

TATA CRUCIBLE HACKATHON **2020**

ACCIDENT CARE SYSTEM **(ACS)**

Team Name : THE INTIMIDATORS

Members: Nipun Tyagi (TL)
Nikita Chauhan
Veral Agarwal
Mohd. Gulfam
Muskan Agarwal

PROBLEM STATEMENT

Development of innovative safety measures for two-wheelers.
Prevention of accident for 2 wheelers.

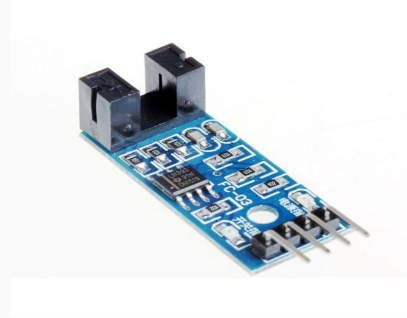
OUR SOLUTION

Our device names ACS (Accident Care System) is different from the existing product as the device has features like **vehicle to vehicle communication**, **rear clearance**, **speed regulation alert** and along with that it also performs **image processing** such as lane detection of the driver vehicle to prevent skidding of bike that is it detects the curvature of the road and displacement from the centre of the road, all these features are not present in the existing product in the market. The device is cheap and easily affordable for use. The device has service for both the user and for its family member which makes it versatile.

HARDWARE



GPS



Speed Sensor



Raspberry Pi 4



Raspberry Pi Cam

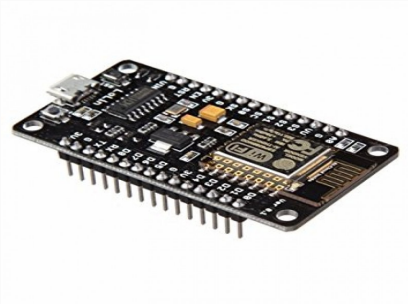


Ultra Sonic Sensor

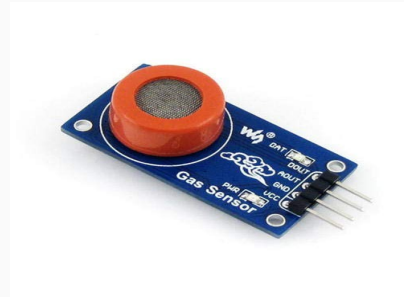


GSM Module

HARDWARE



Node MCU



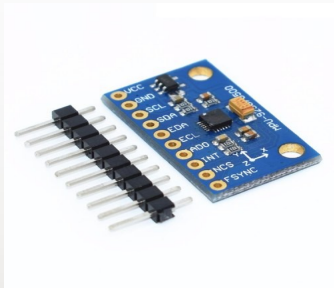
MQ-3 Sensor



ESP-32 CAM



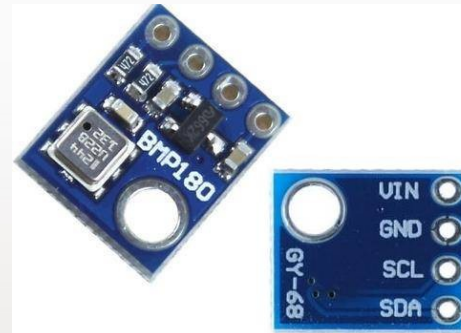
PIR Sensor



GY-521 Mpu6050
Accelerometer



Voltage Converter
(12 V to 5 V)

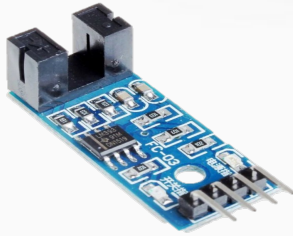


Pressure Sensor (BMP-
180)

BIKE DASHBOARD



HC-SR04 Ultra sonic Sensor:
This sensor is used for the rear object distance monitoring while driving the bike.



