ADVANCE DRIVER ASSISTANCE SYSTEM BY USING WIRELESS TECHNOLOGY

Mayur B. Petkar[1], Kiran R. Barapatre[2], Rahul B. Lanjewar[3]

[1,2,3] *Assistant Professor, Department of Electronics Engineering, DBACER, Nagpur, (India)*

ABSTRACT

Manufacturing automobiles to keep drivers safe and accident free while operating their vehicles is the need of the day. These technologies are known in the industry as Advance Driver Assistance. In order to reach this objective, human-centered design principles have to be considered. To avoid collision with unexpected obstacles, the vehicle uses ultrasonic range finders for detection and mapping. The direction system for monitoring driver's vigilance is presented. The level of vigilance is determined by integrating head movement parameters. The estimated parametric values are collected and analyzed every fixed time interval to provide a real-time vigilance level of the driver. Vehicles thefts are increasing, alarmingly around the world are being set for vehicle manufacturers to make their products more secure. Therefore, a system is made to provide vehicle security and doesn't allow unknown person to handle the vehicle.

I. INTRODUCTION

With the increasing adoption of ultrasonic sensor systems for accident control, cars have gained the ability to detect the speed and position of obstacles in front or behind the vehicle. In this paper, we will focus on the development of a specific active safety system, that of brake assistance. This will utilize sensor subsystem to extract informational cues about the vehicle, vehicle surround, as well as driver state. An analysis module will consider these inputs to access the need for braking and situational criticality, and will provide signals which can trigger appropriate alarms or can even be used to initiate automatic braking. In each of the figures, an intelligent vehicle is approaching a slow moving truck with different levels of awareness of the driver. At time=t1, the distance is not critical hence nor the braking is planned neither the buzzer is generated. At time=t2, it just warns the driver but does not brakes the vehicle. At time=t3, driver fails to apply brake and system apply them automatically.

In this paper, we focus on an important component specific to our example: estimating the orientation of a driver's head. A driver's field-of-view can be reasonably approximated from the pose of his head, which can unobtrusively monitored by an accelerometer (ADXL 335) .The 3-axis accelerometer attached to the transmitter side is used to recognize gestures (dynamic head positions) in x, y directions and postures (static head positions) in z direction. The head position in x, y direction indicates that the driver is in the sleep or tired mode and the transmitter section gives the alarm to the driver to be attentive and then if the head position is not straight then the signal is transmitted to the receiver to break the vehicle.

Today, vehicles have been an essential part of our daily life. Unfortunately, we are also facing the high possibility of vehicle theft. Car alarm systems are very popular these days. In our system, without the transmitter section car does not run. It is necessary that the driver must have the transmitter section to start the vehicle. In such way, the thieves won't be able to steal the vehicle.

