AUTOMOTIVE BUILD PROGRAM

Quick measures post-accident

L&T Technology Services

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Date of Approval:

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ABOUT ME

My name is Priyanshu Mishra, Associate Engineer in L&T Technology Services. Working here since November, 2021.

I have completed my B.Tech from MMMUT(Madan Mohan Malaviya University Of Technology, Gorakhpur) with specialization in Electronics and Communication Engineering with CGPA OF 7.15 in year 2021. I have completed my High School and 10+2 from Jeevandeep Public School, Varanasi. I am from Varanasi (Uttar Pradesh). I am under Transportation Business Unit in L&T Technology Services.

INTRODUCTION

Project is based on sending information to places where aid id possible post-accident. Life is most important thing on this earth and after accident every second’s matter so to give quick response this project is been made.

In this project when any automotive system meets an accident, an alarm system will flag which leads to a functionality of calling system to ambulance and pre-saved some contacts.

There are many Force Sensing Resistors(FSR) placed at different places. When any accident happens, these resistors will experience force and an alarm system will flag.

If the driver is okay then he/she can turn off the alarm. if in 15 seconds no action is taken then ESU will assume people inside vehicle is not well and it will automatically make a call and sends the GPS location with an emergency flag message to ambulance and pre-saved contacts(FAMILY).

OBJECTIVES

1. To save the life of people as much as possible.

2. To send the precise data accurately to pre-saved contacts.

3. Save time post-accident because every second’s matter in accidents.

4. Sudden action taking.

REQUIREMENTS

EQUIPMENTS REQUIRED

1. Force Sensing Resistors(FSR)
2. Emergency sirens
3. Blue lights
4. ECU’s (3)
5. Clock Timer
6. GPS Locater
7. Microcontroller
8. Storage

HIGH LEVEL REQUIREMENT

S. No.	Id	Description	Status
1.	HLR_1	All the subsystem must work both when system is on/off.	
2.	HLR_2	Switch input will decide at what point process should stop, either ignition is on/off.	
3.	HLR_3	FSR should work either system is ON/OFF.	
4.	HLR_4	Signal must sent to microprocessor.	
5.	HLR_5	Message with emergency flag is sent to pre saved contacts.	
6.	HLR_6	Call is sent to ambulance.	
7.	HLR_7	If user does not gives any input upto this point, emergency aid is required.	
8	HLR_8	Battery must work in both states either ON/OFF.	
9.	HLR_9	Pre-saved contacts must be in working condition.	
10.	HLR_10	Location must be accurate.	
11.	HLR_11	Data must be correct.	

LOW LEVEL REQUIREMENT

S. No.	Id	Description	Status
1.	**LLR_1**	System must work when ignition is 1/0.	
2.	**LLR_2**	Any other values other than 0 and 1 will show the error.	
3.	**LLR_3**	All the subsystem will turn off when switch turn off to 0 for emergency flag,	
4.	**LLR_4**	System will send 1if FSR sends and force data.	
5.	**LLR_5**	ECU will receive 1 as input when siren rings for 15 seconds.	
6.	**LLR_6**	ECU will send ‘1’ for sending flag emergency signal.	
7.	**LLR_7**	0 will be sent to all subsystems when turn off button is pressed	
8	**LLR_8**	Battery must work in both states either ON/OFF.	
9.	**LLR_9**	10 seconds for initial relaxation time.	
10.	**LLR_10**	After 10 seconds initialisation process should start.	
11.	**LLR_11**	1 signal will go for indication light.	

ANALYSIS

1.4W1H

WHERE?

Any accident meet’s, where people are inside vehicle needs urgent aid vis anything possible. It can be on road or off-road.

WHEN?

When sensors experience a hard force and system assumes an accident is met and this system will be activated. It will follow a proper process which includes many things as

told in introduction.

WHAT?

Passenger of the vehicle had to press an alarm system if he/she is not conscious & if not it will automatically work.

