Heart Attack and Alcohol Detection Sensor Monitoring in Smart Transportation System using Internet of Things

Pughazendi N, Sathishkumar R, Balaji S, Sathyavenkateshwaren S, Subash Chander S and Surendar V

Abstract— **In this modern world, we are depending on devices for doing our work in day-to-day life, which is interconnected through networks of networks. In this paper, we mainly focused on the safety measures for both driver and vehicle by using three types of sensors: Heartbeat sensor, Traffic light sensor and Level sensor. Heartbeat sensor is used to monitor heartbeat rate of the driver constantly and prevents from the accidents by controlling through IOT. IOT conveys the emergency message to the Owner, Ambulance and the Police. Traffic light sensor is used to follow the traffic rules and regulations by the driver. If the Red light is in the ON state, then the vehicle automatically stops before it reaches the white line. Fuel level sensor is used to measure vehicle's fuel level and calculate whether the available fuel is enough to reach the destination or not, if it is not enough then map will suggest the driver to reach the nearby petrol bunks.**

Keywords- Heart beat sensor, Light sensor, Alcohol Detection sensor, IoT, GSM.

I. INTRODUCTION

Internet of Thing (IOT) has a major growth in this changing world to innovate new ideas to make things smarter. As per the recent survey published by World Health Organization [12] (WHO) reveals that most of the accidents in India occur due to the cardiac arrest while driving. India has the second largest road network in the world with about 3 million km path in which 60% of the roads are paved. According to a survey around 336 people die each day in the road accident. In the below figure1.1, PIC Micro Controller is used to implement things easier in IOT. Heartbeat sensor is used, which monitors driver's heartbeat rate before he takes off. Traffic Light sensor is also used to avoid accidents by following traffic rules and regulations. Fuel Level sensor helps driver to locate a Petrol stations nearby if the fuel is not sufficient to reach the destination.

In this concept driver's must follow the rules like buckle up seat belt, cannot able to drink and drive, and cannot able to run through the car in red signal.

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Heartbeat sensor monitor the heartbeat rate of a driver continuously only after driver buckle up, so driver wanted to buckle up then only heartbeat sensor monitor heartbeat rate and send message to PIC microcontroller. After receiving message from heartbeat sensor, PIC microcontroller executes necessary action whether allow driver to start or not. If the seat belt is buckled up then message will not be send from heartbeat sensor to PIC microcontroller. In PIC microcontroller only five ports are available to connect and access. The LCD display with 16x2 configurations is used to user to know the status.

Figure 1.1 PIC Microcontrollers

Alcohol sensor will detect the alcohol level from air, which is presented in the steering to detect the alcohol level in air breath out by driver. If level of alcohol is detected then it will be send message to PIC microcontroller. PIC microcontroller compares the level of alcohol send by the sensor with normal level of alcohol. If the level of alcohol detected in the sensor is higher than normal level then PIC microcontroller execute the code which would not allow the driver to start the car. If the alcohol level is become high while car in moving condition then the car will be slowed down like parking and send message to owner using GSM.

Traffic level sensor use Zigbee to transmit the message from traffic light to car. If the traffic signal display red signal then the Zigbee will send the message from traffic light to all receivers in 10 meters range. Cars moving towards signal within 10 meters range will receive this message. PIC microcontroller presents in the cars note the

speed of the car and execute the code which makes buzzer to start alarm to alert the driver about red signal. Even after buzzer alarm if the driver does not reduce speed of the car then Microcontroller will execute the code which will slow down the car like parking till it reaches zero in speed.

II. LITERATURE SURVEY

In [1] describes about 2029, approximately after 35 years the Internet went important, and today the world, its people, and devices are connected in ways that the Internet's importance could never have imagined. In [5] is about the fuel emission and how much air pollution is happening due to vehicle's engine is running in red sign. In [2] describes about waiting time in traffic signal for unwontedly that is if there is no vehicles crossing the road even though they have to wait, so by making traffic lights to change according to the number of vehicles waiting in the signal. In [6] describes about the automatic driving car using cameras for recognizing the white lines and signs. In [10] describes about the safety camera is fixed inside vehicle for monitoring the driver whether the driver is following the rules like applying brake for stop sign and driving manner. In [9] describes about the wearable glass which alert the driver using cloud computing and guiding driver for take necessary action according to situation.