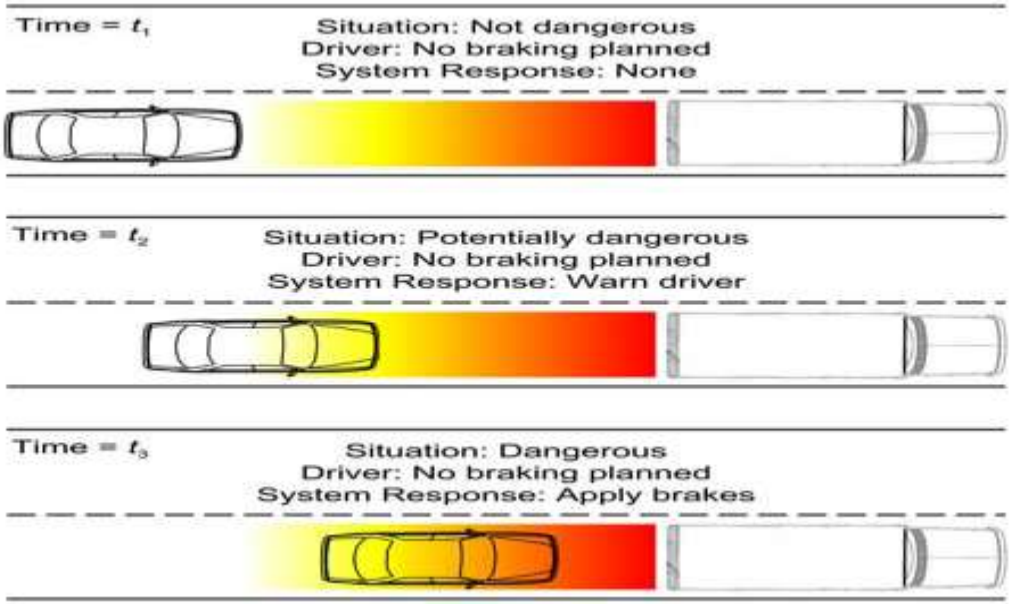

Fig1. Automated Braking System

1.1 MEMS Technique

MEMS has been identified as one of the most promising technologies from the 21st Century and has the potential to revolutionize both industrial and consumer products by combining silicon-based microelectronics with micromachining technology. Its techniques and micro system-based devices have the potential to dramatically affect of all of our lives and the way we live. MEMS deal with the emerging field of micro-electromechanical systems, or MEMS. MEM is a process technology used to create tiny integrated devices or systems that combine mechanical and electrical components. They are fabricated using integrated circuit (IC) batch processing techniques and can range in size from a few micrometers to millimeters. These devices (or systems) have the ability to sense, control and actuate on the micro scale, and generate effects on the macro scale.

II. BLOCK DIAGRAM

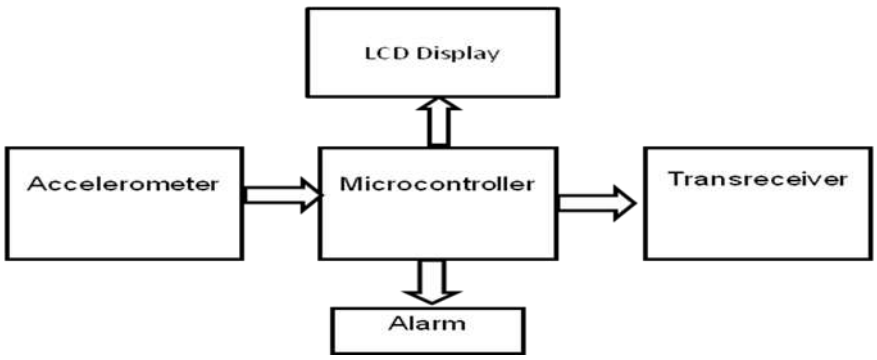

Fig2. Block Diagram of Transmitter

2.1 Working

Transmitter section consists of ATMEGA 16 microcontroller which is 40 pin DIL and with inbuilt ADC at port A. The 3 axis accelerometer is attached to the port A so that analog output is converted to digital form. The inclination of driver's head beyond the limit (x>400//x<320//y>400//y<320) gives an alarm to the driver to be attentive. If he fails to correct his position then after 2000msec the microcontroller will send the signal via cc2500 transreceiver which is at port D to the receiver side and then stops the vehicle gradually. The slowing

down of vehicle indicates that the driver is in the sleep mode and is not attentive. For the working of the microcontroller, ADXL335 and CC2500 5v is required which is given by 7805. Buzzer needs 12v to work hence L293D amplifier is used to amplify 5v to 12v.

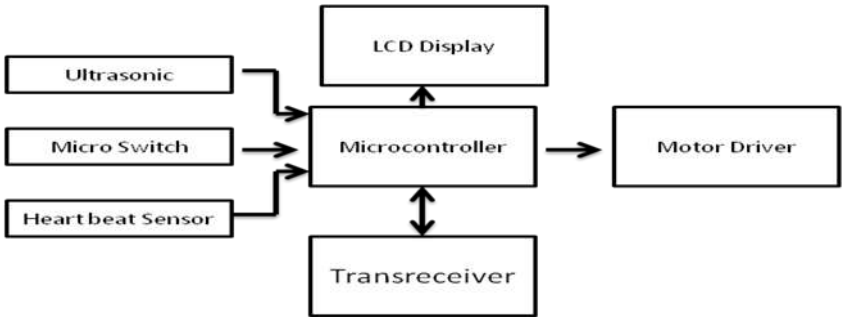

Fig3. Block diagram of receiver

2.2 Working

In the receiver section, LCD display is connected to the port B. It is a 16 pin IC used to show the indication like 'PLEASE WAKE UP'. Signal transmitted to the receiver section by the accelerometer shows that the driver is not attentive and slowly stops the vehicle. 4 pin ultrasonic sensors detect the range of few meters from the vehicle. If the distance between the two vehicles is dangerous then it gives alarm to the transmitter section and after few seconds if he fails to break the vehicle then the motor is stopped slowly.

