to stay active on the road[9]. So this type of speed breaker is useful before any building for which the time is specified for coming in the building and going out from it e.g. schools, any organization etc. And also in our day to day life we come across many emergency cases like accidents and medical issues. In such emergency situations, to save the human's life there is a need for an ambulance that reaches the hospital in time. But speed breakers are the major obstacles on the road that the ambulance is in need to deal with because it doesn't provide a free flow path for any vehicles and also increases the time delay in reaching the hospital[4]. This project is based on the concept automatic speed breaker flattening system which includes RF module , RTC and motors. When the RF receiver , receives high signal strength then the micro controller will command the system to disable at that time[12].

2.3.1 ADVANTAGES OF PROPOSED SYSTEM

The following are the advantages of the proposed system:

- The speed of vehicle reduced before the any place or organization specified for which it has been installed.
- There is no need to reduce the speed of the vehicle, the speed of the vehicle should be kept unchanged by making the speed breaker disappeared from the road[10].

2.4 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and a business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. Three key considerations involved in the feasibility analysis are

- Economic Feasibility
- Technical Feasibility
- Social Feasibility

2.4.1 ECONOMIC FEASIBILITY

The developing system must be justified by cost and benefit. Criteria to ensure that effort is concentrated on a project, which will give best, return at the earliest. One of the factors, which affect the development of a new system, is the cost it would require.

The following are some of the important financial questions asked during preliminary investigation:

- The costs conduct a full system investigation.
- The cost of the hardware and software.
- The benefits in the form of reduced costs or fewer costly errors.

Since the system is developed as part of project work, there is no manual cost to spend for the proposed system. Also all the resources are already available, it gives an indication that the systemis economically possible for development.

2.4.2 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

2.4.3 BEHAVIORAL FEASIBILITY

This includes the following questions:

- Is there sufficient support for the users?
- Will the proposed system cause harm?

The project would be beneficial because it satisfies the objectives when developed and installed. All behavioral aspects are considered carefully and conclude that the project is behaviorallyfeasible .

2.5 HARDWARE AND SOFTWARE REQUIREMENTS

2.5.1 HARDWARE REQUIREMENTS

Hardware interfaces specify the logical characteristics of each interface between the software product and the hardware components of the system. The following are some hardware requirements.

- RTC - Real Time Clock
- Arduino
- LCD Display
- RF Receiver
- RF Transmitter
- Buzzer

2.5.2 SOFTWARE REQUIREMENTS

Software Requirements specifies the logical characteristics of each interface and softwarecomponents of the system. The following are some software requirements.

- Operating system : Windows 7 & above.
- Coding Language : Python 3.7.0 & above.
- Application : Arduino IDE 1.8.16

3.ARCHITECTURE

3. ARCHITECTURE

3.1 PROJECT ARCHITECTURE

The project architecture of the system depicts the interaction of the subsystems in the system as shown in below Figure 3.1