Now a day's road accidents are becoming serious public health problem. The annual report published by Transport Research Wing about road accidents in India 2015. India is one of the highest motorization growth rate country in world, but now our country is facing serious impact of road safe levels. There is 2.5 per cent increased in road accidents from 4,89,400 in 2014 to 5,01,423 in 2015. Likewise total number of persons killed in road accidents increased by 4.6 per cent from 1,39,671 in 2014 to 1,46,133 in2015. Injuries also increased by 1.4 per cent from 4,93,474 in 2014 to 5,00,279 in 2015. The road accidents severity will be measured in terms of number of persons killed per 100 accidents increased from 28.5 in 2014 to 29.1 in 2015. The survey of road accidents in 2015 reveal that about 1,374 accidents and 400 deaths is takes place every day, which may further translates into 57 accidents and loss of 17 lives as average every hour in our country.

According to table 2.1 survey accident severity is increased by 2.1 per cent from 2014 to 2015. In 2014, 28.5 per cent accident severity is registered and in 2015 accident severity is increased to 29.1 per cent. From the analysis of survey registered in table 2.1 road accidents and severity is increasing year by year. Likewise the persons killed also increasing year by year.

Road Accidents Parameters: 2014 and 2015			
Parameter	***2014***	***2015***	***%change over previous year***
Total Accidents in the country	4,89,400	5,01,423	2.5
Total number of persons killed in the country	1,39,671	1,46,133	4.6
Total number of persons Injured in the country	4,39,474	5,00,279	1.4
Accident Severity	28.5	29.1	2.1

Table 2.1 Road accidents in 2014 and 2015

According to table 2.2 the total number of accidents and fatal accidents is increasing year by year. From 2005 to 2015 there is continuously increasing rate of accidents, fatal accidents, persons killed and injured persons also. Survey clearly shows the number of accidents and killed persons are increasing, if this continues then it will leads to sever problem in future.

Year	**Number of Accidents**		**Number of Persons**		**Accident Severity**
	Total	***Fatal***	***Killed***	***Injured***	
2005	4,39,255	83,491	94,968	465,282	21.6
2006	4,60,920	93,917	105,749	496,481	22.9
2007	4,79,216	1,01,161	114,444	513,340	23.9
2008	4,84,704	1,06,591	119,860	523,193	24.7
2009	4,86,384	1,10,993	125,660	515,458	25.8
2010	4,99,628	1,19,558	134,513	527,512	26.9
2011	4,97,686	1,21,618	1,42,485	5,11,394	28.6
2012	4,90,383	1,23,093	1,38,258	5,09,667	28.2
2013	4,86,476	1,22,589	1,37,572	4,94,893	28.3
2014	4,89,400	1,25,828	1,39,671	4,93,474	28.5
2015	5,01,423	1,31,726	1,46,133	5,00,279	29.1

Table 2.2 Number of Road Accidents and Number of Persons affected: 2005-2015

According to table 2.3 the total number of accidents done by regular accidents is higher than learners and drivers without license, this shows the accidents are not only done by drivers who don't have license. Survey show the accidents are mostly done by drivers with license due to distraction and some other rules disobeyed by driver.

Total Number of Road Accidents Classified based on type of License	
Type of License	***Accidents***
Regular License	3,96,381(79.1)
Learner's License	59,435(11.9)
Without License	45,191(9.0)

Table 2.3 Road accidents done by types of license.

According to Figure 2.2 the number persons killed by road accidents in year is continuously increasing year by year that is the persons killed in 1965 is less than 20,000 but in 2015 it reaches 1,50,000 this show clearly the death due to road accidents rate is increasing which needs to be reduced.

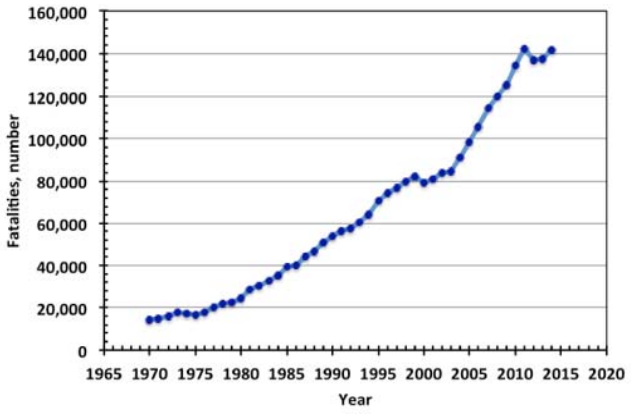

Figure 2.2 Road traffic death rates

According to table 2.5 the total number of accidents is occurring mostly in traffic signals and persons killed also mostly occurring in traffic signals. Flashing signals or blinkers is the area where more injuries are occurring due to road accidents.