III. HARDWARE DESCRIPTION

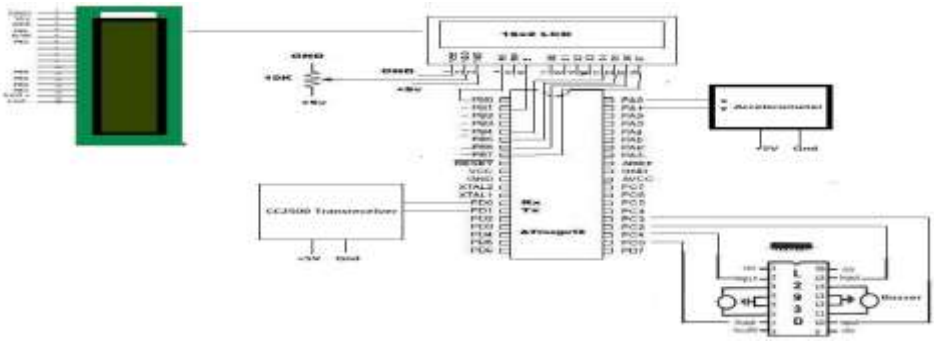

Fig4. Circuit Diagram of Transmitter

ATmega16 is a 40 dual in line IC with four ports A, B, C, D each containing 8 pin. Pin 40-pin 33 is port A with analog to digital converter inbuilt in it. Pin 32 is the analog pin for analog to digital converter and pin 30 is the supply voltage pin for Port A and the A/D Converter. It should be externally connected to Vcc, even if the ADC is not used. If the ADC is used, it should be connected to Vcc through a low-pass filter. Three pins X, Y, Z of ADXL335 are connected to PA0-PA2 and two pins are connected to ground and vcc. Transreceiver CC2500 is the four pin IC Rx pin of CC2500 is connected to Tx (pin 15) of microcontroller and similarly Tx pin of CC2500 is connected to Rx (pin 14) of microcontroller. The other two pins of CC2500 are Gnd and Vcc. 7805 voltage regulator IC is used to give 5v supply to the entire circuit. Buzzer at port B requires more than 5v to generate high volume alarm so L293D IC is connected to amplify 5v.LCD display is interfaced with port B of microcontroller to show status result.

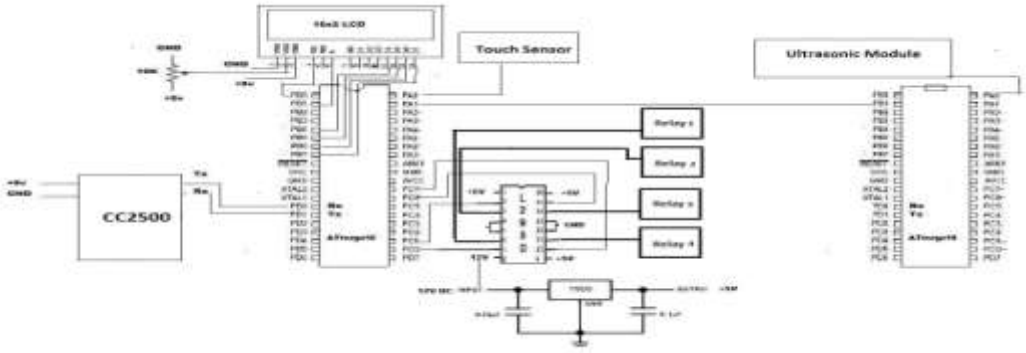

Fig5. Circuit Diagram of Receiver

The receiver section has two ATmega16 microcontrollers. L293D IC is connected to port D as an amplifier because the motor requires 12v to operate. Relays are connected to stop the reverse current coming back from motor. Ultrasonic sensor is connected to port A of second microcontroller. An ultrasonic car braking system includes; an ultrasonic wave emitter provided in a front portion of an automatic braking car producing and emitting ultrasonic waves frontward in a predetermined distance in front of the car. Ultrasonic receiver also formed in a front portion of the car operatively receiving a reflective ultrasonic wave signal as reflected by obstacles positioned within the pre-determined distance in front of the automatic braking car. LCD is interfaced with port A.