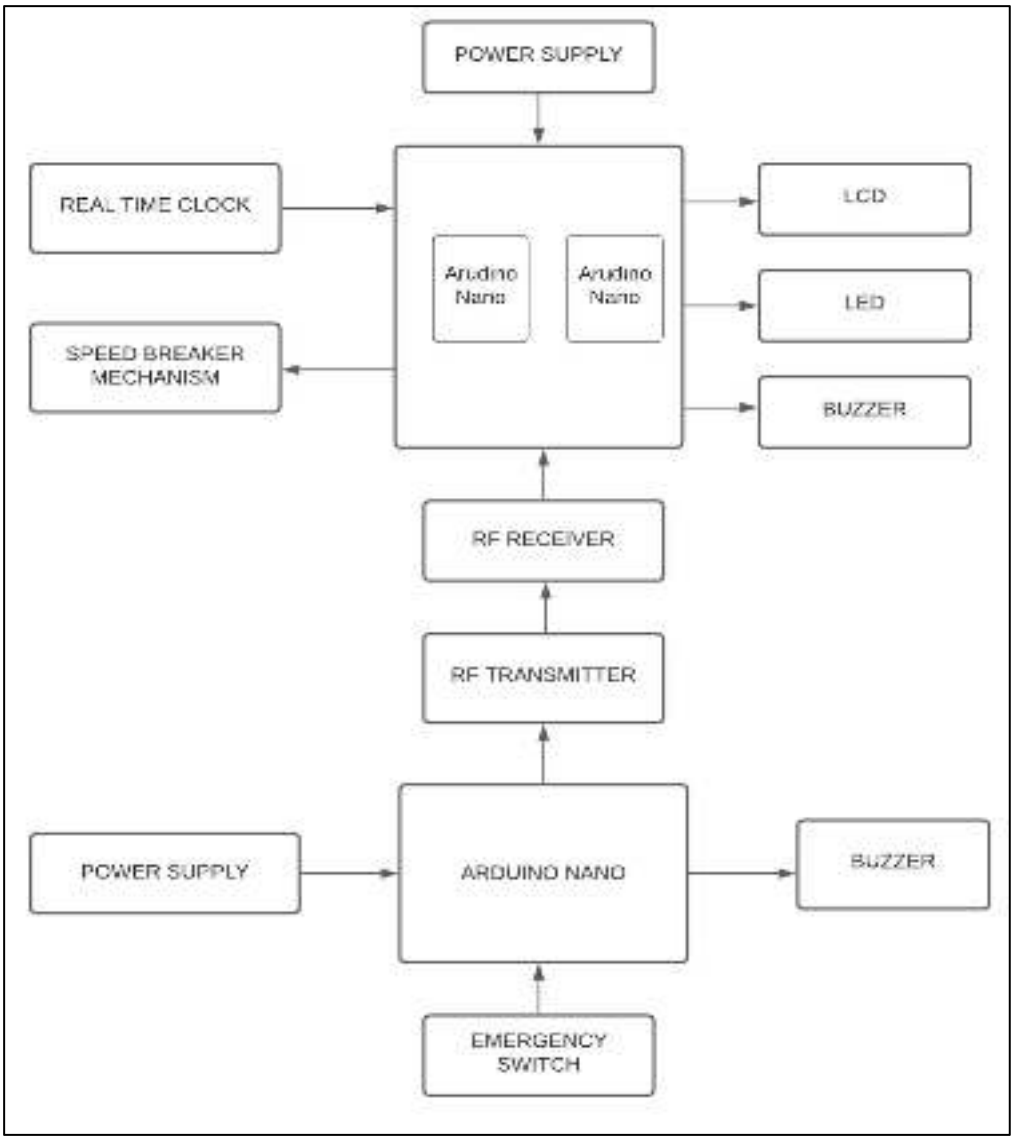

Figure 3.1:Project Architecture

3.2 DESCRIPTION

Initially power supply is given to the Arduino. The speed breaker for movement is connectedto servo and Buzzer sound is played to alert the people in the surroundings so that can come slower while speed breaker is rotating. The LCD displays certain message when speed breaker is active or not and also shows the real time. RF receiver is used to receive the signals from the emergency vehicles so that whenever the speed breaker is active and an ambulance or a police vehicle are in emergency they can use the RF transmitter to send high signals and make the speed breaker disable and go at constant speed. RTC is the most important module as we upload the time that we need the speed breaker to be active and for how long it has to be until it disables.

LCD DISPLAY : A liquid crystal display (LCD) is one of the display devices. It is a thin, flat electronic display that uses the light modulating properties of liquid crystals combined with polarize.

PIEZO BUZZER: A buzzer or beeper is an audio signaling device, which may be mechanical, electro mechanical or piezoelectric (piezo for short).

ARDUINO: Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a micro controller) anda ready-made software called Arduino IDE (Integrated Development Environment), which is used towrite and upload the computer code to the physical board.

REAL TIME CLOCK: Real time clocks (RTC), as the name recommends are clock modules. The DS1307 real time clock (RTC) IC is an 8 pin device using an I2C interface. The DS1307 is a low- power clock/calendar with 56 bytes of battery backup SRAM. The clock/calendar provides seconds, minutes, hours, day, date, month and year qualified data. The end date of each month is automatically adjusted, especially for months with less than 31 days.

3.3 USE CASE DIAGRAM

Use-case diagrams describe the high-level functions and scope of a system. These diagrams also identify the interactions between the system and its actors. The use cases and actors in use- case diagrams describe what the system does and how the actors use it, but not how the system operates internally.