Total Number of Road Accidents at various Traffic Controlled areas			
	Accidents	***Killed***	***Injured***
Traffic Light Signal	31,807(12.9)	7,648(11.9)	29,287(12.2)
Police Controlled	19,291(7.9)	4,058(6.3)	13,285(5.5)
Stop Sign	13,228(5.4)	3,464(5.4)	10,614(4.4)
Flashing Signal/Blinker	15,183(6.2)	5,129(8.0)	16,663(6.9)
Uncontrolled	1,66,158(67.6)	44,059(68.4)	1,70,568(71.0)

Table 2.5 Number of accidents at various traffic controlled areas

According to table 2.6 survey taken in 2013 which shows almost in all countries road accidents are occurring due to disobeying of traffic rules and distractions of drivers while driving vehicles.

Cross Country Comparison of Incidence of Road related Deaths and Injury Accident in2013			
Sl.No	***Country***	***Killed per 100,000 Populations***	***Injury Accidents per 100,000 Populations***
1	Australia	5	N.A
2	Canada	5	348
3	Denmark	3	53
4	Finland	5	98
5	France	5	86
6	Germany	4	361
7	India	11	40
8	Israel	3	162
9	Japan	4	494
10	Korea	10	429
11	Mauritius	10	199
12	New Zealand	6	208
13	Niger	5	36
14	Norway	4	103
15	Poland	9	93
16	Portugal	6	334
17	Russian Federation	19	142
18	Singapore	3	119
19	U K	3	216
20	USA	10	513

Table 2.6 Number of road accident in countries

According to table 2.7 mostly 70 per cent of road accidents are occurring due to drink and drive. If this continues then life of persons will be spoiled even good persons also affected due to this type of activities. In this paper we used alcohol sensor to avoid this type of road accidents and reduce the number of persons killed due to drink and drive.

Sl.No.	**States**	**Accidents caused due to Intake of Alcohol**		
		No. of Accidents	***No. of Persons***	
			Killed	***Injured***
1	Andhra Pradesh	1,315	379	1,778
2	Arunachal Pradesh	36	15	41
3	Assam	807	246	366
4	Bihar	1,532	790	1,094
5	Chhattisgarh	310	82	203
6	Goa	13	1	8
7	Gujarat	40	6	29

8	Haryana	1,021	398	887
9	Himachal Pradesh	82	30	110
10	Jammu & Kashmir	388	141	115
11	Jharkhand	444	241	414
12	Karnataka	495	118	525
13	Kerala	28	1	36
14	Madhya Pradesh	4,301	1,012	5,592
15	Maharashtra	2,187	479	1,526
16	Meghalaya	29	8	21
17	Mizoram	13	7	23
18	Nagaland	10	3	8
19	Odhisha	739	301	1,050
20	Punjab	147	111	72
21	Rajashthan	1,451	696	1,621
22	Sikkim	5	1	4
23	Tamil Nadu	2,764	718	2,957
24	Tripura	4	1	7
25	Uttarakhand	9	10	31
26	Uttar Pradesh	2,049	658	1,490
27	West Bengal	0	0	0
28	Andhaman & Nicobar Islands	20	3	16
29	Chandigarh	1	1	0
30	Dadra & Nagar Haveli	0	0	0
31	Daman & Diu	1	0	2
32	Delhi	41	6	48
33	Lakshadweep	0	0	0
34	Puducherry	8	0	7
	Total	20,290	6,463	20,081

Fig 2.7 State Wise accident

III PROPOSED SYSTEM

A. To check the driver's Heartbeat rate constantly

To monitor heartbeat rate of driver heartbeat sensor will be attached in Seat belt of the car. Once the driver starts the vehicle and wears the seat belt, this sensor automatically monitors the heartbeat rate of the driver through Internet of Things. When the heartbeat rate goes abnormal (i.e., above the reference value), IOT notifies the emergency message to the owner of the car, nearby Ambulance and the Police to prevent from accident and save the driver's life. This emergency message will be conveyed to the respective person via GSM. Main concept is if and only if the seat belt is buckled by driver then only engine is allowed to start this makes drivers to buckle up the seat belts compulsory to drive car. This is done by small concept that is the message will be send from heartbeat sensor which is fixed in seatbelt then only the PIC microcontroller allow or permit the driver to start engine.

