FORWARD OBSTACLE COLLISION AVOIDANCE USING FM WAVES

A PROJECT REPORT

Submitted by

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EXTERNAL EXAMINER

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We **KARAN SANJEEV S (211418104110), KAMALESHWARAN B (211418104107)** hereby declare that this project report titled "**FORWARD OBSTACLE COLLISION AVOIDANCE USING FM WAVES**", under the guidance of **MR.A. KARTHIKEYAN, M.Tech** is the original work done by us and we have not plagiarized or submitted to any other degree in any university by us.

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ABSTRACT

One of the major challenges of the next generation of road transportation vehicles is to increase the safety of the passengers. Over 10 million people are injured yearly worldwide in road accidents. These include two to three million severely injured and 400,000 fatalities. The financial damage of accidents is estimates as 1- 3% of world GDP. Rear-end collisions constitute a significant proportion of the total accidents (40% in INDIA). Lack of attention by the driver is identified as the cause for 91% of driver related accidents. According to a 1992 study by Daimler-Benz (cited in [1]), if car drivers have a 0.5-second additional warning time, about 60% of rear-end collisions can be prevented. An extra second of warning time can prevent about 90% of rear-end collisions. Also, the read-end collisions have been mostly caused by drivers' insufficient attention to the car speed and its distance to proceeding vehicles.

Basically, the goal of the proposed system is to warn drivers in the imminent frontal collision situations. FOCA provides warning signals in an appropriate time to prevent accidents. FOCA works by using a vehicle that has involved in an accident and using the airbag sensors of the vehicle to send an emergency beacon of FM wave which in-turn alerts the oncoming and incoming traffic which is received by their antennas and alerts the drivers of those vehicles through their vehicles multimedia system.

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INTRODUCTION

1.1 INTRODUCTION AND IDEAOLOGY

Forward-obstacle-collision-*avoidance (**FOCA**)* is one of the most cost-effective method in concerning aspects of safety in vehicles. More expensive vehicles above the price range of 30Lakh rupees use expensive apparatus like RADAR, LIDAR and etc. to enhance the safety. The large number of rear end collisions due to driver inattention has been identified as a major automotive safety issue. Even a short advance warning can significantly reduce the number and severity of the collisions. *This paper describes a FM based system for highway safety and collision avoidance. The system has been implemented on a prototype hardware and has to be further developed as a research.*

Fig 1.1:

Traditional systems available today (typically based on Radar sensors) and their limited performance (narrow field of view and poor lateral resolution) have prevented such systems from entering the market. From a technological point of view, fusion of radar and vision is an attractive approach. In such a system the radar gives accurate range and range-rate measurements while vision solves the angular accuracy problem of radar. However, this solution is costly. This **cost-effective** way for a large-scale consumer base ***is this proposed system***, which will benefit **80% of the Indian Road users.** To this end, many technologies have been developed to diminish the rate of fatalities. Auto maker companies have increased the safety of drivers and passengers by equipping their vehicles with airbags, ADAS (Advance driver assistance system), high strength body steel, etc.

CHAPTER 2

LITERATURE SURVEY

Advanced driver-assistance systems (**ADAS**) are groups of electronic technologies that assist drivers in driving and parking functions. Through a safe human-machine interface, ADAS increase car and road safety. ADAS use automated technology, such as sensors and cameras, to detect nearby obstacles or driver errors, and respond accordingly.

ADAS were first being used in the 1950s with the adoption of the anti-lock braking system. Early ADAS include electronic stability control, anti-lock brakes, blind spot information systems, lane departure warning, adaptive cruise control, and traction control. These systems can be affected by mechanical alignment adjustments or damage from a collision. This has led many manufacturers to require automatic resets for these systems after a mechanical alignment is performed.

The reliance on data that describes the outside environment of the vehicle, compared to internal data, differentiates ADAS from driver-assistance systems (DAS). ADAS relies on inputs from multiple data sources, including automotive imaging, LiDAR, radar, image processing, computer vision, and in-car networking. Additional inputs are possible from other sources separate from the primary vehicle platform, including other vehicles (vehicle-to-vehicle or V2V communication) and infrastructure (vehicle-to-infrastructure or V2I communication). Modern cars have ADAS integrated into their electronics; manufacturers can add these new features.

ADAS are considered real-time systems since they react quickly to multiple inputs and prioritize the incoming information to prevent accidents. The systems use pre-emptive

priority scheduling to organize which task needs to be done first. The incorrect assignment of these priorities is what can cause more harm than good.

ADAS are categorized into different levels based on the amount of automation, and the scale provided by The Society of Automotive Engineers (SAE). ADAS can be divided into six levels. In level 0, ADAS cannot control the car and can only provide information for the driver to interpret on their own. Some ADAS that are considered level 0 are: parking sensors, surround-view, traffic sign recognition, lane departure warning, night vision, blind spot information system, rear-cross traffic alert, and forward-collision warning. Level 1 and 2 are very similar in that they both have the driver do most of the decision making. The difference is level 1 can take control over one functionality and level 2 can take control over multiple to aid the driver. ADAS that are considered level 1 are: adaptive cruise control, emergency brake assist, automatic emergency brake assist, lane-keeping, and lane centring. ADAS that are considered level 2 are: highway assist, autonomous obstacle avoidance, and autonomous parking. From level 3 to 5, the amount of control the vehicle has increases; level 5 being where the vehicle is fully autonomous. Some of these systems have not yet been fully embedded in commercial vehicles. For instance, highway chauffeur is a Level 3 system, and automatic valet parking is a level 4 system, both of which are not in full commercial use yet. The levels can be roughly understood as Level 0 - no automation; Level 1 - hands on/shared control; Level 2 - hands off; Level 3 - eyes off; Level 4 - mind off, and Level 5 - steering wheel optional

Once an impending collision is detected, these systems provide a warning to the driver. When the collision becomes imminent, they can take action autonomously without any driver input (by braking or steering or both). Collision avoidance by braking is appropriate at low vehicle speeds (e.g. below 50 km/h (31 mph)), while collision avoidance by steering may be more appropriate at higher vehicle speeds if lanes are

clear. Cars with collision avoidance may also be equipped with adaptive cruise control, using the same forward-looking sensors.

A collision avoidance system (CAS), also known as a pre-crash system, forward collision warning system, or collision mitigation system, is an advanced driver-assistance system designed to prevent or reduce the severity of a collision. In its basic form, a forward collision warning system monitors a vehicle's speed, the speed of the vehicle in front of it, and the distance between the vehicles, so that it can provide a warning to the driver if the vehicles get too close, potentially helping to avoid a crash. Various technologies and sensors that are used include radar (all-weather) and sometimes laser (LIDAR) and cameras (employing image recognition) to detect an imminent crash. GPS sensors can detect fixed dangers such as approaching stop signs through a location database. Pedestrian detection can also be a feature of these types of systems.

Collision avoidance systems range from widespread systems mandatory in some countries, such as autonomous emergency braking (AEB) in the EU, agreements between carmakers and safety officials to make crash avoidance systems eventually standard, such as in the United States, to research projects including some manufacturer specific devices.