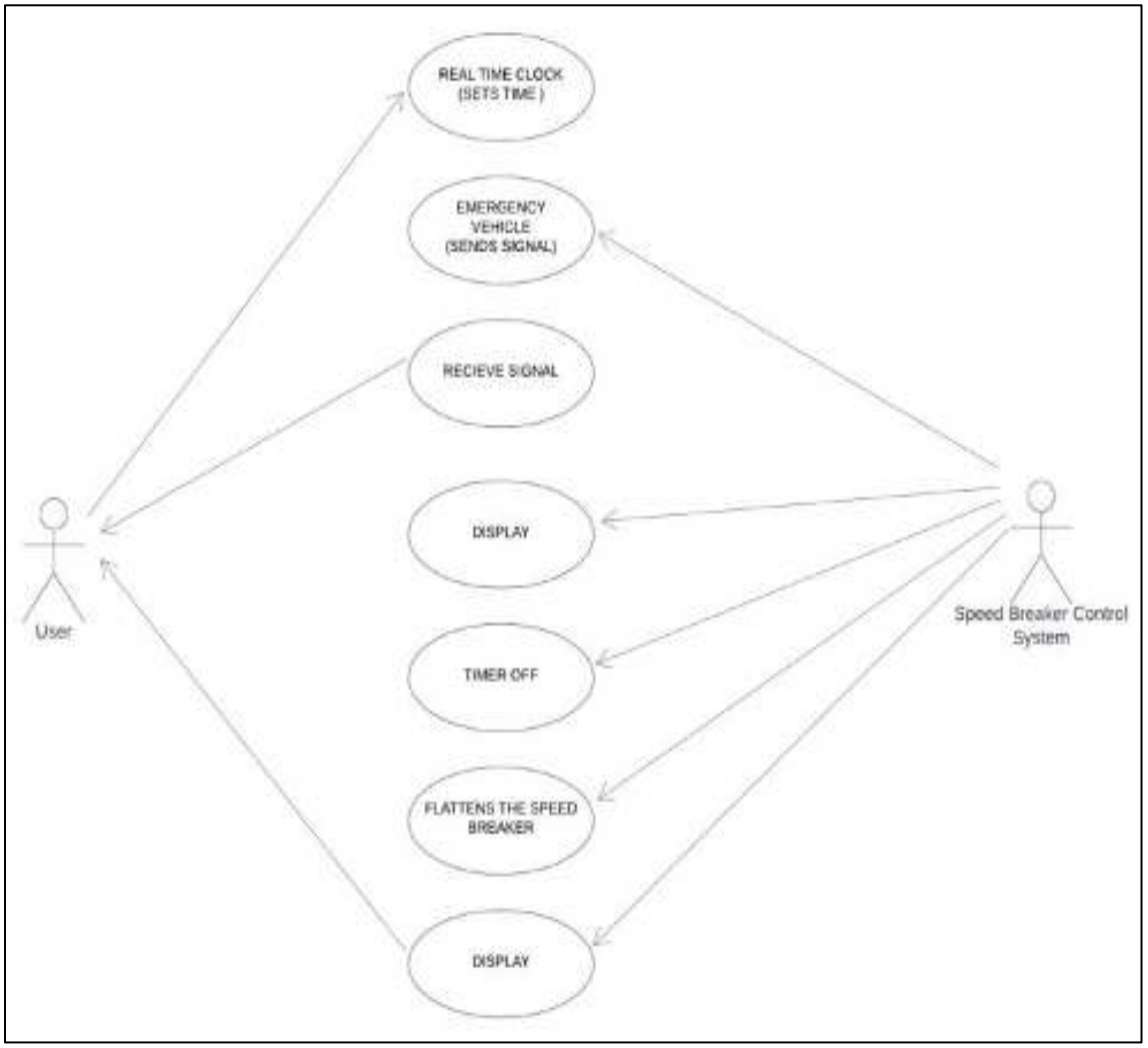

Figure 3.2 : Use case diagram

3.4 CLASS DIAGRAM

Class diagrams are one of the most useful types of diagrams in UML as they clearly map out the structure of a particular system by modeling its classes, attributes, operations, and relationships between objects.