IV. WORKING

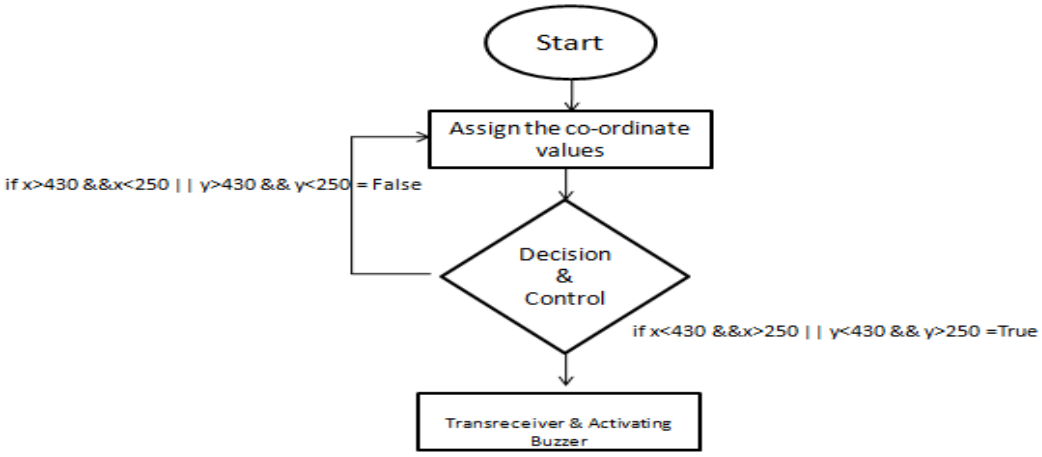

Fig6. Flow Chart of Transmitter

Transmitter section consists of ATmega16 microcontroller which is 40 pin DIL and with inbuilt ADC at port A. The 3 axis accelerometer is attached to the port A so that analog output is converted to digital form. The inclination of driver's head beyond the limit (x>430//x<250//y>430//y<250) gives an alarm to the driver to be attentive. If he fails to correct his position then after 2000msec the microcontroller will send the signal via CC2500 transreceiver which is at port D to the receiver side and then stops the vehicle gradually. The slowing down of vehicle indicates that the driver is in the sleep mode and is not attentive. For the working of the microcontroller, ADXL335 and CC2500 5v is required which is given by 7805. Buzzer needs more than 5v to

generate the loud alarm hence L293D amplifier is used to amplify 5v to 12v.Heart beat sensor detects the pulse of the driver. If the rate is normal then the receiver section starts the motor. Transmitter also gives security to vehicle as the only availability of it would give access to unlock the vehicle.