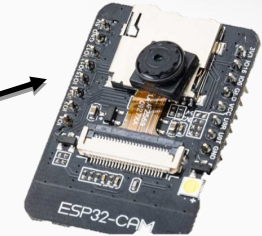
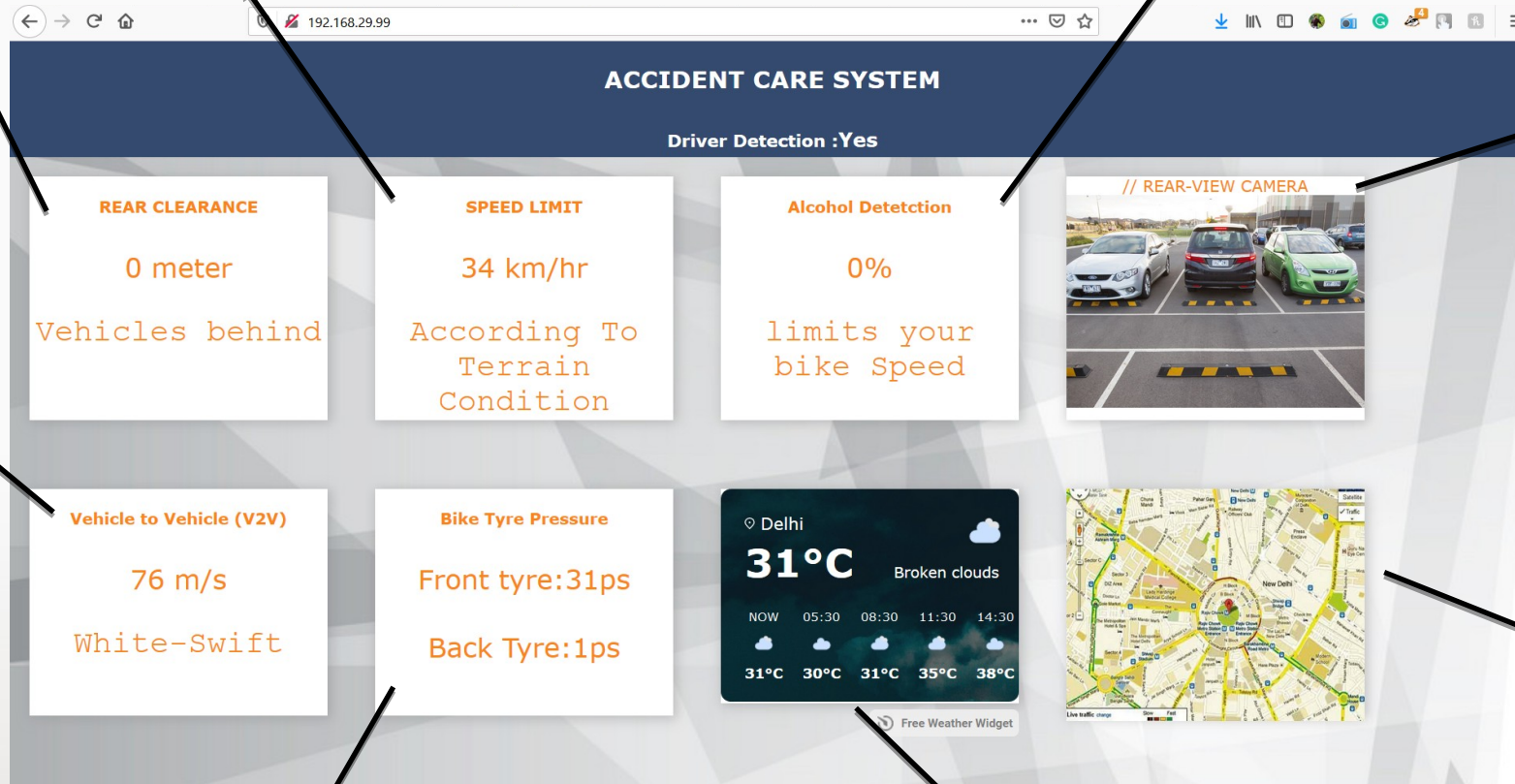
Speed Sensor used for detecting speed of the bike and also display the speed according to the Terrain condition.