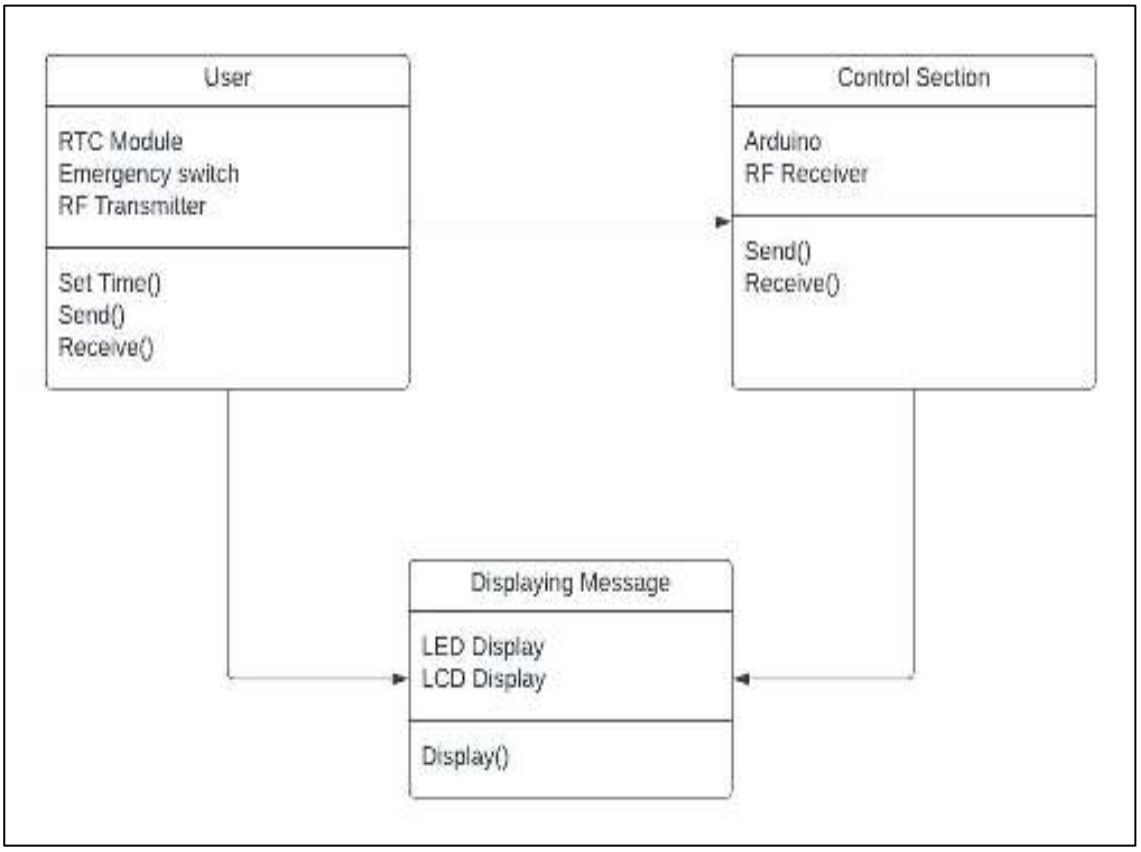

Figure 3.3 : Class diagram

3.5 SEQUENCE DIAGRAM

It shows the sequence in which different tasks are being carried out. Here the user set the time in real time clock when the time get started RTC is connected to arduino then, LCD and LED is displays the alert message and buzzer sound is played so that speed breaker are appeared on the road. If any emergency cases are occur then RF Transmitter will sends the signals to RF receiver so that speed breaker will disappeared from road. If time get off automatically speed breaker will disable from the road.