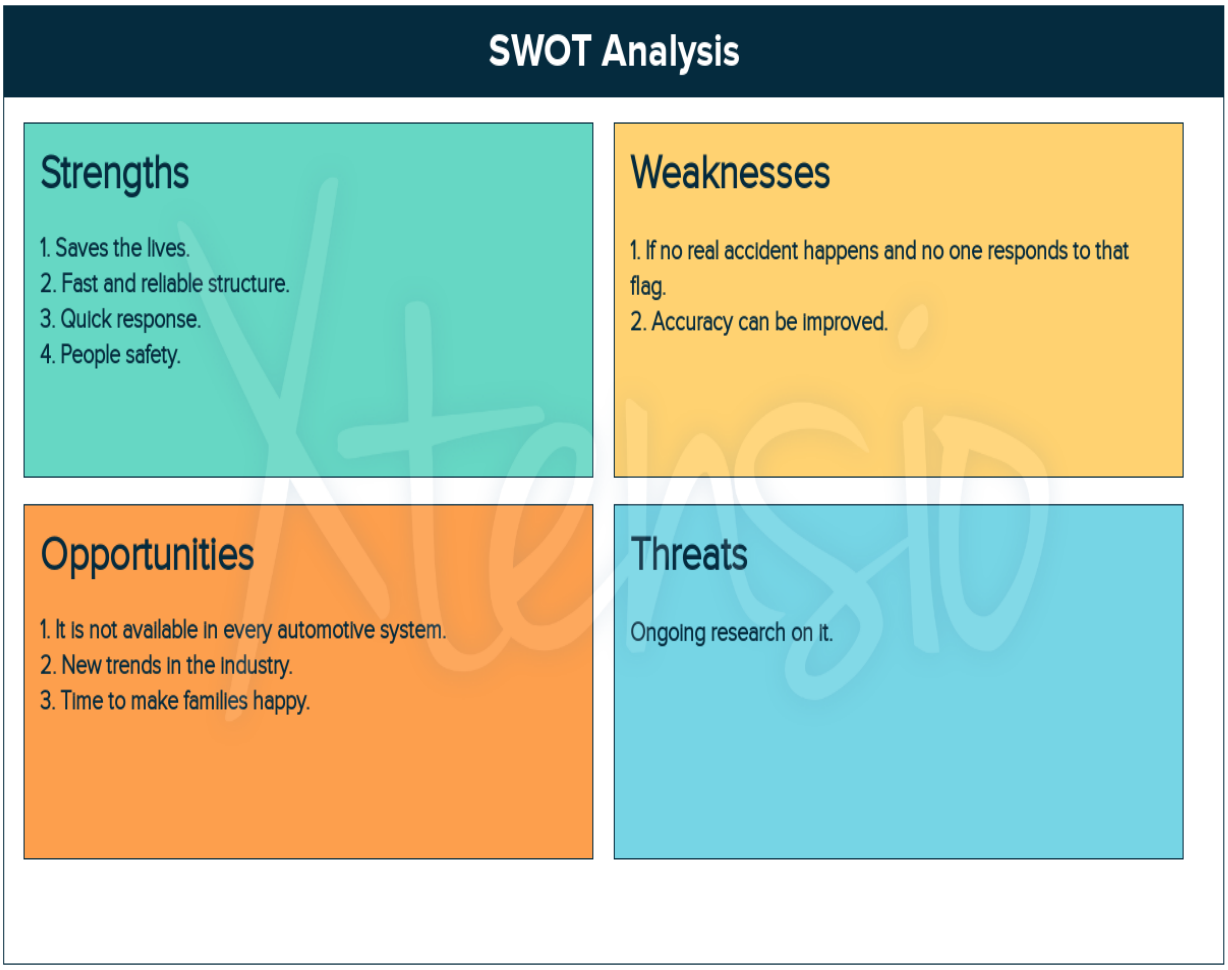
WHO?

A network based microprocessor which will be connected to network and acts a cell phone only for emergency calling system.

HOW?

Various automatic ECU’s will function together.

2. SWOT



SWOT Analysis

Strengths

1. Saves the lives.
2. Fast and reliable structure.
3. Quick response.
4. People safety.

Weaknesses

1. If no real accident happens and no one responds to that flag.
2. Accuracy can be improved.

Opportunities

1. It is not available in every automotive system.
2. New trends in the industry.
3. Time to make families happy.

Threats

Ongoing research on it.