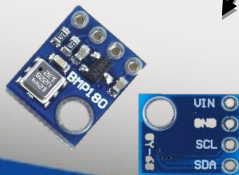
MQ-3 Alcohol Sensor: This sensor is detecting the alcohol level and displaying over here.



ESP NOW Protocol:
This protocol is used for vehicle to vehicle communication.



ESP32-CAM: This is used for providing rear view to the driver in real-time.



BMP-180 Pressure sensor: This sensor will be attached to the inner side of rim for pressure detection in tyre.

Weather widget: This widget is for the weather monitoring while driving the bike.

Google maps widget: This widget is for accessing the google map from the dashboard.

Vehicle to Vehicle Communication

For V-2-V communication we are using the latest protocol developed by the Espressif **ESP-NOW**

This protocol enables multiple devices to communicate with one another **without using Wi-Fi**. The protocol is similar to the **low-power 2.4GHz wireless connectivity** that is often deployed in wireless mice. So, the pairing between devices is needed prior to their communication. After the pairing is done, the connection is safe and **peer-to-peer**, with no handshake being required.

So the question arises how we are Implementing ESP-NOW for V-2-V communication?



Each device is having ESP8266 NodeMCU which is programmed to peer with the nearby device having the same device, once the other device is connected it starts sharing the **data packet** that includes the real time parameters like **speed** and vehicle properties like **vehicle type, vehicle name**.

- Encrypted and unencrypted unicast communication;
- Mixed encrypted and unencrypted peer devices;
- **Up to 250-byte** payload can be carried;
- Sending callback function that can be set to inform the application layer of transmission success or failure.



It has a wide range of 220meter (722ft)

The next question arises, What V-2-V Communication does and Why do we need V-2-V communication?

1-When there is a four way intersection and rider can't get to know from where vehicle is approaching and at what speed then this V-2-V communication comes into role and let driver know about the approaching vehicles.

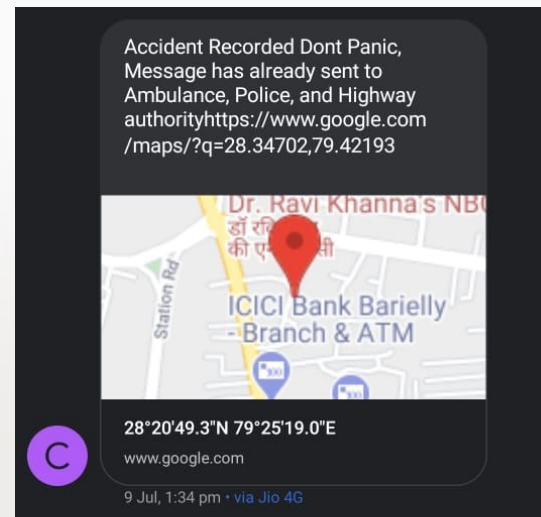
2-Steep cuts on hilly areas: While driving on hilly areas blind cuts then this system will be more informative.

3-While group biking: To know your mate's bike speed and distance.