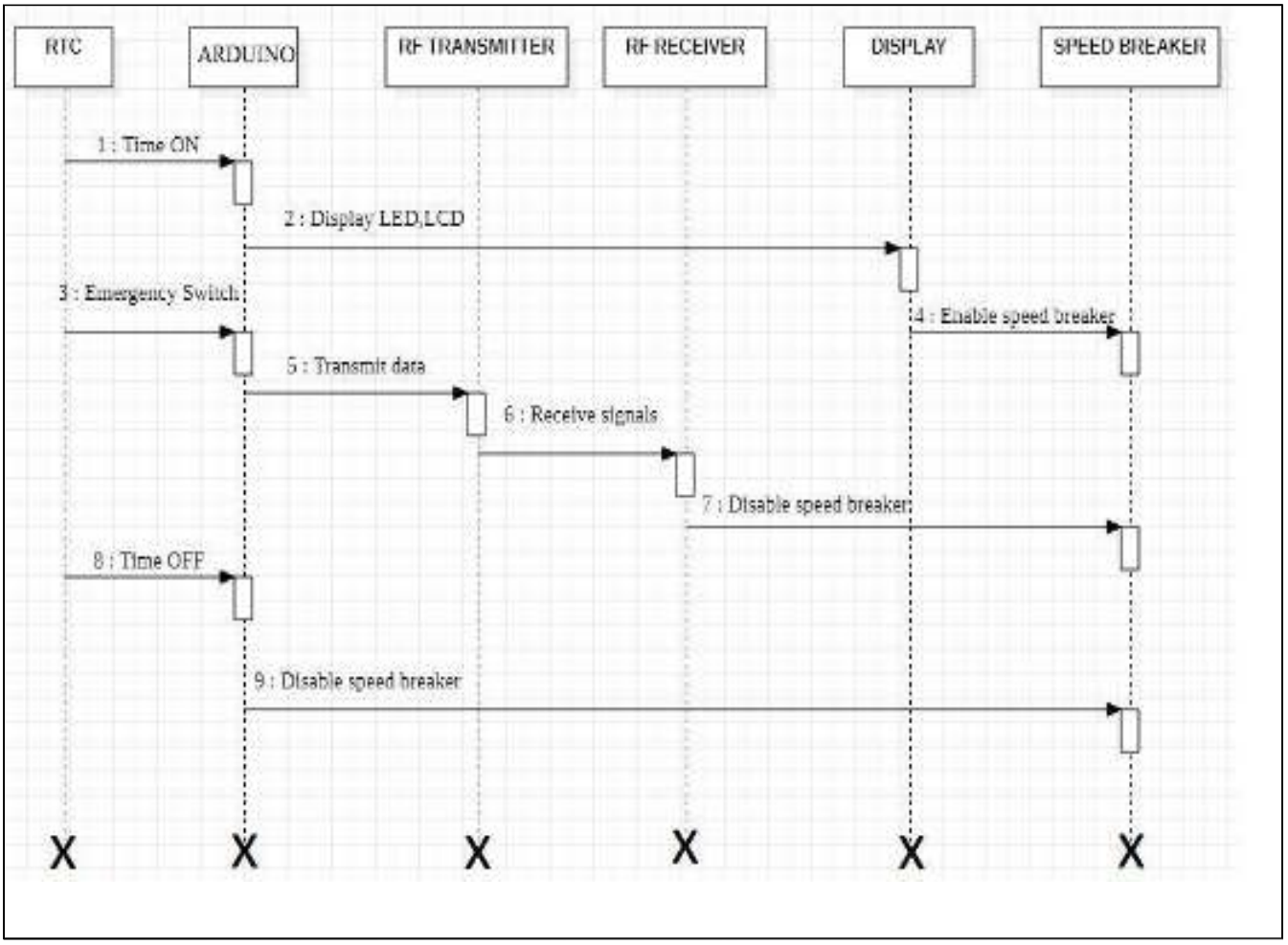

Figure 3.4: Sequence diagram

3.6 ACTIVITY DIAGRAM

Activity diagram is basically a flowchart to represent the flow from one activity to another activity.The activity can be described as an operation of the system.