Efficiency varies depending on analysis, according to the European Commission:
38% drop in accidents according to Fildes, 2015
9%-20% drop in collision according to Volvo
44% drop according to Ciccino

In April 2019, IIHS/HLDI considered real-world benefits of crash avoidance technologies, based on rates of police-reported crashes and insurance claims. Forward collision warning plus autobrake is associated with a 50% decrease in front to rear crashes and a 56% decrease in front to rear crashes with injuries, while forward collision warning alone is associated with only a 27% decrease in front to rear crashes and an only 20% decrease in front to rear crashes with injuries. The rear automatic braking is considered to have generated a 78% decrease in backing crashes (when combined with the rearview camera and parking sensor). However, repair costs with this equipment are an average of US$109 higher due to the sensors being in areas prone to damage.

CHAPTER 3

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

FCW is an advanced driver assistance system (ADAS) that warns drivers when approaching an impending collision with an obstruction or car in its forward path. FCW aims to reduce the number of rear-end collisions that occur when an unexpected vehicle or object is suddenly in your path not giving you enough time to brake.

Forward Collision Warning has the potential to reduce collisions. A study of large trucks found that "FCW was associated with a statistically significant 22% reduction in the rate of police-reportable crashes per vehicle miles traveled, and a significant 44% reduction in the rear-end crash rate."

In March 2016, NHTSA and IIHS announced that 20 major automakers had committed to making FCW and Automatic Emergency Braking (AEB) standard on all cars and light-duty trucks (weighing less than 8,500 pounds) by September 1, 2022. It's becoming more and more common to see FCW on vehicles. Nearly all manufacturers offer it standard on at least one 2021 model, while many more have FCW available as an option. If you haven't driven a car with this feature yet, it's more than likely that you soon will. The trend isn't going away

Forward Collision Warning uses radar, camera, and laser technology to monitor the road ahead. When the distance between your car and an upcoming obstruction is closing too quickly, FCW systems alert drivers so they can brake. FCW provides audible and/or visual warnings to drivers. Some models even offer haptic warnings, with a seat or steering wheel vibration.

3.2 CHALLENGES OF EXISTING SYSTEM

Your forward collision warning system may struggle on wet or icy roads because it is not able to adjust for road conditions. Wet or slick roads may increase your stopping distance, potentially causing your forward collision warning system to alert you too late to avoid a collision. Note in the image below that the forward collision warning system's estimated stopping distance, in blue, is far shorter than the actual stopping distance, in red, due to bad road conditions.

It's important to note that the use of forward collision warning and automatic emergency braking is not advised during inclement weather conditions and no cars under the rate of 30 lakhs has this system implemented in it.

Share of cars in Indian roads that use radar-based luxury cars to prevent collision are less than10% which indicates any large-scale implementation is not present and most users only rely on collision protection like airbags, anti-lock braking system etc**.**

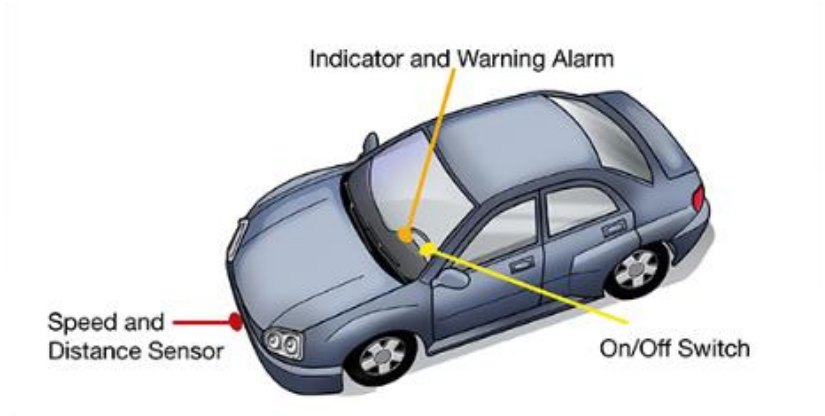


Fig 3.1:

Parts of a typical forward collision warning system

3.3 PROPOSED SYSTEM

The foca software is first downloaded from the web using Android auto or apple car play which basically mimics the phone on to the multimedia system of any vehicle. app store can be used to download the application and can be used to run in the background. The foca app uses the information from the ECU of the vehicle that has crashed and ensures the airbags deployed

During a crash, the vehicle's crash sensors provide crucial information to the airbag electronic controller unit (ECU) Using this information, the airbag ECU's crash algorithm determines if the crash event meets the criteria for deployment and triggers various firing circuits to deploy one or more airbag modules within the vehicle.

Once the airbags are deployed, the software binds with the ECU information to send a FM WAVE. The FM transmitter is a circuit that uses a very low power to operate and does uses (Frequency Modulation) FM Waves to transmit the sound. With the help of such FM transmitters we can easily transmit the audio signals through the carrier waves with different frequencies.

The apparatus to transmit and receiver FM waves are already available in current modern cars that uses semi-conductor chip-based infotainment system. Which is the highest advantage of the proposed system which means no other special apparatus is required to implement this and only a few hardware and software would make the large-scale implementation of this possible.

FOCA performs slightly different in the receiver side. It overtakes the filtering process of the radio software. As an antenna receives 100’s of radio signals the user only

chooses one to listen to but in case of an emergency signal also being received foca overrides the existing signal received.

Foca allows the emergency signal if detected while temporarily pausing the radio signal that's currently in play, as foca is a background software that constantly monitors this and a trigger event occurs as and displays an alert message to the driver using an alert command and audio output to make the driver aware and then the foca software sets a timeout to ensure the command is not repeated over and over as the antenna keeps receiving the signal unless it goes out of range

3.4 MODULES OF PROPOSED SYSTEM PROTOTYPE

Class **select airbags**:

Class select airbags is used as a prototype model here as, this is provided by the cars ECU. This class has one main function it is to transmit the FM wave through the airbag sensors response else not transmit the FM wave. The class takes binary value as input where each Binary value corresponds to each airbag being deployed or not. 1 corresponds to each airbag in the car and where 0 denotes the airbag not being deployed. Each kind of airbag system represents how many binary values the function would take as input for e.g:2 airbags would have "00 01 10 11" as input and if a car has 4 airbags it has an input type of e.g. "1011" and so

Class **main alert:**

The software constantly checks for FM wave of a set frequency as the receiver receives all wavelengths of frequencies and the software if it notices a frequency that we have prefixed then the current FM frequency the user is listening to is stopped and our emergency message is let through. The main alert page is responsible for the message that will alert the driver through a visual textual warning and an auditory alert.

This class uses bright colors specifically that make the human brain understand this message is of higher priority. This class has two repetitive messages to ensure high importance and then it sets a timeout to ensure the message is not repeated as long as we keep receiving the FM through the receiver.