Figure 3.1 Heartbeat sensors in seatbelt

In this concept we used figure 3.1 heartbeat sensor which will constantly detect the heartbeat rate of driver. If the heartbeat rate goes to abnormal rate then the message will be send to owner, hospital and police using GSM or IOT. If the message is received by owner he will able to stop the automatically from anywhere through GSM or IOT.

B. Updating the Fuel Status to Reach the Destination using Google Map

Level Sensor is used to check whether available fuel is sufficient to reach the destination. When driver starts the vehicle, Level sensor automatically calculates the fuel required based on the destination selected in the Google Maps. If the Fuel is lesser than required, then it automatically locates the nearby Petrol Station to fill up the fuel like figure 3.2. If driver don't interested to fill fuel and start driving the car even though the notification will be displayed to fill fuel to travel more distance if any emergency required.

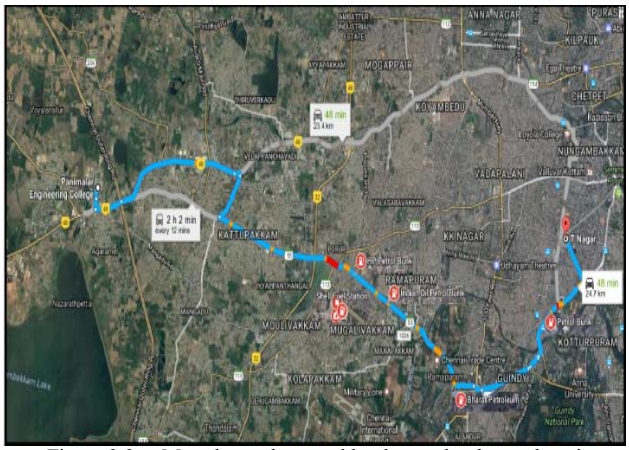

Figure 3.2 Map shows the petrol bunks nearby the car location.

C. Avoid Accidents by following Road rules and regulations

If the traffic signal displays orange or yellow light then Zigbee (802.15.4g) will detect signal and send the message to all receivers, which is present in cars. After receiving the message from traffic light Zigbee transmitter, then the PIC microcontroller will start executing the code, which was already coded in the circuit.

In figure 3.3,The PIC microcontroller executes the code to start buzzer and alert the driver about red light is going to ON. Then the PIC microcontroller executes the code which applies brake slowly and reduces the speed till car reaches certain speed limit like parking. Then if the red light is displayed the message will be send to all car's receivers to stop the car, till that control of acceleration will be controlled only by PIC microcontroller, driver cannot able to accelerate the speed of the car. After the signal changes from the red to green the control will be again given to the driver, which makes driver to wait for green light to move further.

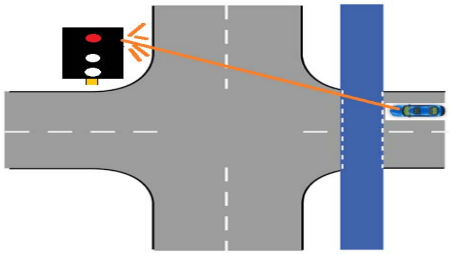

Figure 3.3 Vehicle gets stopped automatically after the red light is ON

D. Vehicle ON/OFF control based on alcohol detection using breathe sensor circuitry

While driving, driver should not drink alcohol is the one of the rule should be followed but in our country it is increasing day by day. To follow that rule alcohol sensor is fixed on the steering which will detect the alcohol level from the air breath out by driver, if in case it accuracy is not that much then just fix the alcohol sensor in the seat belt. There is a possibility to some other chance to get the smell of the alcohol, but by using our concept we can overcome those challenges.

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Figure 3.4 Vehicle gets stopped automatically if the driver consumes alcohol

In figure 3.4, the alcohol sensor will measure the level of alcohol constantly and send to picture microcontroller, which check whether the driver drunk alcohol or not. If the picture microcontroller detected the alcohol drunken by driver then it will send message to owner and police.