1.MARKET ANALYSIS

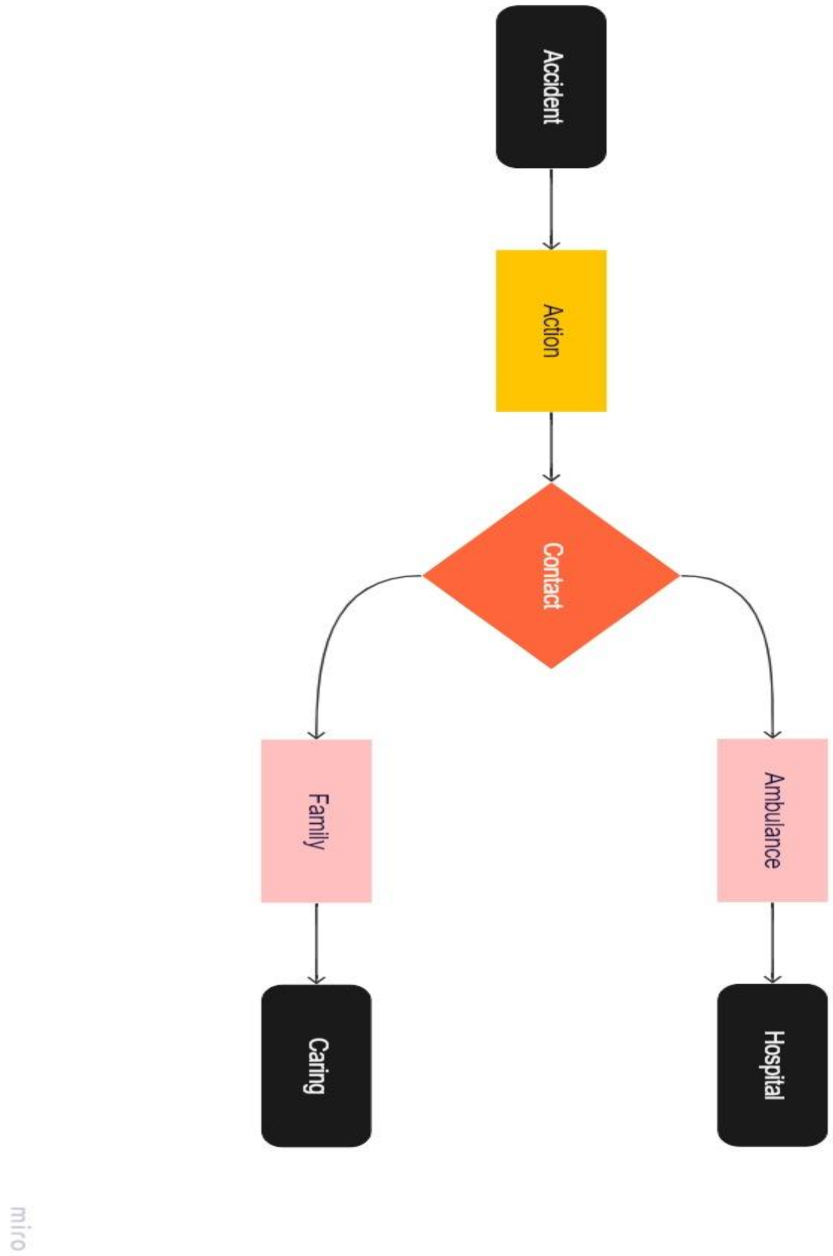
It has been estimated that from the approximate number of 42,000 crash deaths that occur in the U.S. each year, nearly 20,000 dies before receiving hospital treatment, and that many of the remaining 22,000 dies after reaching a hospital too late to be saved. So, this system is very required to give aid and save lives of people. Many people cannot get any aid when they meet accidents and lose their life.