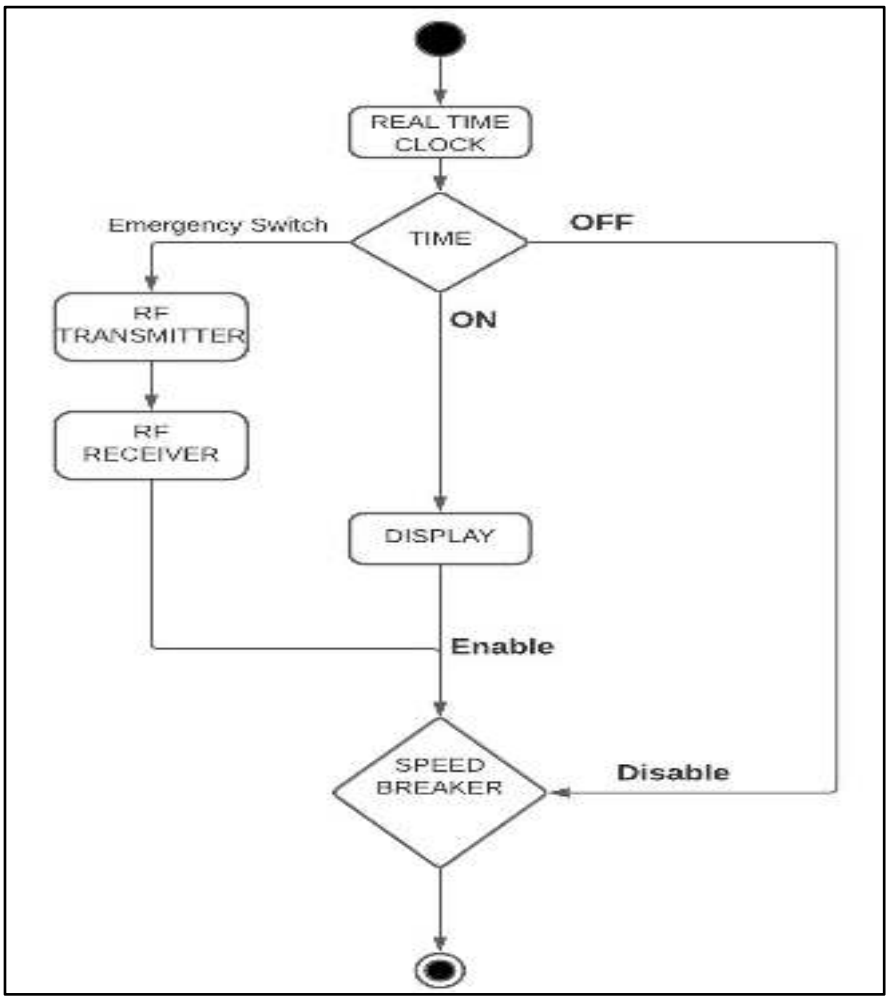

Figure 3.5: Activity diagram

4.IMPLEMENTATION

4. IMPLEMENTATION

4.1 SAMPLE CODE

RECIEVER CODE

```
#include <VirtualWire.h>
#include <DS3231.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);
DS3231 rtc(SDA, SCL);
Time t;
#define buz 9
#define led 4
#define servopin 3
int Hor;
int Min;
int Sec;
void setup()
{
Serial.begin(9600);
//vw_set_ptt_inverted(true); // Required for DR3100
vw_set_rx_pin(11);
vw_setup(4000); // Bits per sec
vw_rx_start(); // Start the receiver PLL running
Wire.begin();
rtc.begin();
Serial.begin(9600);
pinMode(buz, OUTPUT);
pinMode(led, OUTPUT);
pinMode(servopin, OUTPUT);
```

```
//myservo2.write(1250);
lcd.init(); // initialize the lcd
lcd.backlight();
lcd.setCursor(0,0);
lcd.print("AUTOMATIC SPEED ");
lcd.setCursor(0,1);
lcd.print(" BREAKER SYSTEM ");
Buzzer();
lcd.clear();
// //rtc.setDOW(WEDNESDAY); // Set Day-of-Week to SUNDAY
// //rtc.setTime(12, 0, 0); // Set the time to 12:00:00 (24hr format)
// //rtc.setDate(1, 1, 2014); // Set the date to January 1st, 2014
// //delay(2000);
//
}
//
void loop()
{
t = rtc.getTime();
Hor = t.hour;
Min = t.min;
Sec = t.sec;
// lcd.clear();
lcd.setCursor(0,0);
lcd.print("CURRENT TIME: ");
lcd.setCursor(5,1);
lcd.print(rtc.getTimeStr());
Serial.println(rtc.getTimeStr());
//// lcd.setCursor(0,0);
//// lcd.print("Time: ");
//// lcd.print(rtc.getTimeStr());
//// lcd.setCursor(0,1);
```

```
//// lcd.print("Date: ");
//// lcd.print(rtc.getDateStr());
//
if( Hor == 9 && (Min == 29 || Min == 30)) //Comparing the current time with the Alarm time
{
 uint8_t buf[VW_MAX_MESSAGE_LEN];
uint8_t buflen = VW_MAX_MESSAGE_LEN;
if (vw_get_message(buf, &buflen)) // Non-blocking
{
Serial.println(buf[0]);
if(buf[0]=='0')
{ lcd.clear();
lcd.print("EMERGENCY VEHICLE..... ");
digitalWrite(servopin,LOW);
delay(5000);
}
else{
lcd.clear();
Buzzer();
delay(3000);
digitalWrite(servopin,HIGH);
lcd.print("SPEED BREAKER ");
lcd.setCursor(0,1);
lcd.print(" ACTIVETED ");
delay(1000);
}
}
}
}
void Buzzer()
{
digitalWrite(buz,HIGH);
```

```
digitalWrite(led,HIGH);
delay(500);
digitalWrite(buz, LOW);
digitalWrite(led, LOW);
delay(500);
digitalWrite(buz,HIGH);
digitalWrite(led,HIGH);
delay(500);
digitalWrite(buz, LOW);
digitalWrite(led, LOW);
delay(500);
}
```

TRANSMITTER CODE:

```
#include <VirtualWire.h>
char *controller;
int pushButton = 8;
int BUZZER = 6;
void setup() {
Serial.begin(9600);
//vw_set_ptt_inverted(true); //
vw_set_tx_pin(12);
vw_setup(4000);// speed of data transfer Kbps
delay(100);
 pinMode(pushButton, INPUT_PULLUP);
pinMode(BUZZER,OUTPUT);
digitalWrite(BUZZER,HIGH);
delay(500);
digitalWrite(BUZZER,LOW);
}
void loop() {
int buttonState = digitalRead(pushButton);
Serial.println(buttonState);
delay(1);
if (buttonState == 1)
{
controller="1" ;
vw_send((uint8_t *)controller, strlen(controller));
vw_wait_tx(); // Wait until the whole message is gone
}
else
{
digitalWrite(BUZZER,HIGH);
```

```
delay(100);
digitalWrite(BUZZER,LOW);
controller="0" ;
vw_send((uint8_t *)controller, strlen(controller));
vw_wait_tx(); // Wait until the whole message is gone }
}
```

SERVO CODE:

```
#include <Servo.h>
Servo myservo;  // create servo object to control a servo
// twelve servo objects can be created on most boards
int pos = 0;    // variable to store the servo position
int d = 12;
void setup() {
  myservo.attach(11);  // attaches the servo on pin 9 to the servo object
  pinMode(d,INPUT_PULLUP);
  Serial.begin(9600);
}
void loop() {
  Serial.println(digitalRead(d));
  if(digitalRead(d)==1){
     myservo.write(0);
     delay(2000);
  }
  else{
   myservo.write(180);
  }
// tell servo to go to position in variable 'pos'

//  for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees
//    // in steps of 1 degree
//    myservo.write(pos);              // tell servo to go to position in variable 'pos'
//    delay(15);                       // waits 15 ms for the servo to reach the position
//  }
//  for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
//    myservo.write(pos);              // tell servo to go to position in variable 'pos'
//    delay(15);                       // waits 15 ms for the servo to reach the position
//  }
}
```

5. RESULTS

5. RESULTS

5.1 SCREENSHOTS

5.1.1 Powered On:

The receiver side of the model has one of the arduino which has a port with which when a cable is connected to external power supply, the receiver side consisting of the speed breaker, lcd, led, servo motor and other components is powered on.

Figure 5.1.1: Powered On Result

5.1.2 Speed-Breaker Activated:

Once the time is uploaded the speed breaker gets activated on that certain time, the buzzer starts beeping and the message “SPEED BREAKER ACTIVATED” is displayed on the LCD screen.

