

Intelligent Driver's Assistant

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Abstract - As the days are passing the number of vehicles are increasing rapidly. With this not only the issue of pollution, traffic jams but also increase in number of accidents. Technology has always been blessing for mankind but at times a curse. A powerful vehicle in hands of inexperienced or negligent driver is a nightmare. This paper presents a foolproof system that focuses on vehicle safety based on analyzing the situations around the vehicle. System is called Intelligent Driver's Assistant (IDA). The technology that exists today focuses on passenger safety when accidents occur but, Intelligent Driver's Assistant (IDA) emphasize on avoiding the accidents. The main motive is to build a system that will not only ride on the road but will also be alert enough to keep informing the driver about potential threats and will take control of the vehicle in certain situation. The system is such designed to attend the situations drivers may fail to see. It will cover all the blind spots that are crucial to attended while driving a car.

Keywords: Intelligent Driver's Assistant (IDA), Smart system, Blind Spots.

I. INTRODUCTION

Accidents are the bitter truth that nobody would like to go through, to hear or to see. Major causes of accidents are human errors. As the technology improved the vehicles became quicker and more powerful. Along with that came a disadvantage, this was increase in number of accidents per year. Various safety measures are taken by the automobile companies to ensure the safety of passengers, but fatalities still occur and people still die. Then came the era of systems that will assist the driver to avoid the accidents. Various sensors and technologies are available to ensure safety but certain areas are still untouched and need to be seen into.

A car should be smart enough to rectify the incorrect decisions taken by the driver at the time of driving, it

should be able to help the driver to take correct decisions to avoid accidents, which in turn will save many lives.

Situations like accidents when overtaking, during lane changing, poor alertness of driver, sleepy heads, over smart drivers all this will be taken care of with this system. As the name suggest this system will act as active third eye to the driver to avoid various conditions.

Intelligent Driver's Assistant is a system self sufficient to monitor the situation on road do quick calculations that will keep track of all the vehicles around itself at keep updating the drivers about all the potential threats that can occur. It will act as third eye/ears for the drivers that will ensure safe and accident free driving experience. All this process can be controlled with help of a Microcontrollers and multiple sensors working together to achieve the desired goal of passenger safety.

II. REVIEW OF EXISTING SYSTEMS

Passenger safety is priority for automobile manufactures in today's world. All the manufacturers are in competition to build the safest possible vehicles. This is possible through advanced technology and embedded system. Till this date the manufactures were relying on systems that will ensure safety at the time of accidents.

a) Anti-Lock Braking Systems

This system is incorporated to avoid locking of brakes in case of emergency, this in turn does not let the wheels lock and thus avoids skidding. This for sure avoids the accidents if the brakes are applied on right time and at a specified distance. As this is a system combination of man and machine. It definitely has some major drawback, which is if the driver fails to apply brake on right time then accidents could not be avoided [1].

b) Brake Assistance Systems

This is the system that is designed to help the drivers assist in braking depending on the obstacles ahead of vehicle. This system is again a man machine system and can keep alerting the driver about presence of obstacle ahead.

The design of system in such a way that it cannot operate independently makes it a bit vulnerable, if the driver ignores the alarm and decides to continue the system will have no control over the vehicle. One more disadvantage with this system is that, it can only detect the obstacle in front of the car, vehicles coming from behind or those present in blind spots are completely unattended[2],[4].

c) Hurdle Avoidance System

This system is kind of extension to brake assistance system where instead of braking vehicle maneuvering. This actually happens with the technology known as steering assist. Here the system keeps on checking the distance between the obstacles ahead of vehicle, and if some exists, instead of braking or stopping the vehicle it actually makes the steering more responsive. This system can definitely help avoiding collision but does not account the condition of vehicle approaching from the rear. That again is potentially accident situation [3].

Many such technology and systems exist in world today to avoid accidents but no system can completely assure the safety of passengers. Intelligent Driver’s Assistant is a combination of system put together to take care of various scenarios where accidents can occur [3].

III. PROPOSED SYSTEM

The Intelligent Driver’s Assistant (IDA) is a system designed based on observing traffic conditions on road. The main difference between this system and other existing system is that this is a standalone system and is also capable of overriding driver’s control and handle the vehicle itself based on sensor data available and its analysis. This system comes in handy in heavy traffic situation as well as on highways and on hilly serpentine roads. Fig no. 1 shows the basic block diagram of actual system.

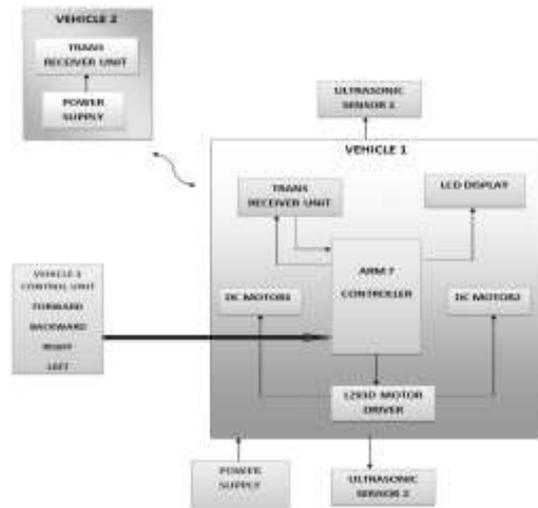


Figure-1: Block Diagram of IDA

The diagram above shows two vehicles wirelessly connected. ARM 7 (LPC2148) microcontroller is used for complete handling of system. Ultrasonic sensors are used to detect the distance between the vehicles. LCD is used to display the warning messages if any.