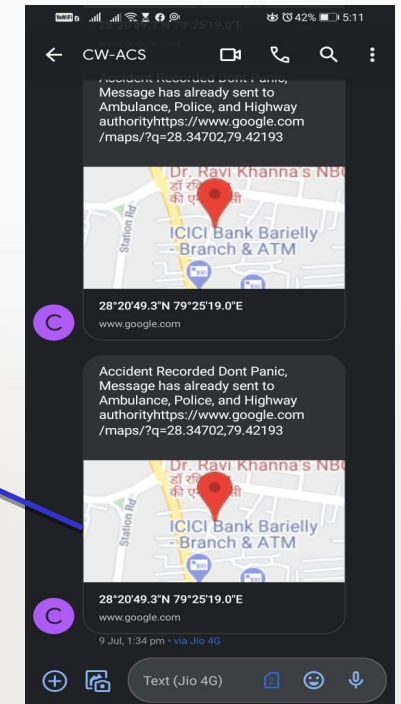
Accident detection and Care

- The **gyroscope** keeps on checking if the tilt of the vehicle is greater than 60° . Similarly, **accelerometer** checks whether there is any deceleration occurrence of greater than 3 m/s^2 ; along with these two modules, the **piezo electric sensor** monitors if there is any excess force exerted on the vehicle, if it is so, then the system confirms that crash has occurred.
- When accident occurs the message will be send to the nearby police station, Ambulance, Family members with the real time location. The message will be send via both ways by using the internet as well as by using the GSM module. In the mobile application side the notification will be generated by the help of internet. If internet is not available then it sends the message by using the GSM module that has a SIM card assigned to that specific driver with vehicle registration number.
- A small recorded video will also be send to the family members by using the image processing camera used for lane detection and rear view camera.

App side photo of notification to be insert here



Zoomed view



Message received to rider's family after an accident

Display Arrangement



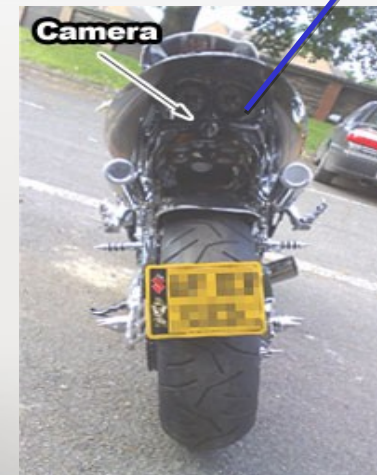
Rider's Smartphone can be used for the dashboard display.

Rear View Camera Display

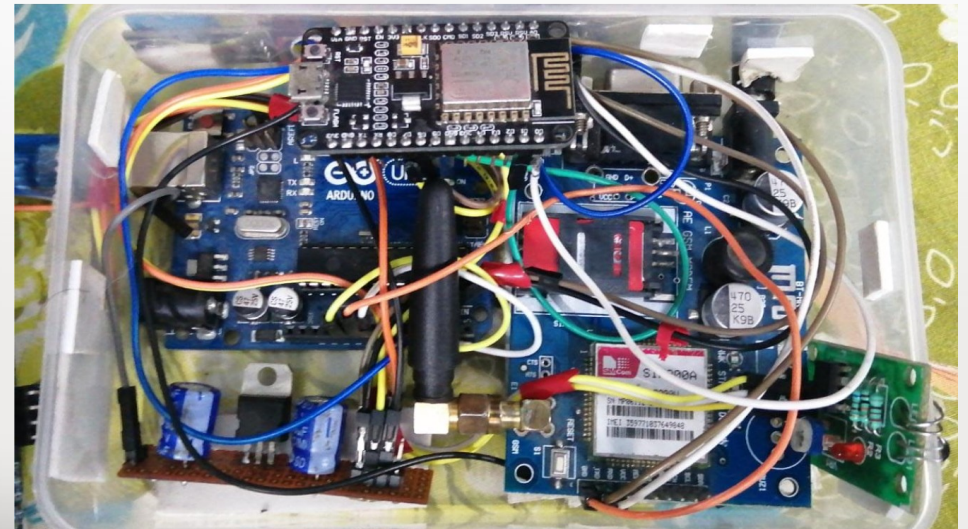
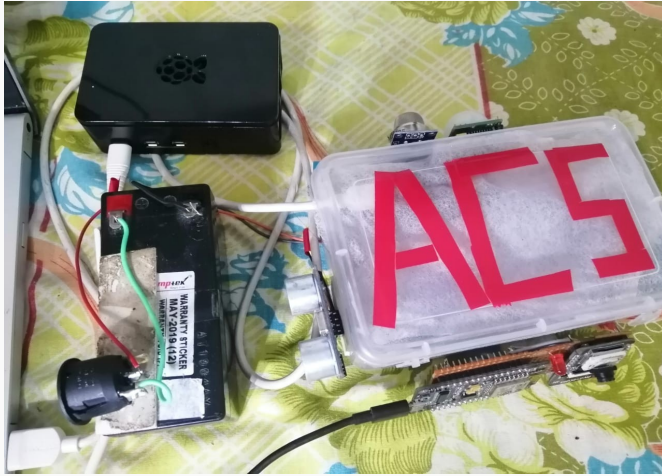


Google Maps redirects to this display after switching from dashboard.