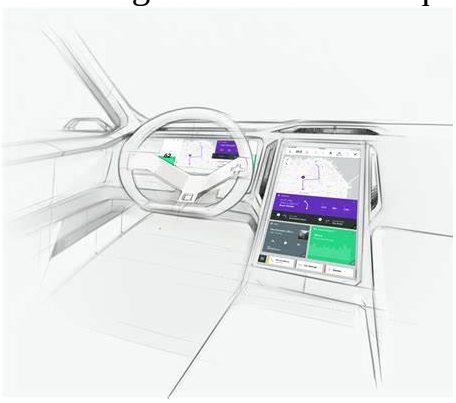
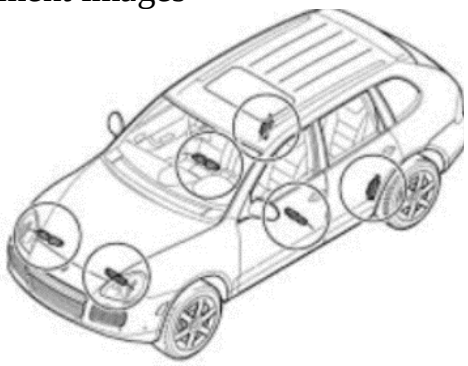
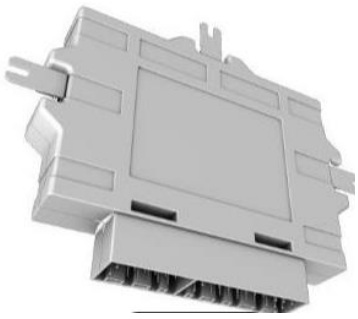
Class **final reminder**:

The final reminder page is to ensure even if the driver or the user was lethargic during the first alert. This page also acts as a landing page to close the application's alert message. Even though the functionality is really less in this page. Repetition of messages will acquire the user's attention even though the user tends to ignore- "After repeated attempts, **your brain gets better at recreating that pattern of neural activity, and you get better at understanding things**. [2]" This is one of the main reasons to include a second landing page in this application.

3.5 HARDWARE REQUIREMENTS

- A shark fin antenna of a car.
- Infotainment system of a car.
- Airbag sensors of a car.
- FM frequency allotted by the government to permit transmission
- Ecu unit of a car.

Fig 3.2: Hardware requirement images

3.6 SOFTWARE REQUIREMENTS

Android studio was used to build the prototype app which will in turn be paired with the hardware of the vehicles system.

What is the advantage of Android Studio?

Android Studio offers build automation, dependency management, and customizable build configurations. You can configure your project to include local and hosted libraries, and define build variants that include different code and resources, and apply different code shrinking and app signing configurations

Why java?

Large applications with lots of features and functionality that need to function across all platforms, including Android, iOS, Windows, or Linux. Java has mature libraries that support this type of application development well

3.7 ADVANTAGES OF PROPOSED SYSTEM

- This will benefit large base of people as cars under the price range of 30 lakh rupees have no ADAS OR RADAR based system hence this will serve as a better alternative to those systems and server the majority of road users who own NON-luxury cars and are hence under greater risk
- Keeping in mind the focused customer base the cost effectiveness is a huge advantage to existing RADAR OR ADAS systems as this requires a lot of expensive sensors replacement when damaged whereas in this case just the FM antenna replacement would suffice.
- The range of 500-600 meters is much effective since a modern car only requires 60 or so meters to come to complete halt from triple digit speeds and hence the driver has optimum time to react.
- Cars with infotainment screen can access these as there is no requirement of any other special apparatus is required to use this application when it would be in real time usage.
- Since the speed of transmission is dependent on the type of wave, the time delay is crucial in these types of systems but since we used FM wave which is a type of radio wave it travels in the speed of light in transmission and hence it would be $3x10^8$ m/s which is less than a fraction of a second.

CHAPTER 4

SYSTEM ARCHITECTURE

4.1 MODULE DESCRIPTION

AIRBAGS

Designed to inflate extremely quickly, then quickly deflate during a collision. It consists of the airbag cushion, a flexible fabric bag, an inflation module, and an impact sensor. The purpose of the airbag is to provide a vehicle occupant with a soft cushioning and restraint during a collision. It can reduce injuries between the flailing occupant and the interior of the vehicle.

The airbag provides an energy-absorbing surface between the vehicle's occupants and a steering wheel, instrument panel, body pillar, headliner, and windshield. Modern vehicles may contain up to 10 airbag modules in various configurations, including: driver, passenger, side-curtain, seat-mounted, door-mounted, B and C-pillar mounted side-impact, knee bolster, inflatable seat belt, and pedestrian airbag modules. During a crash, the vehicle's crash sensors provide crucial information to the airbag electronic controller unit (ECU), including collision type, angle, and severity of impact. Using this information, the airbag ECU's crash algorithm determines if the crash event meets the criteria for deployment and triggers various firing circuits to deploy one or more airbag modules within the vehicle.

FOCA SOFTWARE -TRANSMIT:

The foca software is first downloaded from the web using Android auto or apple car play which basically mimics the phone on to the multimedia system of any vehicle. app store can be used to download the application and can be used to run in the background. The foca app uses the information from the ECU of the vehicle that has crashed and ensures the airbags deployed. In the case of deployment, the background running app will transmit a FM modulated digital signal to the transmitter. transmitter

and receiver apparatus come with the cars multimedia system. Now this digital signal is then sent to the receiver for transmission.

THE FM TRANSMITTER:

The FM transmitter (Frequency modulation) circuit is made up of a single transistor or a BJT. In wireless communication, the (frequency modulation) FM carries the data or information by changing the frequency of the carrier wave as per the information or a message signal.

The FM transmitter achieves the application of (very high frequency) VHF radio frequencies of 87.5 HZ to 108 MHZ in both transmission as well as in reception of the Signal. The FM transmitter completes the most excellent volume within less power
The FM transmitter is a circuit that uses a very low power to operate and does uses (Frequency Modulation) FM Waves to transmit the sound. With the help of such FM transmitters we can easily transmit the audio signals through the carrier waves with different frequencies.

The frequency of the carrier wave would be the same as for the audio signal with an amplitude. The FM Transmitter produces a range of VHF from 88 HZ to 108 MHZ Components required for FM transmitter circuit are modulator, oscillator, RF-Amplifier, Audio pre-amplifier, microphone and antenna. The Diagram shows the Block diagram for FM transmitter circuit. There are two types of frequency in the signal:
Carrier signal (with carrier frequency)
Audio signal (With audio frequency). The carrier frequency is obtained by modulating the audio signals. The (Frequency Modulation) FM signal is obtained by differentiating the carrier frequency and by allowing the Audio frequency. The transistor is used for oscillator purpose in order to obtain Radio Frequency signal.

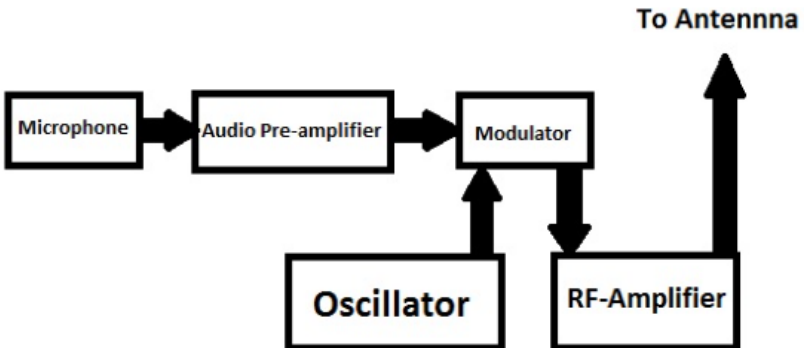


Fig 4.1: Simple Fm Block Dig

The circuit diagram shown for FM transmitter circuit and the electronic components are the resistor, capacitor, trimmer or variable capacitor, inductor (coil), transmitter, mic, 9v of power supply or 7809 Voltage regulator (in case if you are using input voltage more than 9v) and an antenna. The mic or a microphone is assumed to grab the sound signals and there is a presence of sensor with capacitance value inside the mic. The change in pressure of air or AC signal causes in production of such capacitance.