There are 5 type of automobile accidents:

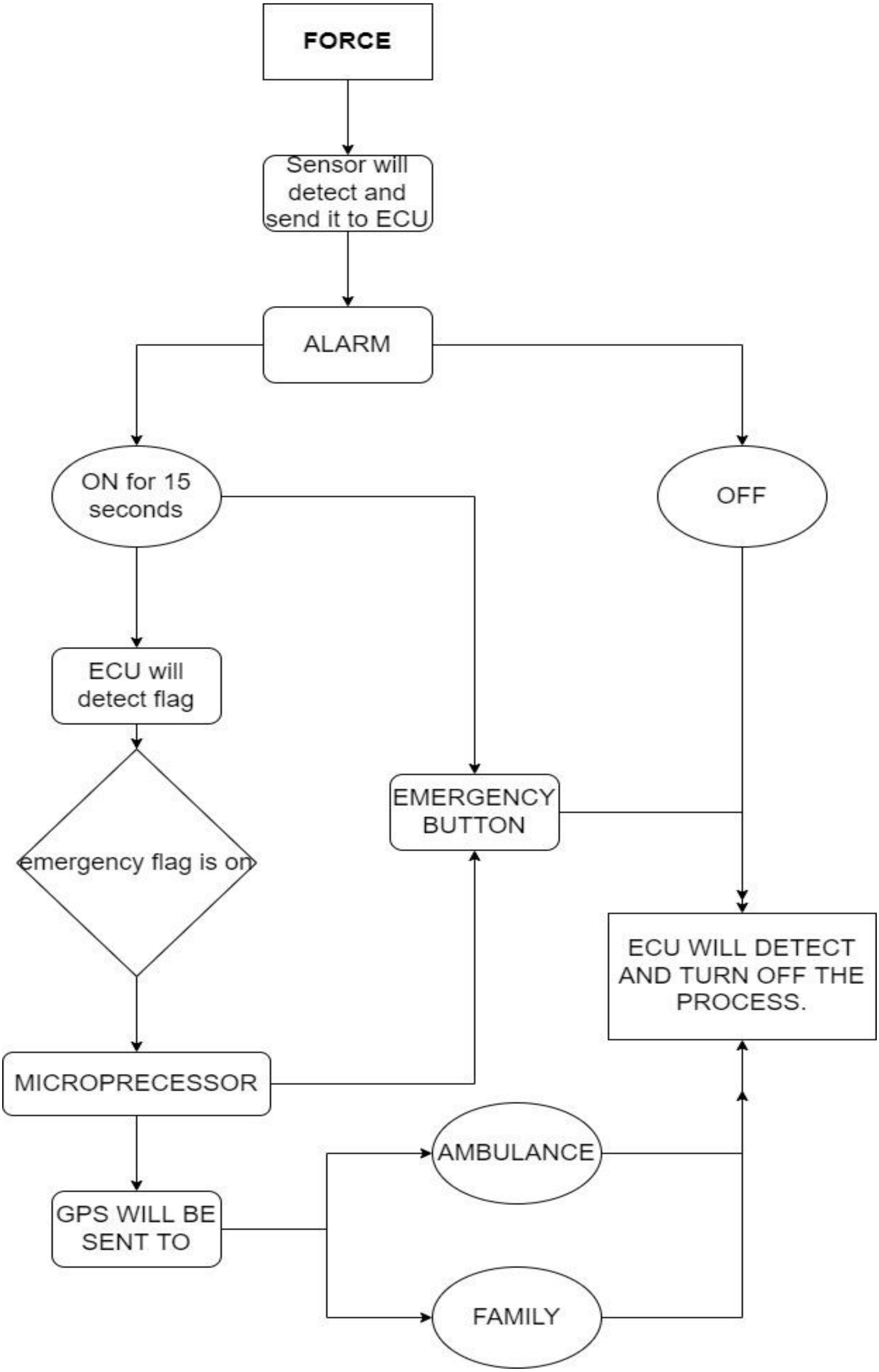
1. Rear end collision.
2. Single vehicle crashes.
3. T-bone accidents.
4. Clipping other cars.
5. Low speed accidents.