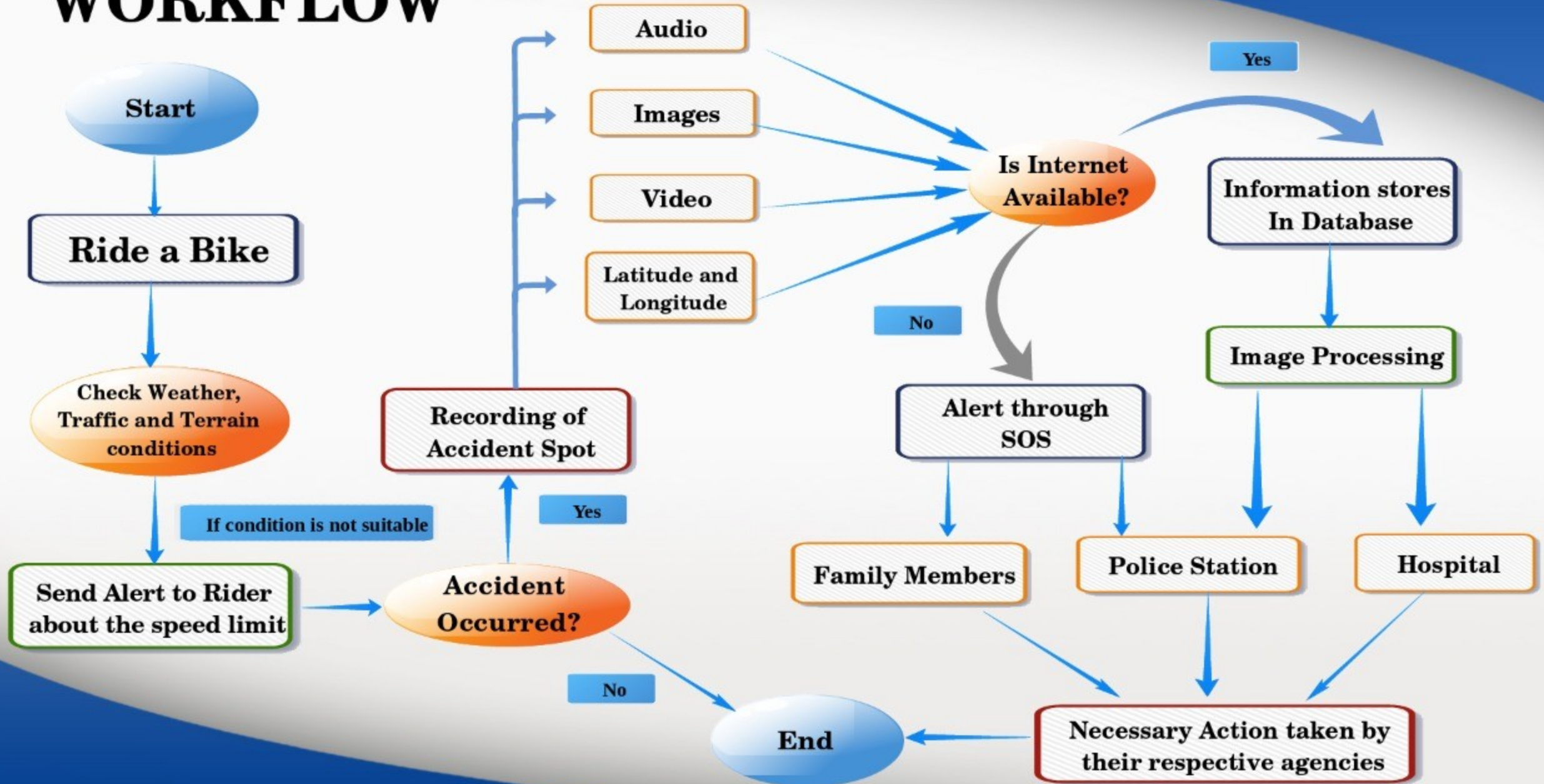
Rear View Camera



Developed Hardware Working Prototype



WORKFLOW



WRITE UP

- In India, two-wheelers account for a major share of accidents and consequent fatalities. According to a Govt. of India report, death occurs every 3.5 minutes due to road accidents.
- This device will help in reduce the chances of accident, by providing the alert regarding regulation of speed. According to the weather, traffic and terrain condition.
- Along with that bike-to-vehicle communication is there, which will improve the efficiency of providing the safety to the rider.
- Even after providing alerts to the rider, if accident occurred. The device has one more feature that it will record the pictures, video of the accident spot and will provide Real time location of the accident spot.
- Using the image captured by device, appropriate decision can be taken by nearby hospital and police station.