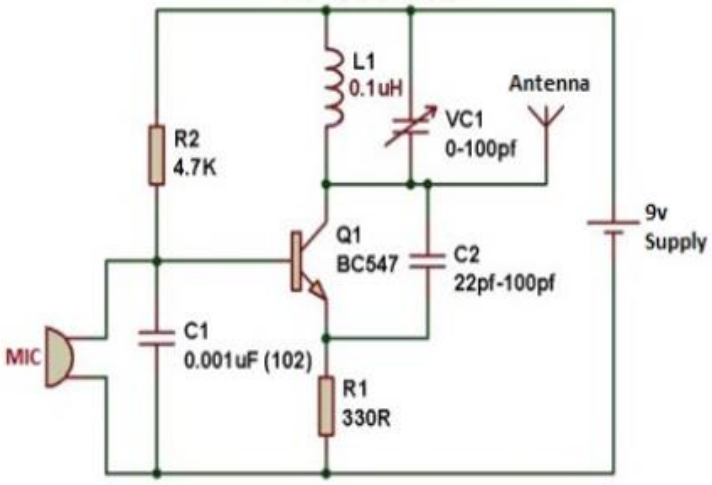


Fig 4.2: FIG: circuit diagram for an FM transmitter with 3 km radius

FM RECEIVER:

FM receiver is an electronic device that receives radio waves and converts the information carried by them to a usable form. An antenna is used to catch the desired frequency waves. The receiver uses electronic filters to separate the desired signal from all the other signals picked up by the antenna, an electronic amplifier to increase the power of the signal for further processing, and finally recovers the desired information through demodulation.

Frequency modulation is used in a radio broadcast in the 88-108MHz VHF frequency band. This bandwidth range is marked as FM on the band scales of radio receivers, and the devices that are able to receive such signals are called FM receivers.

The FM radio transmitter has a 200kHz wide channel. The maximum audio frequency transmitted in FM is 15 kHz as compared to 4.5 kHz in AM. This allows a much larger range of frequencies to be transferred in FM and thus the quality of FM transmission is significantly higher than of AM transmission

FOCA SOFTWARE-RECEIVE

FOCA performs slightly different in the receiver side. It overtakes the filtering process of the radio software. As an antenna receives 100's of radio signals the user only chooses one to listen to but in case of an emergency signal also being received foca overrides the existing signal received. Foca allows the emergency signal if detected while temporarily pausing the radio signal that's currently in play, as foca is a background software that constantly monitors this and a trigger event occurs as and displays an alert message to the driver using an alert command and audio output to make the driver aware and then the foca software sets a timeout to ensure the command is not repeated over and over as the antenna keeps receiving the signal
Unless it goes out of range.

4.2 ARCHITECTURE DIAGRAM

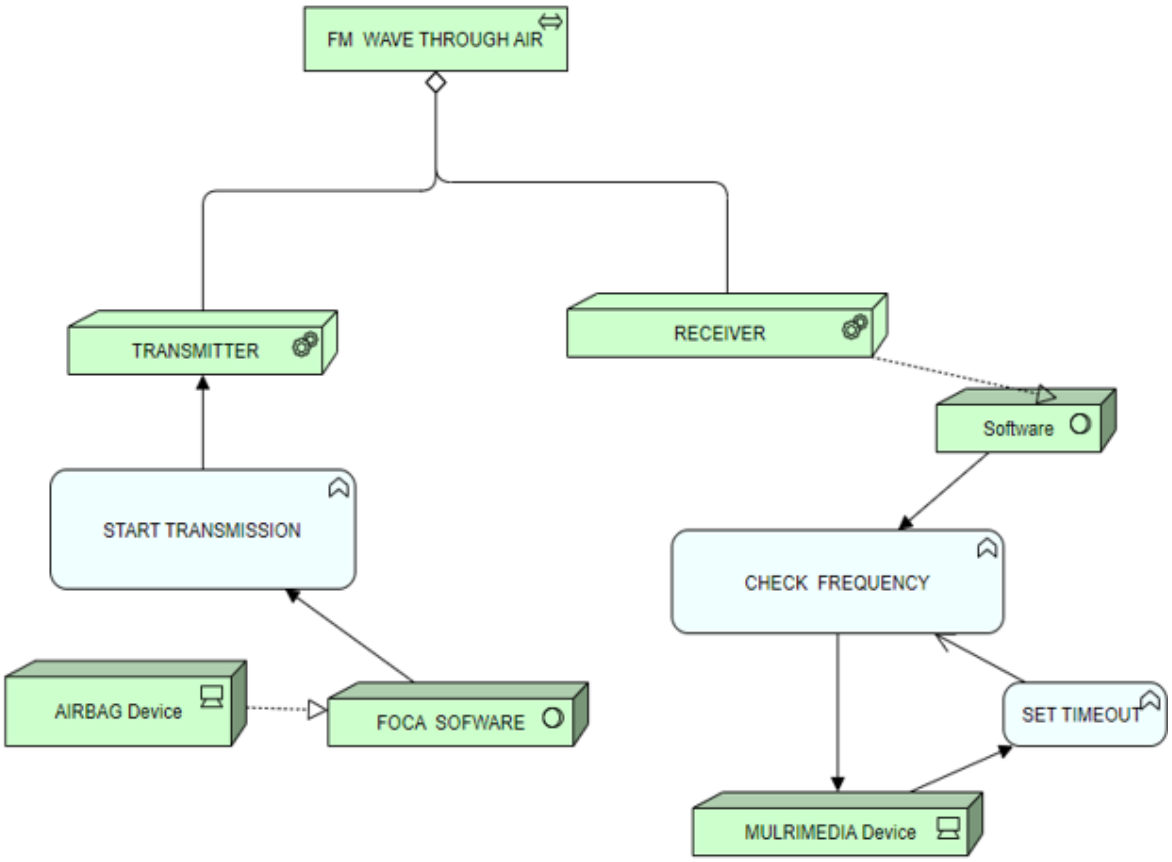


Fig 4.3:	Architecture diagram

FIG 4.3:

The diagram depicts the hardware and software functioning together. First a crash triggers the airbag device and sends it to the FOCA software gets the information by binding with the cars ecu and then triggers a transmission process this transmission process in turn will alert all receivers in the current area of its transmission radius close to (500-600meters real range) and those receivers if they detect this emergency frequency being transmitted while the foca software is running in the background the software is programmed to alert the driver twice through visual and acoustic alerts which when acknowledged will set a timeout to ensure the receiver doesn't keep the driver as long as the signal is being received