DIAGRAMS

1. FLOWCHART



2. UML DIAGRAMS


FORCE
Sensor will detect and send it to ECU
ALARM
ON for 15 seconds
OFF
ECU will detect flag
emergency flag is on
EMERGENCY BUTTON
ECU WILL DETECT AND TURN OFF THE PROCESS.
MICROPRECESSOR
AMBULANCE
GPS WILL BE SENT TO
FAMILY

IMPLEMENTATION

CAN (Controller Area Network) protocol is used here to communicate between ECU's. Here CAN protocol is used because of its many features:

- Low Cost. When the CAN protocol was first created, its primary goal was to enable faster communication between electronic devices.
- Built-in Error Detection.
- Robustness.
- Speed.
- Flexibility.

Here we are using 3 ECU to implement this full feature in the system.

Now we will talk about the functioning of each ECU in details.

ECU – 1:

It takes input from the Force Resisting Sensors digitally to check weather it should proceed further to ring the siren and raise a flag or not. A fixed value for force will be pre-saved to know that condition is serious or not. But at a fixed certain level of force it will surely raise an emergency flag either passenger is okay or not. Then it is onto the user how he/she responds. It is second prioritize in all the ECU applied here. 8 bytes of data will be sent on the CAN bus to communicate with others.

ECU – 2:

It takes input as siren timing as it is already pre saved for 15 seconds. If someone does not stops the siren for 15 second then the ECU will send a signal to microprocessor to send an emergency flag for contact to various places. It will be connected via network and will send the GPS location and message to ambulance and family/relative/friend pre-saved contacts. It will contain a memory in which the data entry will be already saved.

ECU – 3:

This is the one of the most important part of this feature. It is used to come out of the system at any time. It is possible that accident happens and process starts but passengers are safe. 3 cases will happen:

CASE - 1: ECU will send notification to siren.

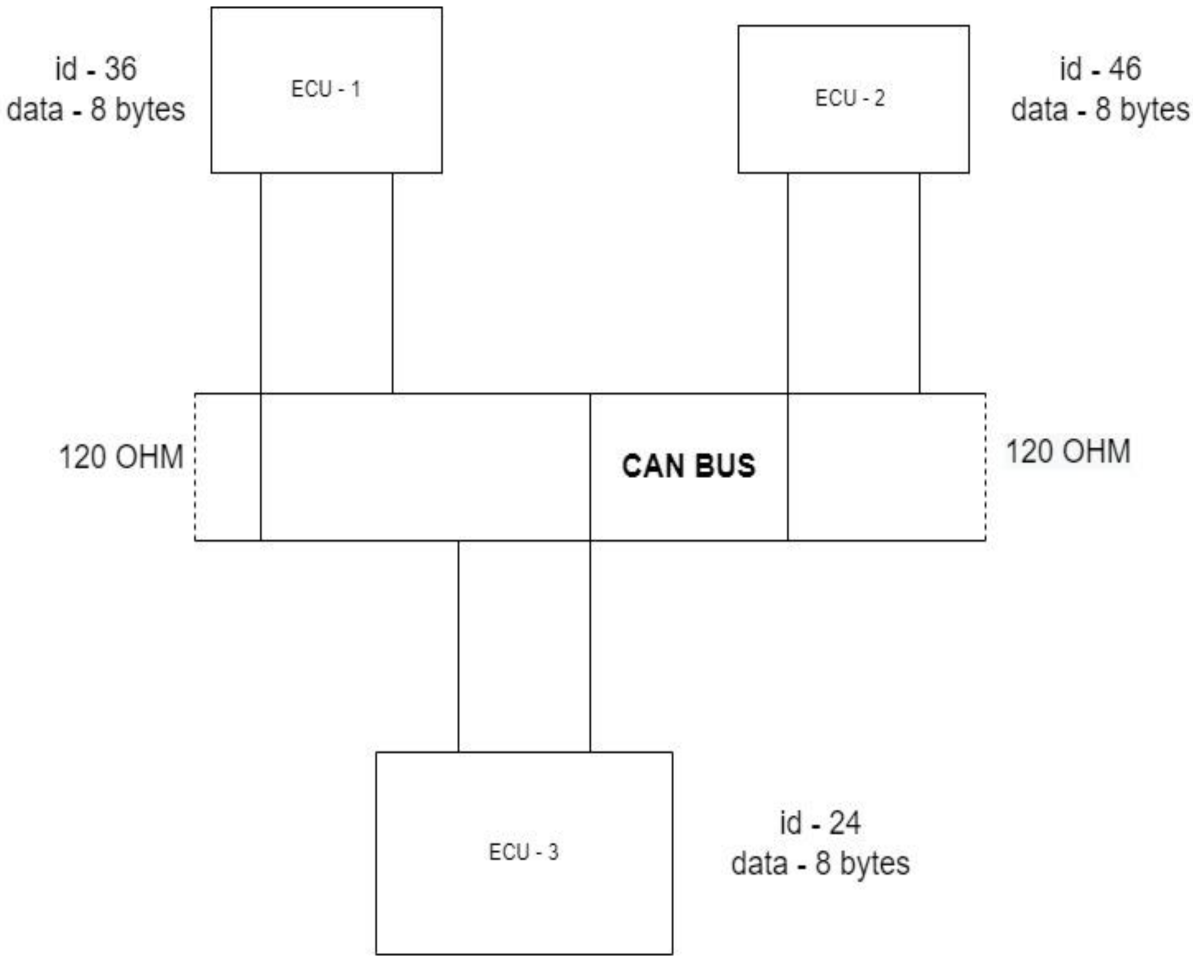
CASE - 2: Siren will flagged for 15 seconds.