IV. PROBLEMS AND OVERCOMES

Road accidents are increased year by year; new possible intervention is not possible in our day-to-day life. Proper road rules have been not devised and these devised rules aren't meant and proper. There is a lack of safety rules and first aids emergency services in highways which leads to critical situations. If there is any emergency case, then driver is not allowed to drive the car against the traffic rules. Zigbee is not secured like wifi. Cost for Replacement of any components in Zigbee is high. The coverage limit of Zigbee is only 10 meters. Buckle up seat belt is important which prevent drivers from serious injuries and it is one of the important rules in road traffic rules. Don't drink and drive is also one of the rule which is cause for more road accidents.

V. IMPLEMENTATION

In India almost 400 persons are killed in road accidents per day. In figure 4.1 we implemented our concept surely we can reduce the number of road accidents from 400 to less than hundred per day. In India most of road accidents are occurring due to drink and drive, not following traffic rules like running through red signal, not buckle up seat belt, driver got heart attack. Till now government ask the drivers to follow the traffic rules to prevent both travelers inside the

car and persons on the road. In our concept driver should buckle up seat belt to start car engine, in traffic signal automatically the car will be controlled by PIC microcontroller, driver cannot able to drive car if he drink alcohol before start driving or while driving. All this concepts mostly prevent from road accidents which will help to prevent lakhs of person's life. In our concept main motivation is to order drivers to obey the rules then only the drivers are allowed to drive the car.

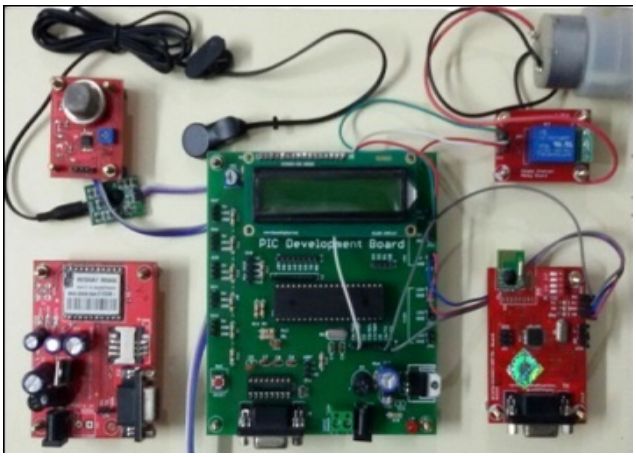

Figure 5.1 Smart car system demo circuit

In figure 4.2, the heartbeat sensor is used to check the drivers heartbeat rate. If the heartbeat rate is abnormal then the emergency message will goes to the people whose contacts are available in the GSM (SIM).Heartbeat sensor which will constantly detect the heartbeat rate of driver. If the heartbeat rate goes to abnormal rate then the message will be send to owner, hospital and police using GSM or IOT. If the message is received by owner he will able to stop the automatically from anywhere through GSM or IOT.

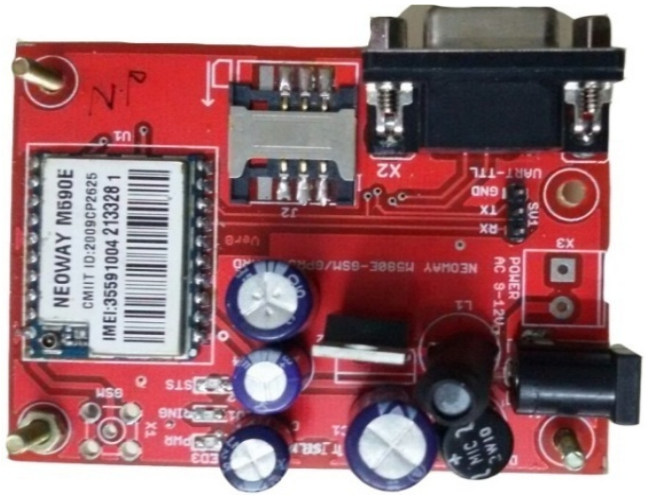

Figure 5.2 Heartbeat sensor circuit

In figure 4.3, the alcohol sensor is fixed on the steering which will detect the alcohol level from the air breath out by driver, if in case it accuracy is not that much then just fix the alcohol sensor in the seat belt. There is a possibility to some other chance to get the smell of the alcohol, but by using our concept we can overcome those challenges. The Alcohol sensor will measure the level of alcohol constantly and send to PIC microcontroller, which check whether the driver drunk alcohol or not. If the PIC microcontroller detected the alcohol drunken by driver then it will send message to owner and police.