Chapter 5

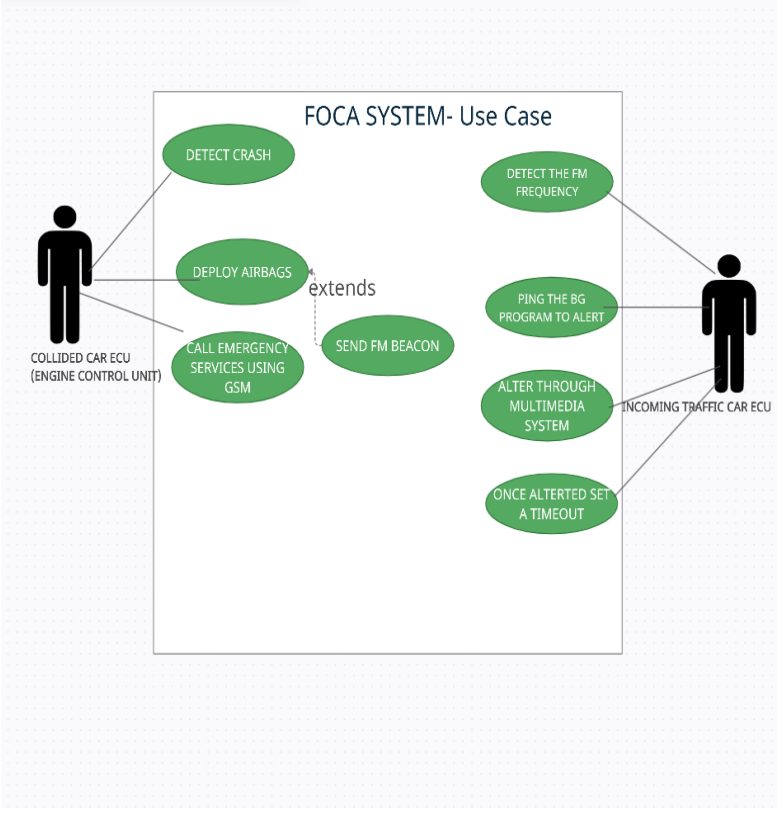
ARCHITECTURE OVERVIEW

System architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

5.1 USE CASE DIAGRAM

- use case diagram is the primary form of system/software requirements for a new software program underdeveloped. Use cases specify the expected behavior (what), and not the exact method of making it happen (how)
- A key concept of use case modeling is that it helps us design a system from the end user's perspective

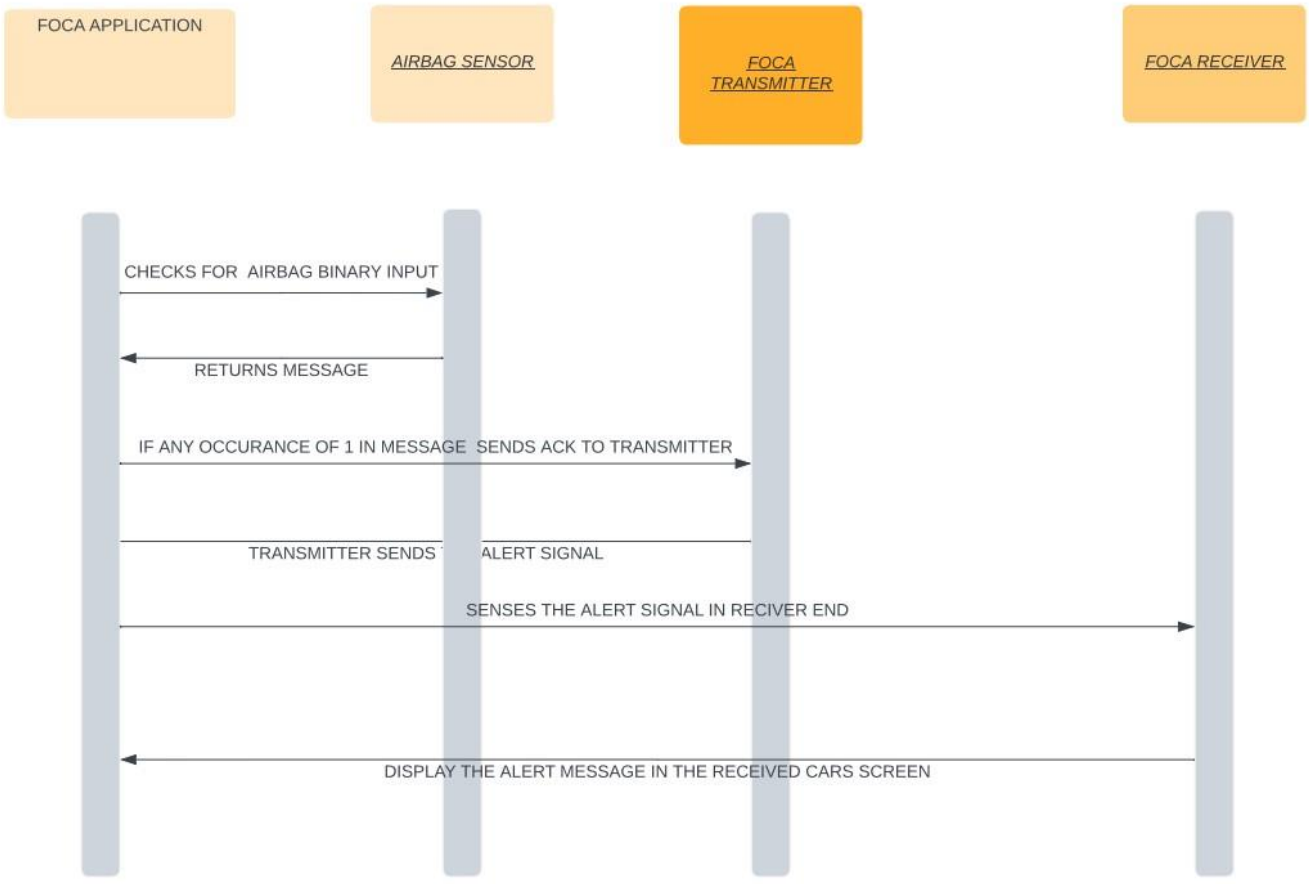
FIG 5.1: The below diagram shows the relation of Use Case diagram in this project



5.2 SEQUENCE DIAGRAM

- A sequence diagram is a type of interaction diagram because it describes how and in what order a group of objects works together. These diagrams are used by software developers and business professionals to understand requirements for a new system or to document an existing process.
- It shows the sequence of messages passed between objects and it can also show the control structures between objects.

FIG 5.2: The below diagram shows the relation of Sequence diagram in this project



CHAPTER 6

SYSTEM IMPLEMENTATION

6.1 SAMPLE CODE

MAINACTIVITY.JAVA

```
package com.example.madminipoject;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;

public class MainActivity extends AppCompatActivity {

    private Button button;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        button = (Button) findViewById(R.id.button);
        button.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                openActivity2();
            }
        });
    }

    public void openActivity2() {
        Intent intent = new Intent(this, Airbags.class);
        startActivity(intent);
    }
}
```

ACTIVITY_MAIN.XML

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#EDEDED"
    tools:context=".MainActivity">

    <Button
        android:id="@+id/button"
        style="@style/Widget.AppCompat.Button.Colored"
        android:layout_width="268dp"
        android:layout_height="83dp"
        android:layout_marginStart="50dp"
        android:layout_marginTop="22dp"
        android:layout_marginEnd="50dp"
        android:layout_marginBottom="180dp"
        android:background="#7E0909"
        android:fontFamily="sans-serif-condensed-medium"
        android:text="START"
        android:textColorHighlight="@color/teal_700"
        android:textColorLink="#FFC107"
        app:iconPadding="10dp"
        app:iconTint="#E91E63"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.488"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/imageView"
        app:strokeColor="#EC9B25" />

    <TextView
        android:id="@+id/textView4"
        android:layout_width="200dp"
        android:layout_height="59dp"
        android:layout_marginStart="70dp"
```

```
        android:layout_marginTop="40dp"
        android:layout_marginEnd="70dp"
        android:background="#329598"
        android:text="FOCA "
        android:textAlignment="center"
        android:textAppearance="@style/TextAppearance.AppCompat.Display2"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <ImageView
        android:id="@+id/imageView"
        android:layout_width="353dp"
        android:layout_height="203dp"
        android:layout_marginTop="100dp"
        android:layout_marginBottom="14dp"
        app:layout_constraintBottom_toTopOf="@+id/button"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView4"
        app:layout_constraintVertical_bias="0.026"
        app:srcCompat="@drawable/colli" />