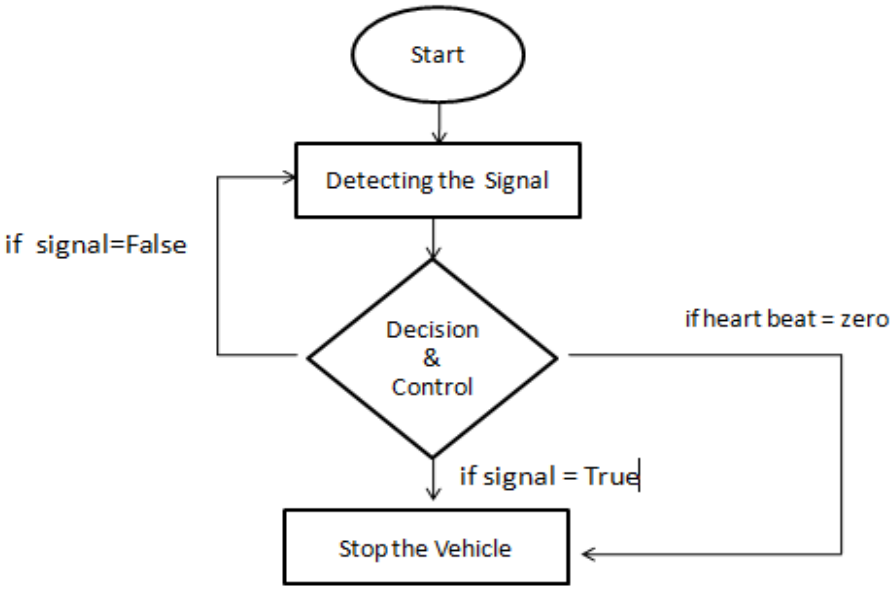

Fig7. Flow Chart of Receiver

In the receiver section, LCD display is connected to the port B. It is a 16 pin IC used to show the indication like 'START THE MOTOR' at the time of safe situation or 'STOP THE MOTOR' at the time of accidental situation. Signal transmitted to the receiver section by the accelerometer shows that the driver is not attentive and then the vehicle is stopped automatically. Four pin ultrasonic sensors detect the range of few meters from the vehicle. If the distance between the two vehicles is dangerous then it gives alarm to the transmitter section and after few seconds if he fails to brake the vehicle then the motor is stopped slowly. An ultrasonic car braking system includes; an ultrasonic wave emitter provided in a front portion of an automatic braking car producing and emitting ultrasonic waves frontward in a predetermined distance in front of the car. Ultrasonic receiver also formed in a front portion of the car operatively receiving a reflective ultrasonic wave signal as reflected by obstacles positioned within the pre-determined distance in front of the automatic braking car. The reflected wave (detection pulse) was measured to get the distance between the vehicle and the obstacle. Then microcontroller is used to control servo motor based on detection pulse information to push pedal brake to brake the car intermittently for automatically braking the car for a safe braking purpose.

V. RESULTS

- Results are obtained from the Accelerometer and then classified as driver is asleep or not based on their acceleration magnitude and power spectrum of the x, y, and z axis.
- The result shows the anti-collision braking system has substantial potential to reduce forward collision. It can also reduced rear-end collisions assuming the device is installed in all vehicles.
- Anti-theft sensor and pulse detection sensor also proves to be effective in limiting car theft as well as drivers physical state.

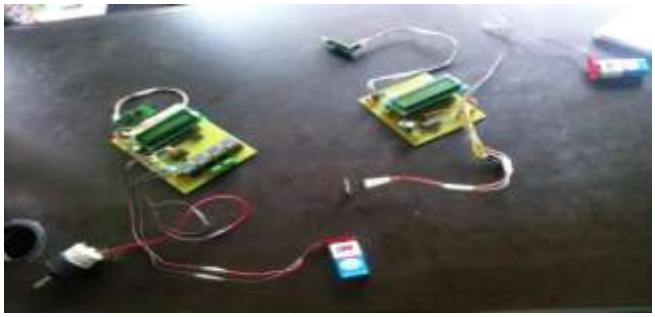

Fig8. Implemented Picture of Transmitter and Receiver **Fig9. Model Car**

VI. CONCLUSION

We have been able to accomplish our baseline goals and implement some of our extras. Even though along the way we ran into many problems, our system was flexible enough to adapt to the problems we encountered. We were able to build a successful accident prevention unit. In the process we learned about functioning of the hardware and software. During the monitoring, the system is able to decide if the driver is asleep or not. If the driver is asleep system will issue a warning signal to the driver and vehicle will be stopped gradually. In addition, during monitoring, the system is able to automatically detect an obstacle and have ability to stop vehicle thus preventing accident.

REFERENCES

[1] John Borenstein and Yoram Koren, "Obstacles avoidance with ultrasonic sensors", IEEE Journal on Robotics and Automation, April 1988(213-218).

[2] Tnum chia Chieh , Mohd Marzuki Mustafa, Aini Hussainl , Edmond Zahedi and Burhanuddinyeop Majlig " Driver Fatigue Detection using Steering Grip Force", student Conference on Research and Development(SCOReD) 2003 Proceedings, Putraiaya,Malaysia

[3] Xinshuai Che, Shaohui Xi, Xu Bai, "Prewarning System for Preventing Rear-end Collisions on Freeways", Chunyan Han Software College, Northeastern University, Shenyang, Liaoning Province, China, IEEE 2010.

[4] Erik Murphy-Chutorian, Anup Doshi, and Mohan Manubhai Trivedi, "Head Pose Estimation for Driver Assistance Systems: A Robust Algorithm and Experimental Evaluation", Computer Vision and Robotics Research Laboratory, University of California, San Diego.