- SOS alert will be sent to family member of rider. This single device will cover all the aspects of the safety and security of rider.

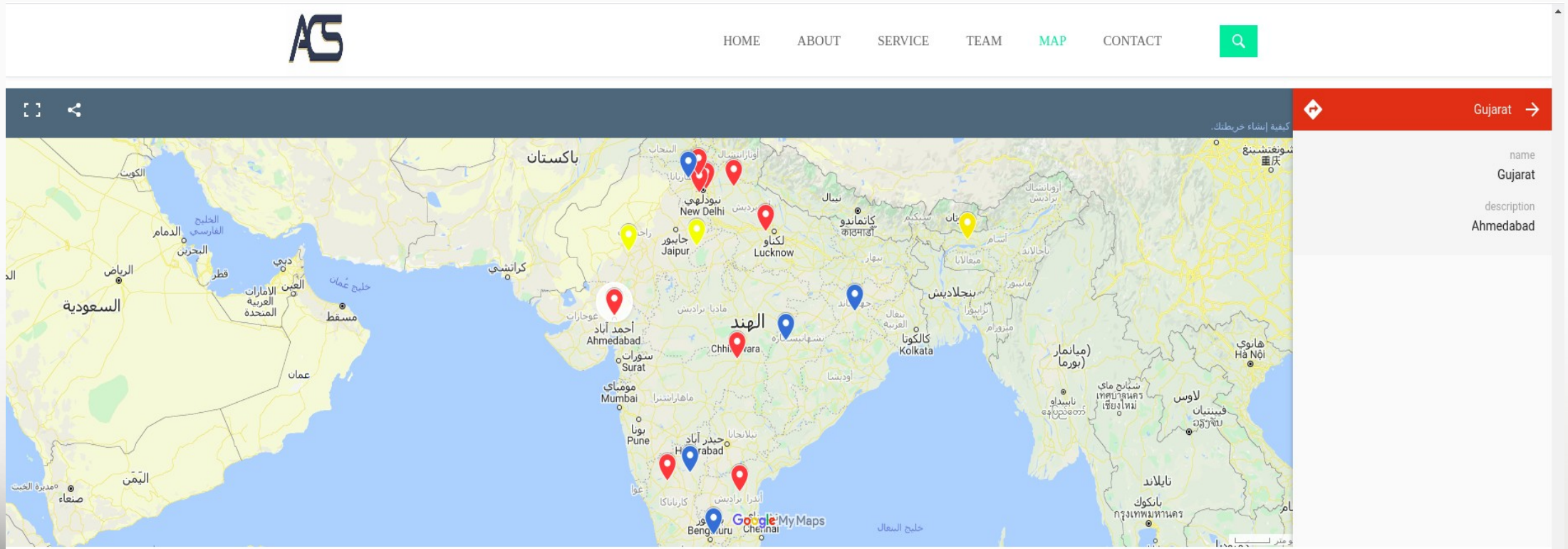
KEY FEATURES

- Government can monitor the Number of devices in use.
- Web portal for Government and Mobile App for user using the devices.
- Victim's relative will be informed about Accident (SOS).
- Record of accident prone area can be kept and necessary action can be taken to prevent it.
- Communication can also takes place without INTERNET availability.
- Real time Location of the victim will be available.
- Vehicle and device security will be ensured.
- Vehicle to vehicle communication for vehicle monitoring.
- The Device is OEM supportable.
- Prevention of accident will be ensured by device, by sending the alert to regulate the speed.
- If accident took place, then it alert will be sent to nearby hospital, police station.