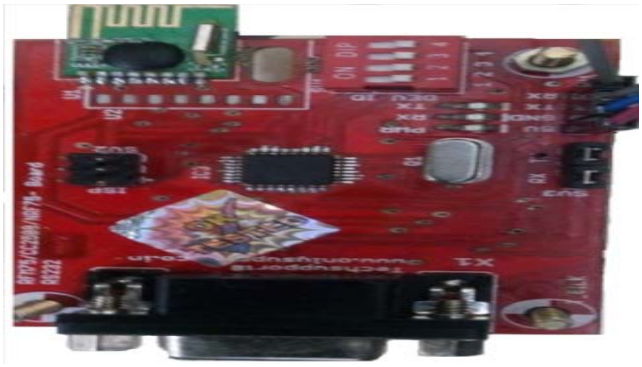

Figure 5.3 Zigbee circuit

In figure 4.2, the Zigbee (802.15.4g) will detect signal and send the message to all receivers, which is present in cars. After receiving the message from traffic light Zigbee transmitter, then the PIC microcontroller will start executing the code, which was already coded in the circuit.

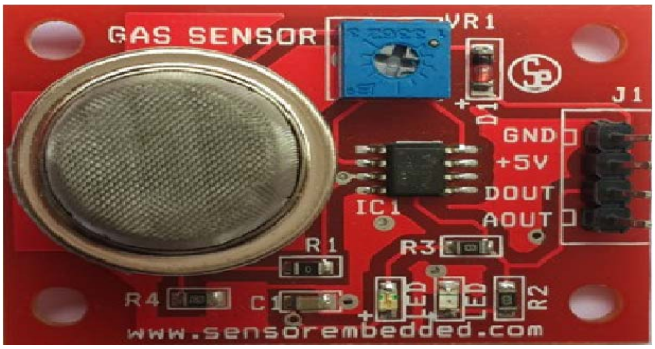

Figure 5.4 Alcohol circuit

VI CONCLUSION AND FUTURE ENHANCEMENT

In this paper we have proposed the smart car system using IOT, GSM and sensors like heartbeat sensor, Fuel level sensor, traffic light sensor and alcohol sensor for prevent the persons and driver travelling in the car from accident. We used "Prevention is better than cure" proverb

which makes our life safe and secured. Like the proverb in this paper we described our concept which makes the drivers to follow the road rules to drive the car. Our Government asked drivers to follow the Traffic rules, but drivers refused to follow road rules like buckle up seatbelt, don't drink and drive vehicle, stop in red signal. If we implement the concept described in this modern world then surely there will be reduction in accidents.

If our concept is implemented in this real world, then the some more implementation is needed to make this project completely useful to this world. We have to fix RFID tag for ambulances, fire engines, etc.., to make signals to detect there is some emergency, so if the RFID tag is detected by traffic signal then the signal will be change from the red to green. If the RFID tag is goes out of range then the signal will change again from green to red. But in this project we have to make signals to communicate with each other to change from green to red when there is emergency detected in another sign al. Likewise in alcohol detection concept the message wants to be send to nearby car belongs to same owner and make that car's driver to pick up the passenger. In heartbeat concept the treatment for heart attack wants to be displayed to help driver, if there is passenger then it will be useful to driver as first aid.

A decade ago, Drivers suffered from Cardiac arrest due to continuous driving and stress inside them, which in turn they met with lots of accidents. Tension may be caused due to various factors such as personal reason, work pressure, etc., which leads to accident due to cardiac arrest. Stress may be increased due to continuous driving for 16-20 hours without any rest. We can overcome these problems/accidents with the help of our project with the Heartbeat sensor. When driver wears the seat belt, Heartbeat sensor starts monitoring while driving and if any abnormal change in the heartbeat is found, then the vehicle gradually decreases the speed and will automatically stop the vehicle by initiating the Parking light.

Until now, we cannot accurately measure the petrol level. This may lead to stop the vehicle before we reach the destination and we cannot reach on time. If petrol is empty, then we need search for the nearby petrol station during our journey time, which will waste our time in this fast moving world. By using our concept, we can measure the petrol level before we start our journey. This will save time, which helps us to reach our destination on time. If the petrol is not enough to reach the destination, then we can easily identify the nearby petrol station easily using Google Maps.

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