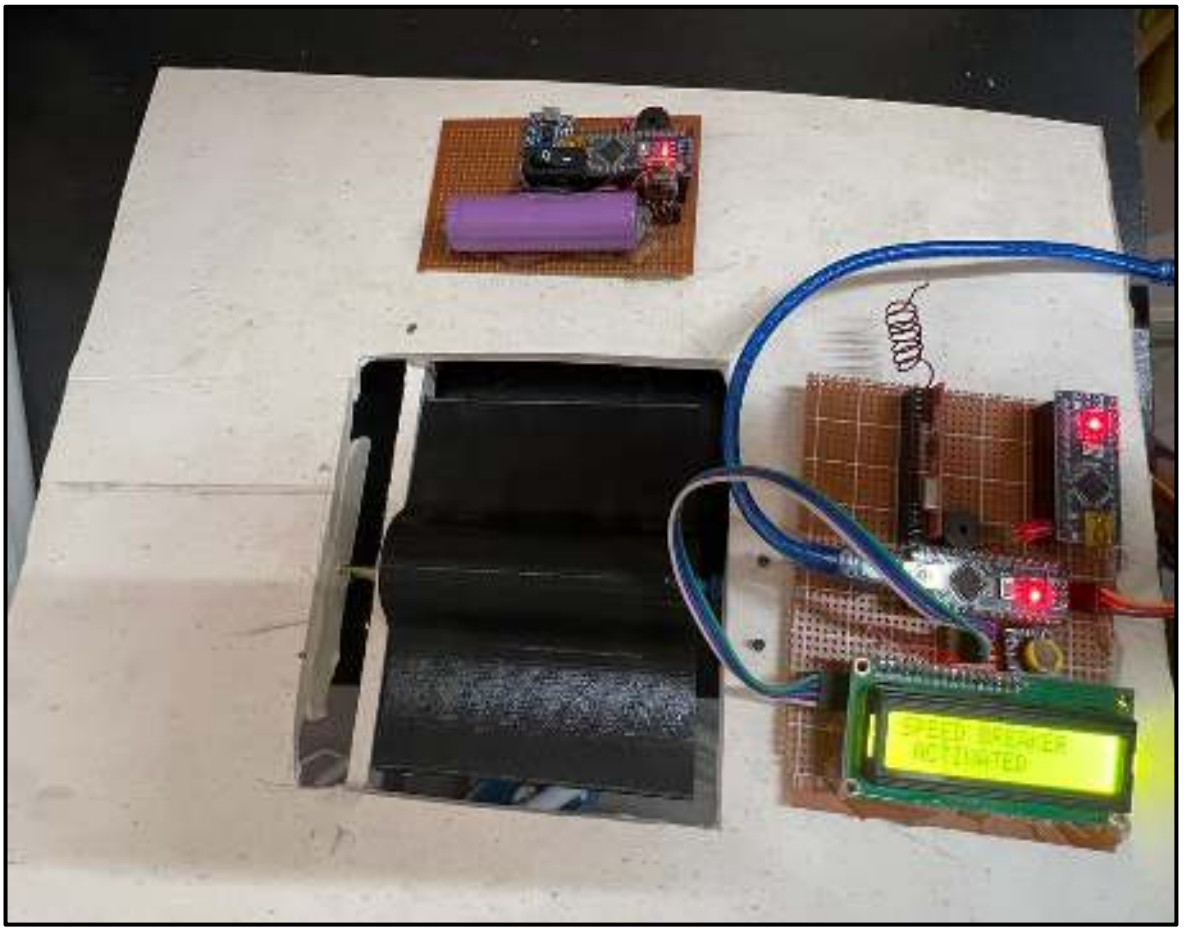

Figure 5.1.2: Speed Breaker Activated Result

5.1.3 Emergency Vehicle Signal:

During the activation time of the speed breaker when the emergency vehicle sends a radio frequency signal the speed breaker rotates immediately and makes it a flat road, a message “EMERGENCY VEHICLE” is displayed.