</androidx.constraintlayout.widget.ConstraintLayout>
```

AIRBAGS.JAVA

```
package com.example.madminipoject;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;

public class Airbags extends AppCompatActivity {

    private Button button2;
    private Button button3;
```

```
private Button button4;
private Button button5;
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_routes);

    button2 = (Button) findViewById(R.id.button2);
    button2.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            openActivity2();
        }
    });
    button3 = (Button) findViewById(R.id.button3);
    button3.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            openActivity3();
        }
    });
    button4 = (Button) findViewById(R.id.button4);
    button4.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            openActivity4();
        }
    });
    button5= (Button) findViewById(R.id.button5);
    button5.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            openActivity5();
        }
    });
}

public void openActivity2() {
    Intent intent = new Intent(this, twoAirbags.class);
    startActivity(intent);
}
```

```
    public void openActivity3() {
        Intent intent = new Intent(this, fourAirbags.class);
        startActivity(intent);
    }

    public void openActivity4() {
        Intent intent = new Intent(this, sixAirbags.class);
        startActivity(intent);
    }

    public void openActivity5() {
        Intent intent = new Intent(this, eightAirbags.class);
        startActivity(intent);
    }
}
```

ACTIVITY_AIRBAGS.XML

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".Routes">

    <Button
        android:id="@+id/button2"
        android:layout_width="350dp"
        android:layout_height="70dp"
        android:layout_marginStart="50dp"
        android:layout_marginTop="250dp"
        android:layout_marginEnd="50dp"
        android:layout_marginBottom="30dp"
        android:text=" Two Airbags"
        android:textAppearance="@style/TextAppearance.AppCompat.Display1"
        app:layout_constraintBottom_toTopOf="@+id/button3"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.512"
        app:layout_constraintStart_toStartOf="parent"
```

```
    app:layout_constraintTop_toTopOf="parent" />

<Button
    android:id="@+id/button3"
    android:layout_width="350dp"
    android:layout_height="70dp"
    android:layout_marginStart="50dp"
    android:layout_marginTop="30dp"
    android:layout_marginEnd="50dp"
    android:layout_marginBottom="30dp"
    android:text="Four Airbags"
    android:textAppearance="@style/TextAppearance.AppCompat.Display1"
    app:layout_constraintBottom_toTopOf="@+id/button4"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.512"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/button2" />

<Button
    android:id="@+id/button4"
    android:layout_width="350dp"
    android:layout_height="70dp"
    android:layout_marginStart="50dp"
    android:layout_marginTop="30dp"
    android:layout_marginEnd="50dp"
    android:layout_marginBottom="30dp"
    android:text="Six Airbags"
    android:textAppearance="@style/TextAppearance.AppCompat.Display1"
    app:layout_constraintBottom_toTopOf="@+id/button5"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.512"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/button3" />

<Button
    android:id="@+id/button5"
    android:layout_width="350dp"
    android:layout_height="70dp"
    android:layout_marginStart="50dp"
    android:layout_marginTop="30dp"
    android:layout_marginEnd="50dp"
    android:layout_marginBottom="250dp"
```

```
        android:text="Eight Airbags"
        android:textAppearance="@style/TextAppearance.AppCompat.Display1"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.512"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/button4" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

TWOAIRBAGS.JAVA

```
package com.example.madminipoject;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;
import android.widget.Toast;
import android.widget.ToggleButton;

import org.w3c.dom.Text;

public class twoAirbags extends AppCompatActivity {
    EditText number1;
    Button Add_button;
    TextView result;
    int ans=0;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_twoAirbags);

        // by ID we can use each component which id is assign in xml file
        number1=(EditText) findViewById(R.id.editText_first_no);
        Add_button=(Button) findViewById(R.id.add_button);
```

```
        // Add_button add clicklistener
        Add_button.setOnClickListener(new View.OnClickListener() {

            public void onClick(View v) {

                // num1 or num2 double type
                // get data which is in edittext, convert it to string
                // using parse Double convert it to Double type
                double num1 = Double.parseDouble(number1.getText().toString());
                // add both number and store it to sum
                if(num1 == 00){
                    Toast.makeText(getApplicationContext(),"Ride peacefully , No accident
ahead",Toast.LENGTH_SHORT).show();
                }else{
                    openActivityTwo();
                }
            }
        });
    }
    public void openActivityTwo() {
        Intent intent = new Intent(this, Alert.class);
        startActivity(intent);
    }
}
```

ACTIVITY_TWOAIRBAGS.XML

```
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">
    tools:layout_editor_absoluteY="81dp">


    <EditText
        android:id="@+id/editText_first_no"
        android:layout_width="150dp"
        android:layout_height="40dp"
```

```
    android:layout_marginStart="130dp"
    android:layout_marginTop="20dp"
    android:layout_marginEnd="131dp"
    android:layout_marginBottom="20dp"
    android:inputType="number"
    app:layout_constraintBottom_toTopOf="@+id/add_button"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView_first_no" />

<TextView
    android:id="@+id/textView_first_no"
    android:layout_width="353dp"
    android:layout_height="130dp"
    android:layout_marginStart="29dp"
    android:layout_marginTop="130dp"
    android:layout_marginEnd="29dp"
    android:layout_marginBottom="20dp"
    android:text="Enter Two digit binary number:"
    android:textAlignment="center"
    android:textSize="30dp"
    app:layout_constraintBottom_toTopOf="@+id/editText_first_no"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    tools:textStyle="bold" />

<Button
    android:id="@+id/add_button"
    android:layout_width="150dp"
    android:layout_height="75dp"
    android:layout_marginStart="130dp"
    android:layout_marginTop="20dp"
    android:layout_marginEnd="131dp"
    android:layout_marginBottom="306dp"
    android:text="PROCCED"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/editText_first_no" />
```

```
</androidx.constraintlayout.widget.ConstraintLayout>
```

ALERT.JAVA

```
package com.example.madminipoject;

import androidx.appcompat.app.AppCompatActivity;


import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;

import java.text.DateFormat;
import java.text.SimpleDateFormat;
import java.util.Calendar;
import java.util.Date;


public class alert extends AppCompatActivity {


    private Button button;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_bill);
        button = (Button) findViewById(R.id.button6);
        button.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                openActivity2();
            }
        });

    }
    public void openActivity2() {
        Intent intent = new Intent(this, Finalalert.class);
        startActivity(intent);
```