CASE - 3: Message will call will sent.

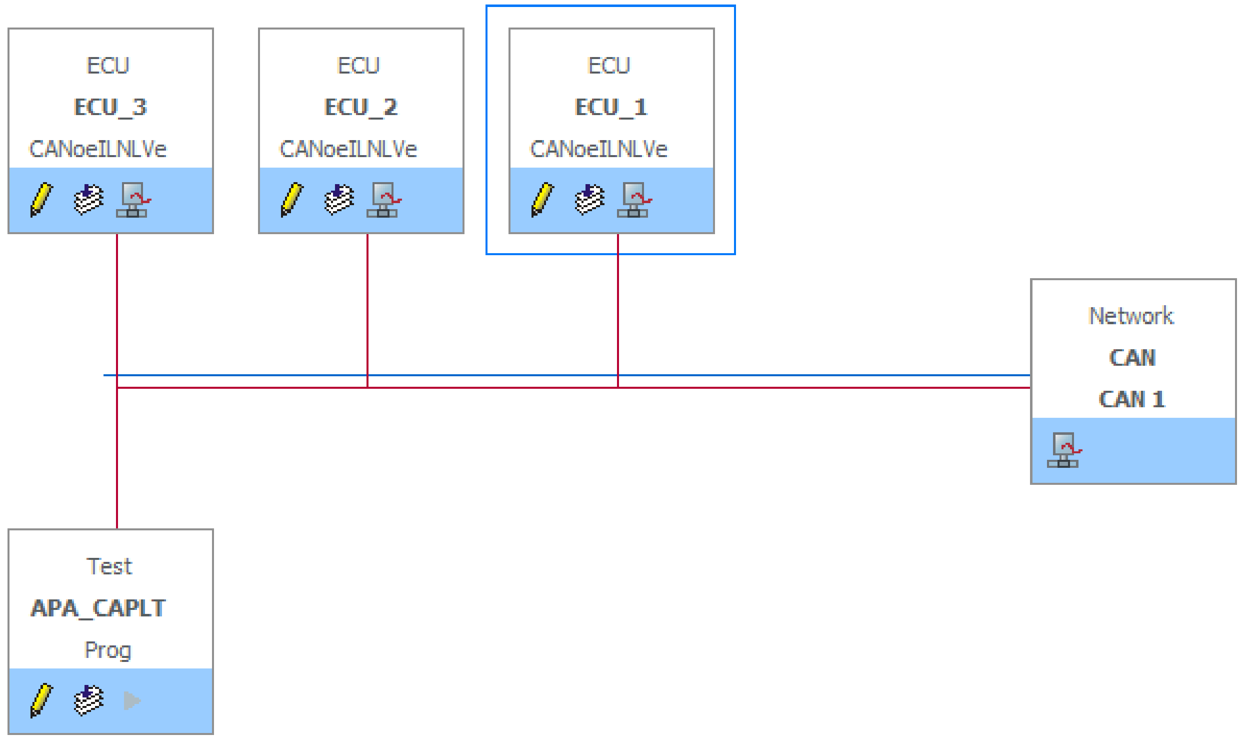
It is not a suitable situation of all people. So this ECU is implemented in which at any point of time we can address the ECU that the passengers are okay and it will terminate the further process at any point of time.