UX/UI

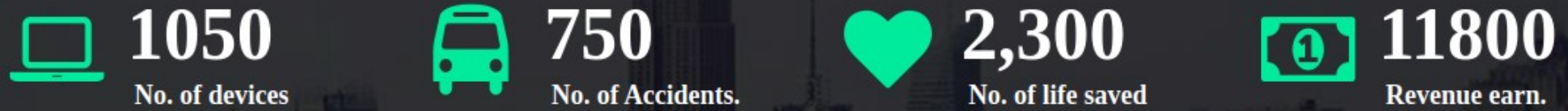
Accident prone area

- 📍 High Accident Prone area
- 📍 Less Accident Prone area
- 📍 No Accident Prone area

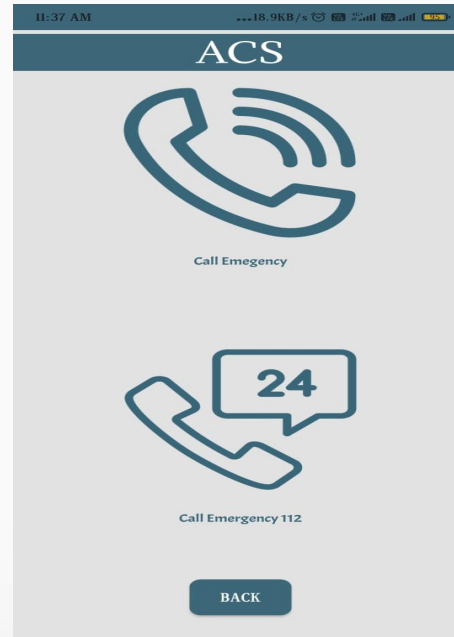
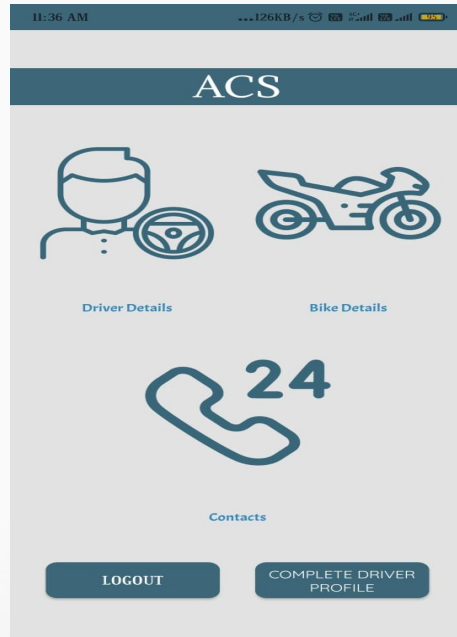


Counter

Real time update about the device in use, no.of accident occurred, no. of life saved, revenue earned etc.



ACS APP



- In ACS App, we will provide the Driver details like speed, alcohol percentage, temperature and location of driver.
- It will provide the Emergency call feature for the driver.

ESTIMATED COST

Component Name	Price (in Rs.)
Raspberry Pi 4 (2GB)	5000
Raspberry Pi CAM	600
ESP8266 Node MCU	400
ESP32-CAM	900
Sensors (MQ-3, Accelerometer, BMP-180, PIR,HC-SR04,Speed Sensor)	700
GSM SIM 900	1300
GPS Module	650
Miscellaneous items	500
Total	10,050

FUTURE ASPECTS

- The information stored in database can be used by GOI(Government of India) to identify the reason for accidents and necessary preventive measures.
- The images, videos can be use for investigation of court/police cases.
- Information about the nearest petrol pump, pawnshop, restaurant can be provided to the rider.
- Insurance Company can be informed about accident, which would speed up the insurance claim procedure.
- Helmet Detection can be done and also the device can be integrated with smart hemlet.

THANK YOU