```
    }
}
```

ACTIVITY_ALERT.XML

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".Bill">


    <TextView
        android:id="@+id/textView21"
        android:layout_width="168dp"
        android:layout_height="55dp"
        android:layout_marginStart="50dp"
        android:layout_marginTop="20dp"
        android:layout_marginEnd="50dp"
        android:layout_marginBottom="15dp"
        android:text="FOCA"
        android:textAlignment="center"
        android:textAppearance="@style/TextAppearance.AppCompat.Display2"
        app:layout_constraintBottom_toTopOf="@+id/imageView2"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.496"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/textView8"
        android:layout_width="360dp"
        android:layout_height="61dp"
        android:layout_marginStart="58dp"
        android:layout_marginTop="10dp"
        android:layout_marginEnd="59dp"
        android:layout_marginBottom="10dp"
        android:text="Collided vehicle ahead please slow down !!"
```

```
    android:textAlignment="center"
    android:textAppearance="@style/TextAppearance.AppCompat.Large"
    app:layout_constraintBottom_toTopOf="@+id/textView9"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/imageView2" />

<TextView
    android:id="@+id/textView9"
    android:layout_width="347dp"
    android:layout_height="67dp"
    android:layout_marginStart="58dp"
    android:layout_marginTop="10dp"
    android:layout_marginEnd="59dp"
    android:layout_marginBottom="15dp"
    android:text="Speed Limit less than 20kmph"
    android:textAlignment="center"
    android:textAppearance="@style/TextAppearance.AppCompat.Large"
    app:layout_constraintBottom_toTopOf="@+id/button6"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.49"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView8" />

<ImageView
    android:id="@+id/imageView2"
    android:layout_width="370dp"
    android:layout_height="177dp"
    android:layout_marginStart="26dp"
    android:layout_marginTop="15dp"
    android:layout_marginEnd="26dp"
    android:layout_marginBottom="10dp"
    app:layout_constraintBottom_toTopOf="@+id/textView8"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView21"
    app:srcCompat="@drawable/colli" />

<Button
    android:id="@+id/button6"
    android:layout_width="200dp"
    android:layout_height="wrap_content"
```

```
        android:layout_marginStart="160dp"
        android:layout_marginTop="5dp"
        android:layout_marginEnd="157dp"
        android:text="Stop Alert"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView9" />


</androidx.constraintlayout.widget.ConstraintLayout>
```

FINALALERT.JAVA

```
package com.example.madminipoject;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.widget.TextView;

import java.text.DateFormat;
import java.util.Calendar;
import java.text.SimpleDateFormat;
import java.util.Date;

public class finalAlert extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_finalAlert);

    }
}
```

ACTIVITY_FINALALERT.XML

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
```

```
xmlns:app="http://schemas.android.com/apk/res-auto"
xmlns:tools="http://schemas.android.com/tools"
android:layout_width="match_parent"
android:layout_height="match_parent"
android:background="@android:color/holo_blue_bright"
tools:context=".MainActivity">

<TextView
    android:id="@+id/textView3"
    android:layout_width="0dp"
    android:layout_height="60dp"
    android:layout_marginStart="59dp"
    android:layout_marginTop="64dp"
    android:layout_marginEnd="56dp"
    android:layout_marginBottom="40dp"
    android:background="#E0E8E6"
    android:contentDescription="@string/bottom_sheet_behavior"
    android:text="FOCA "
    android:textAlignment="center"
    android:textAppearance="@style/TextAppearance.AppCompat.Display2"
    android:textColor="@color/design_default_color_primary_variant"
    android:textColorHighlight="@color/design_default_color_error"
    app:layout_constraintBottom_toTopOf="@+id/textView"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.0"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />


<TextView
    android:id="@+id/textView"
    android:layout_width="340dp"
    android:layout_height="52dp"
    android:layout_marginStart="24dp"
    android:layout_marginTop="40dp"
    android:layout_marginEnd="24dp"
    android:layout_marginBottom="20dp"
    android:background="#FBFAF9"
    android:text=" FINAL REMAINDER!!"
    android:textAlignment="center"
    android:textAllCaps="true"
    android:textAppearance="@style/TextAppearance.AppCompat.Display1"
```

```
        android:textColor="#D84315"
        app:layout_constraintBottom_toTopOf="@+id/textView101"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.478"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView3" />

    <TextView
        android:id="@+id/textView101"
        android:layout_width="340dp"
        android:layout_height="85dp"
        android:layout_marginStart="24dp"
        android:layout_marginTop="20dp"
        android:layout_marginEnd="24dp"
        android:background="#FBFAF9"
        android:text=" Drive Slow Collision Ahead."
        android:textAlignment="center"
        android:textAllCaps="true"
        android:textAppearance="@style/TextAppearance.AppCompat.Display1"
        android:textColor="#D84315"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.478"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView" />

    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="138dp"
        android:layout_marginTop="49dp"
        android:layout_marginEnd="139dp"
        android:text="CLOSE"
        android:textAppearance="@style/TextAppearance.AppCompat.Display1"
        android:textColorHighlight="@color/design_default_color_error"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView101" />