It’s id value is low so that in case of multiple message is sent then priority will be given to the 3rd ECU. Because it is more important to terminate the process when it is applied.

CAN BUS WITH NODES



ECU CONFIGURATION



Here we use CANoe tool to make this configuration. We also made the data base file here in DB++.

Many messages and the signals under message is been taken here.

Number of messages is been take = 7

Number of signals is been taken here = 7

All these messages is been assigned to the ECU to send signals and process the input/output.

Now we will see the individual functionality of all the ECU’S.

Then in CAPL script we write the code for ECU1, ECU2, ECU3 according to their functionality.

Code for ECU1

```
includes
{

}

variables
{
  timer timer1, timer2;
  message Force_Inp data1;
}

on start
{
  write("Simulation Started");
}

on stopMeasurement
{
  write("Simulation Stop");
}

on sysvar Ignition::KL_15
{
  if (@Ignition::KL_15 ==1)
  {
    write("Ignition is on");
    setTimer(timer1,2);
  }
  else
  {
   write("Ignition is off");
    cancelTimer(timer1);
     cancelTimer(timer2);
  }
}

on timer timer1
{
  $Force_Data = 0;
  output(data1);
  write("Accident did not happened, you are safe");
  setTimer(timer2,1);
}

on timer timer2
{
  $Force_Data = 1;
  output(data1);
  write("Accident happened, you are not safe");
  setTimer(timer1,1);
}
on key 'i'
{
  if(@Ignition::KL_15==0)
  {
    @Ignition::KL_15 =1;
    write("Ignition is ON");
  }
  else
  {
     @Ignition::KL_15 =0;
    write("Ignition is OFF");
  }
}
```

Code for ECU2

```
includes
{

}

variables
{

  message Alert_System data2;
}

on message Force_Inp
{
  if ($Force_Data == 1)
  {
    $Siren_Data = 1;
    write("HELP");
    output(data2);

  }
  else
  {
    write("You are safe");
  }
}
```

Coder for ECU3

```
includes
{

}

variables
{
 timer timer3;
}

on message Alert_System
{
  if ($Siren_Data == 1)
  {
    setTimer(timer3,2);
    write("Dear hospital please reach to this location, it is emergency");
    write("Calling Ambulance");
    write("Call is going to your father");
  }
  else
  {
    write("You are safe");
  }

}


    on timer timer3
    {
      $Contact_Call = 1;
      $Ambulance_Call = 1;
```

TEST CASE

```
includes
{

}

variables
{
  int temp1,temp2;
}

void MainTest()//Entry point for the test Module code
{
  testModuleTitle("Post Accident Aid Report");
testModuleDescription("This is a system in which if any accident
happens then after accident post aid will be given instantly,
sometimes passenger is not in councious mode so it will be a
automatic process");
testReportAddEngineerInfo("Name - Priyanshu Mishra ",
"Organization = LTTS");
    testReportAddEngineerInfo("Employee ID","40020833");
  testReportAddEngineerInfo("Reports to","Thrilochan Sharma");

  testModuleDescription("     1.The Test Features of CANoe");
  testModuleDescription("     2.The implementation of Testcases");
  testModuleDescription("     3.Analysis of Testcase Verdicts");


  //Calling of test cases
  testcase1();
  testcase2();
}

//Verification of Ignition
testcase testcase1()
```