Based on survey and study of all the existing system available in market and comparing those systems with actual road conditions did not make a complete package for passenger safety. Multiple factors were considered while designing the system, but mostly driver feedbacks were considered.

There are three main pillars of this system, they are

1. Intelligent braking system (IBS).
2. Intelligent Lane Change assist.
3. Intelligent serpentine road assist.

All these concepts are discussed below.

a) Intelligent Braking System

This is the concept similar to that of brake assistance. The brake assistance system only alarms the driver but in Intelligent Braking system, the microcontroller will not only keep indicating but will take control of the vehicle if necessary.

The sensors continuously monitor the presence of obstacle ahead of vehicle. If the obstacle is sensed it calculates if the object is stationary or moving.

Depending on the motion and speed of object microcontroller decides if vehicle has to be stopped or simply reducing the speed will be sufficient. The microcontroller then waits for driver to act accordingly if that doesn't happen it overrides the manual control and takes control of the vehicle. Fig no. 3 shows the diagrammatic explanation of the system.

The ultrasonic sensors in the front will be continuously active and busy monitoring the distance between front object and car it's installed on.

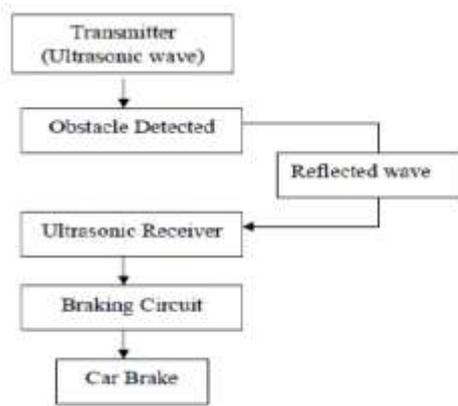


Figure-2: IBS program flow

b) Intelligent Lane Change Assist

As seen in the fig no. 2 front and rear of vehicles are installed with two ultrasonic sensors each.

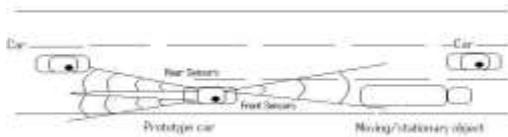


Figure-3: IBS & Lane change assist

This is the part of system, which is most useful for all the drivers. On the road while driving people keep changing the lane for overtaking. While this is being done certain blind spots are created around the car. The existing rear view placement on the car is insufficient to address these blind spots. No technology has been developed for this issue and only way to tackle it is to look back for vehicles approaching form the rear. This may not be the best solution, as the drivers need to stick his eyes on the front instead of rear. Even if the drivers do so

there is a chance they may miss out the vehicle, which is over speeding. These are the situations where the Lane Change Assist comes in handy. When drivers turn on the side indicator the rear sensor that are placed exactly in the blind spot are ON and keep monitoring the area. If it doesn't sense any vehicle approaching it indicates a message accordingly, but if a vehicle is sensed it will immediately start indicating presence of vehicle also it will calculate the relative speed and decide if it is safe to overtake.

Similarly a sensor will be placed diagonally opposite to the driver. The function of this sensor is almost same as that of once planted at the rear, but the only difference will b it will monitor the vehicles on the front side which may not be visible to the driver in case of a huge vehicle exactly in front of him. Placement of such sensors on Left and Right at the rear end ensures the safety from that end. Fig no.2 shows the same in combination with IBS.

c) Intelligent Serpentine Road Assist

Hilly and Serpentine (Ghats) roads are the most dangerous roads. The factor that makes it more dangerous is that due to limitation of space the roads are usually single, no road dividers and due to natural terrain the visibility may be poor. Although all these situations are well known to people they are always in a hurry to overtake irrespective of the fact that they are absolutely unaware of what is approaching them. Such situations lead of fatal accidents.

IDA has a solution for it. Locally communicating vehicles can share their directions (Uphill or Downhill) using RF transmitters. The vehicles going uphill and vehicles going downhill will be reception and transmission mode respectively. A beacon type message will be continuously sent out for receiver vehicles all the time to a specific distance. This will keep alarming the vehicles about approaching vehicles. Now there may be a chance of false alarming. To avoid such false signaling the transmission and reception will be unidirectional so that vehicles that have already passed each other will not interfere with the signals.

All these features work together. Different sensors may be working at different point of time but together the

system ensures complete safety of passengers/cars/people around the car.

IV. CONCLUSION

The work introduces an embedded system with a combination of multiple sensors. Digital control of the vehicle is an important reference of modern technology. With the high-speed development of embedded technology, high performance embedded processor is perforated into the auto industry, that is of low cost, high reliability and other features to meet the requirements of the modern automobile industry. The presented Intelligent Driver's Assistant solves the problem of automotive system applications in terms of passenger safety, also has an exact practical value and significance.

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