</androidx.constraintlayout.widget.ConstraintLayout>
```

CHAPTER 7

TESTING

7.1 TESTING AGAINST CUSTOM INPUTS

Fig 7.1

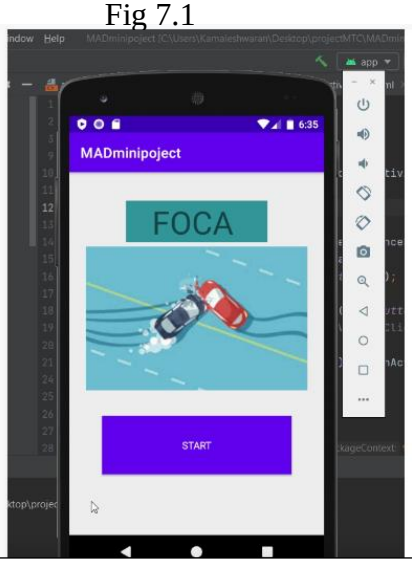


Fig 7.2

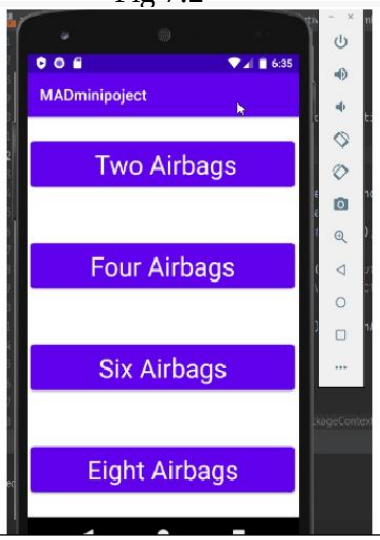
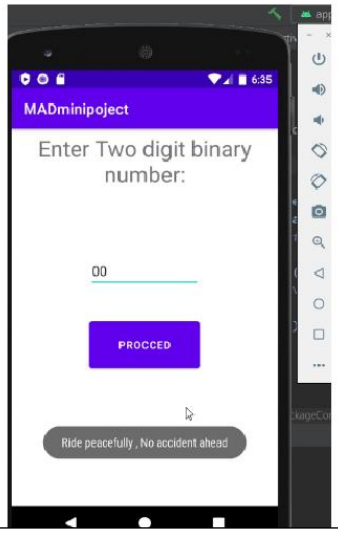


Fig 7.3



- Customs inputs are given as a test case.
- No of airbags is chosen
- Binary value input is given if it contains all ‘0’s then the result page of that is fig 7.3.
- If binary input has a ‘1’ in it then then the result page will be directed to a new page as fig 7.4 and 7.5
- And finally, the close button “stop alert” will redirect to a new page which is depicted in

Fig 7.4

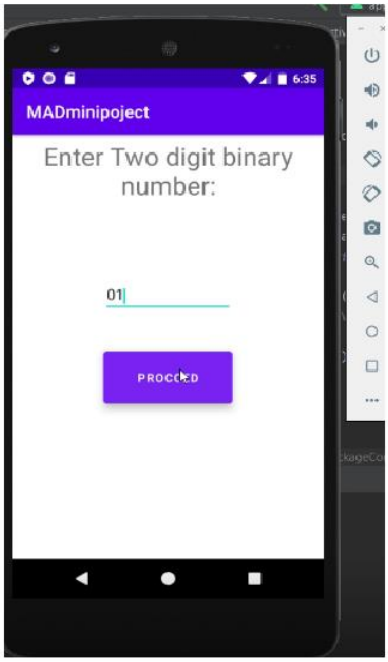


Fig 7.5

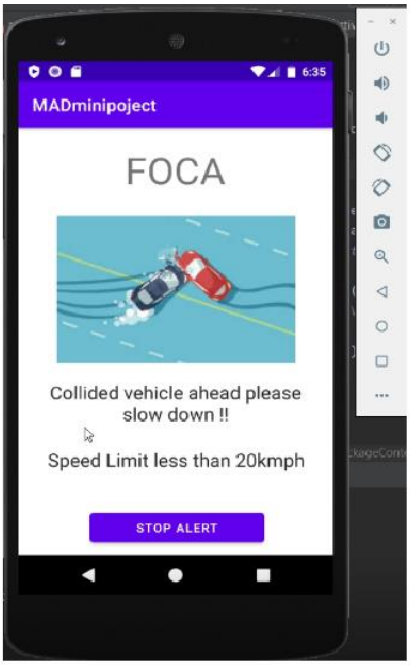
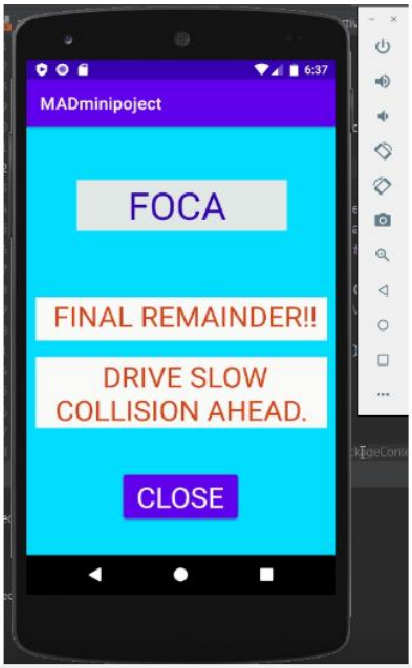


Fig 7.6



CHAPTER 8

RESULTS AND IMPLEMENTATION

8.1 RESULT AND DISCUSSION

FIG 8.1:

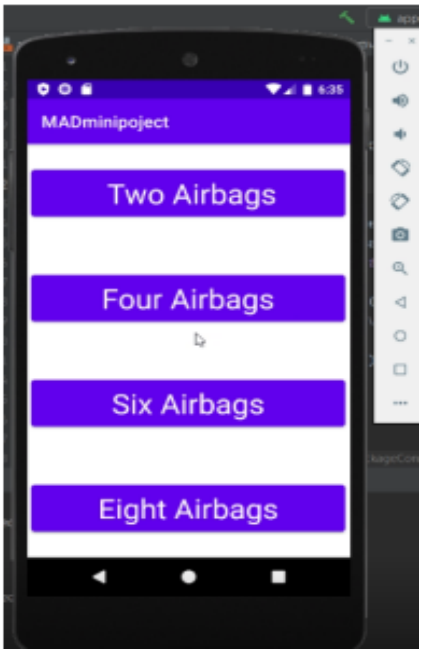


FIG 8.2:

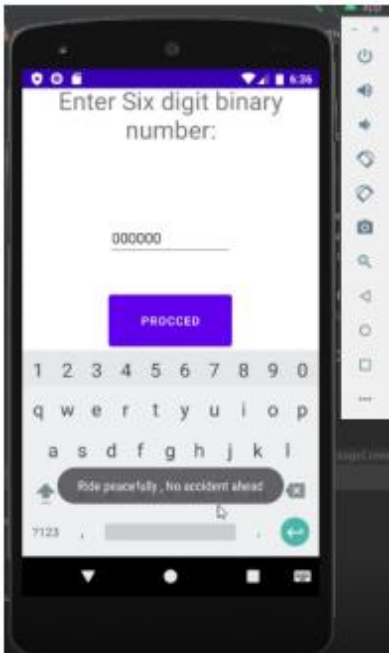


FIG 8.3:

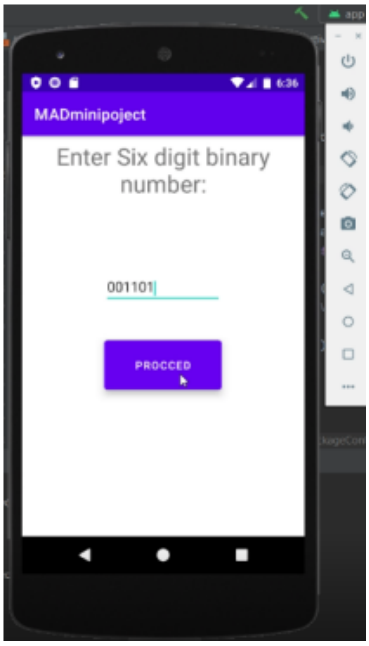


FIG 8.4:

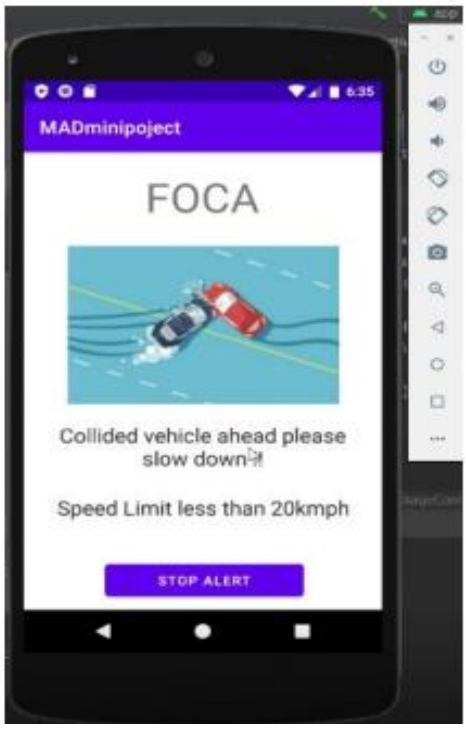


FIG 8.5:

FIG 8.(1,2,3,4,5) RESULTS Sample shots of the app working under different input types

Each image represents the full prototype working of the application that when on its full functionality would work with the hardware in real time. The first image mimics an airbag sensor input where each no. of airbags would be represented as 0 or 1 where 1 means deployed and 0 means it's not deployed. If any of those binary inputs are found to be one as in real time this would be a crash transmission would happen and the driver of another car would get notified twice else he/she wouldn't but the case of not getting notified cannot be shown hence in case of 0 as all inputs we mimic this by displaying a text notifying no accidents ahead drive peacefully

CHAPTER 9
CONCLUSION

This system is a work in progress and it requires further development to be implemented in full scale, hence only a prototype of the proposed idea is presented here and further research and accurate tuning will make it implementable on large scale customer base.

9.1 CURRENT LIMITATIONS TO BE OVERCOME FOR FULL SCALE IMPLEMENTATION:

- Government allotment of a specific FM BAND for emergency services.
- All car manufacturers ECU binding permission with the app.
- Airbag sensors information provision.
- All cars with FM antenna must be made mandatory

CHAPTER 10
REFERENCES

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