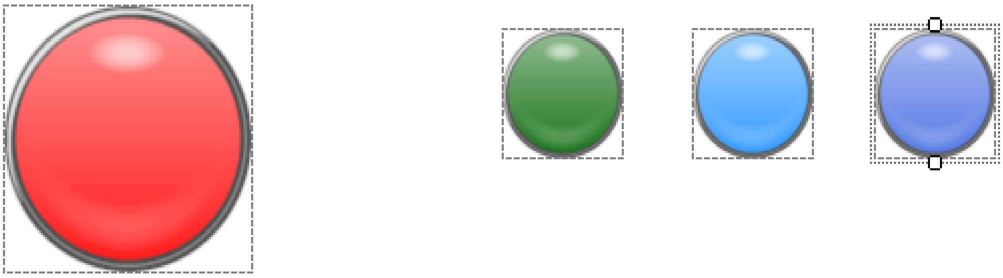
```
{
 //Ignition is 1 when a msg is recieved
 temp1=testWaitForMessage(Force_Inp, 10000);
 if(temp1==1)
 {
  if(@Ignition::KL_15==1)
  {
    //Correct execution scenario
   write("Ignition on message is recieved");
   testStepPass("Message is received when ignition is on");
  }
  else
  {
   //Error scenario
   testStepPass("Message is received but ignition is on");
  }

 }
 else
 {
  write("Message has not recieved");
  //warning scenario
  testStepWarning("Message is not been recieved");
 }

}

testcase testcase2()
{
 //Ignition is 1 when a msg is recieved
 temp2=testWaitForMessage(Alert_System, 10000);
 if(temp2==1)
 {
  if(@Ignition::KL_15==1)
  {
    //Correct execution scenario
   write("Ignition on message is recieved");
   testStepPass("Message is received when ignition is on");
  }
  else
  {
   //Error scenarsio
   testStepPass("Message is received but ignition is on");
  }

 }
 else
 {
  write("Message has not recieved");
  //warning scenario
  testStepWarning("Message is not been recieved");
 }

}

  }
```

Panel

We have created a panel with 2 component. One stich and one light indicator. Switch have only one input option with off flag to turn off the process at any time. There will a light indicator with 2 modes in which colour will be 2 which will show the 2 states:

–

COLOUR	MESSAGE
Red	Ignition
Green	Raise flag
Blue	Contact Call
Purple	Siren Ring



HIGH LEVEL TEST PLAN

S. No.	Description	Expected outcome	Actual Outcome
HLTP_1	All the subsystem must work both when system is on/off.		
HLTP_2	Is switch input deciding at what point process should stop, either ignition is on/off.		
HLTP_3	FSR is working either system is ON/OFF.		
HLTP_4	Signal must sent to microprocessor or not.		
HLTP_5	Message with emergency flag is sent to pre saved contacts.		
HLTP_6	Call is sent to ambulance.		
HLTP_7	If user does not gives any input upto this point, emergency aid is given or not.		
HLTP_8	Battery is working in both states either ON/OFF.		
HLTP_9	Pre-saved contacts is in working condition.		
HLTP_10	Locations are accurate.		
HLTP_11	Data is correct.		

LOW LEVEL TEST PLAN

S. No.	Description	Expected outcome	Actual Outcome
LLTP_1	System is working when ignition is 1/0.		
LLTP_2	Any other values other than 0 and 1 is showing the error.		
LLTP_3	All the subsystem is turning off when switch turn off to 0 for emergency flag,		
LLTP_4	System is sending 1if FSR sends and force data.		
LLTP_5	ECU is receiving 1 as input when siren rings for 15 seconds.		
LLTP_6	ECU is sending '1' for sending flag emergency signal.		
LLTP_7	0 is sent to all subsystems when turn off button is pressed		
LLTP_8	Battery is working in both states either ON/OFF		
LLTP_9	10 seconds for initial relaxation time is given.		
LLTP_10	After 10 seconds only initialisation process is starting.		
LLTP_11	1 signal is going for indication light.		

REFERENCES

1. Vector Documentation
2. Microsoft Stream
3. CANoe Tool 16
4. Draw.io