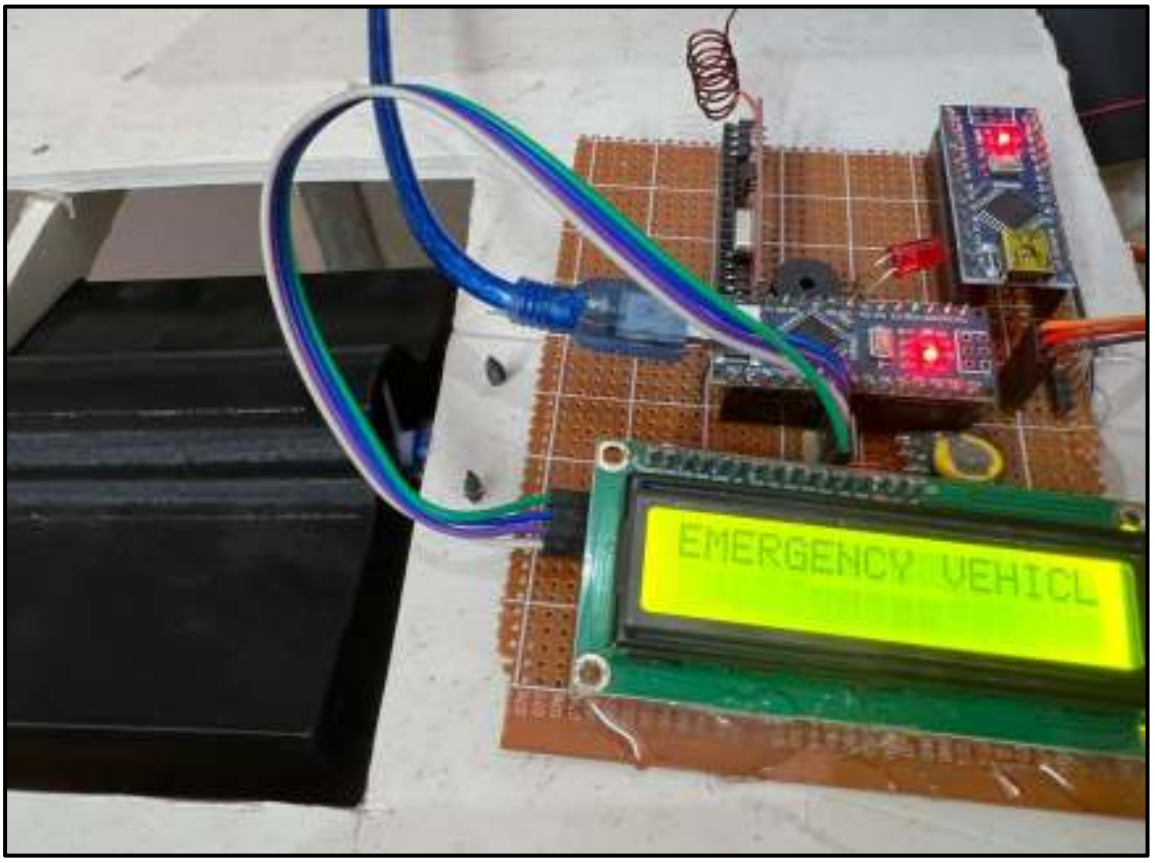

Figure 5.1.3: Emergency Vehicle Signal Result

6. TESTING

6. TESTING

6.1 INTRODUCTION TO TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product[6]. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement[9].

6.2 TYPES OF TESTING

6.2.1 UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .It is done after the completion of an individual unit before integration[8]. This is a structural testing that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results[1].

6.2.2 INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields[11]. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.2.3 FUNCTIONAL TESTING

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures : interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identifying Business process flows; data fields, predefined processes.

6.3 TEST CASES

Test	Description	Action	Excepted Result	Actual Result	Result
RTC (when user sets the time)	Real Time Clock is used to set the time	User will sets the time in RTC module for having the speed breaker on the road.	Speed Breaker should be Enable.	Same as Expected	Pass
Emergency Switch / Vehicle	When there is any emergency situation, RF is used. So that RF Receiver will automatically disable the speed breaker when they receive high signals then the micro controller.	Arduino will identify the emergency vehicle and it will transmit the signals through RF Transmitter and RF Receiver will receives the signals.	Speed Breaker should be Disable.	Same as Expected	Pass
Timer Off	User mentioned time gets zero.	When the countdown gets zero in RTC, Speed Breaker will automatically disable from the road.	Speed Breaker should be Disable.	Same as Expected	Pass

7. CONCLUSION

7. CONCLUSION & FUTURE SCOPE

7.1 PROJECT CONCLUSION

- On completion the concept of having an automatic speed breaker on time demand using Embedded Systems tool; it can be seen that the idea is very innovative and useful for the requirements of today's speedy life[4].
- The concept of the mentioned idea is to make the performance of the vehicle better.
- This speed breaker allows emergency vehicle o maintain its constant speed by deactivating the speed breaker using RF that makes the road flat which plays a major role in safeguarding human lives.
- With this idea, transportation is easier and more convenient for emergency vehicles[6].

7.2 FUTURE SCOPE

- This system can increase it's compatibility by using ultra-sonic sensors.
- Ultra-sonic sensors can detect any hurdles on road such as breakers,buildings etc.
- The system with ultra-sonic sensors will be very effective while driving in hilly areas where sharp turns causes problems especially in night.
- This system will also reduce vehicle mash-up on road while over-taking or going with high speed as it will detect vehicle in-front and automatically maintains safe distance and speed[2].

8. BIBLIOGRAPHY

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8.2 WEBSITES

1. https://www.academia.edu/43359333/Automatic_Speed_Breaker_on_Time_Demand_using_Embedded_Systems

2. https://www.ijert.org/automatic-speed-breaker-on-time-demand-using-embedded-systems

3. https://www.scribd.com/document/376476707/Automatic-Speed-Breaker-on-Time-Demand-Using

8.3 GITHUB Link

https://github.com/navyakola99/cmrtc-r18-B6--major-project