A Prospective Towards Smart Vehicle System

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Abstract— Currently, we are at a stage or world where everything is made smart and digital. Technology has grown faster when compared to past generations and now it's time for another step ahead. Yes, the concept of a smart city is now the recent plan that is still in existence. A smart city implementation doesn't just involve a single technology but requires the collaboration of various techniques and one such amazing concept is the use of Wireless Sensor Network (WSN). When sensor networks are utilized as a core in various applications like the smart street light system and still many more, smart safety vehicle implementation is also now possible. This paper illustrates the use of sensor nodes for adjusting inside mirror or outside mirror of a vehicle based on the pre-stored information and thus guiding the driver in a proper direction to avoid accidents. Temporal factors, environmental factors, medical and entertainment technologies are all taken into consideration to steer the driver correctly. This idea is related to various fields like telematics, traffic safety, vehicle development and so on….

Key words: Smart City, Smart Vehicle, Safety Control, Driver Distraction, Wireless Sensor Network, Sensor Nodes, Mirror

I. INTRODUCTION

As humans, we aim and wish everything to be smarter around us. To lend a hand in this, technology has laid its roots and has provided smartphones, smart gadgets that make our life even easier and simpler. But what if smartness is required only in these small measures? The answer is simply no. Because we expect everything to be smarter in our routine life including our transport. Although the modes of transport are implemented in many safer ways, the chance of accidents is still on increasing level day-by-day.

According to a survey, it is concluded that the driver's distraction sets as the reason for most of the incidents. Telephone calls, drowsiness, distraction form entertainment modes like DVD, Radio are also some factors that need to be concentrated on. To reduce accident damage risk to a certain level, smart ABS, airbags are used in present car models. By these arrangements, the driver and the co-passengers can remain safe but what is the assurance or guarantee for the opponent side.

So, it is a prime responsibility that both sides should be aware of the road conditions and concentration is even more required. In order to build or implement a safer control system for vehicles like a car we have proposed the method of usage of sensors that have the ability to sense the activities of a driver and alert them when their eyes get distracted from road conditions. Additionally, various other aspects are also taken into account and implemented within a single module.

II. WIRELESS SENSOR NETWORK

Wireless Sensor Networks (WSN) is serious of sensor nodes connected in a distributed fashion. They follow random topology and are not concerned to a central point. Basically, WSN follows a clustering based protocol technique for data transmission. Nowadays, various hierarchical protocol techniques like PEGASIS, ETR have emerged in this field to avoid collision and interference. Usually, a network consists of several nodes that incorporate a source (transmitter), a gateway (passage) and a sink (receiver).

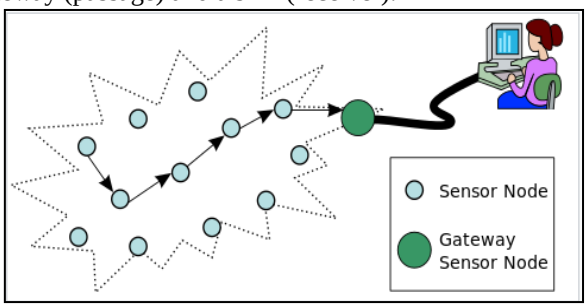

Fig. 1: A WSN Network

In recent days, WSN and MANET are topmost areas of research that have proved successful in implementations. Starting from medical to military, WSN finds application in various fields like environment tracking, animal tracking, flood detection, forecasting and in telematics.

III. PROPOSED WORK

The alignment of various sensors in a vehicle is shown in the Fig.2. Each sensor has its own importance and functionality that is explained in the upcoming section. Starting from the steering wheel to the rear outside mirror sensor nodes are equipped all over the vehicle inorder to avoid the possibility of an accident. Inorder to keep a driver-focused, we gather some data such as brain wave, neural oscillation, and workload so that we can keep them alert whenever they get diverted.

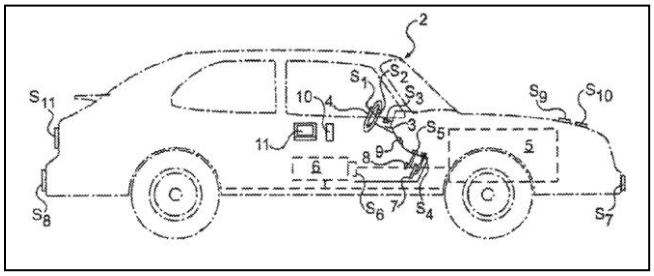

Fig. 2: Sensor implementation in a vehicle

The Driving act is carefully screened from activities like accelerating, reaccelerating, high speed, turn negotiation and so on…if they are expected and marked as dangerous, there is a communication device that suppresses data and alerts the driver. Also; we have some portable telematics with a built-in camera that tracks the events and objects inside and outside the view of the vehicle. Additionally, the position of neighboring vehicles is tracked and given in a 3D view.

The main motto of this idea is the protection for both driver and the pedestrian on road. For pedestrian protection, we have sensors that enable wipers to clear the front glass thus eliminating dirt and blind spot. As said before, we have

aspects of mirror adjustment in this work. Sometimes, the driver's get distracted by improper mirror positions. To help them during the drive, we have dealt with another aspect that is none other than automatic mirror adjustment. Based on driver position, the rear mirrors inside and outside the vehicle is adjusted to facilitate in safe driving.

Last, but not the least, smartphones sets as a major distraction and to overcome it, in this work, we have proposed smart speaker where the incoming calls are routed to a speaker and it could be attended in case of any emergency else can be directed to another person. If the driver considers it an inconvenient one, he can disable all incoming calls and see to them later too.

IV. BLOCK DIAGRAM

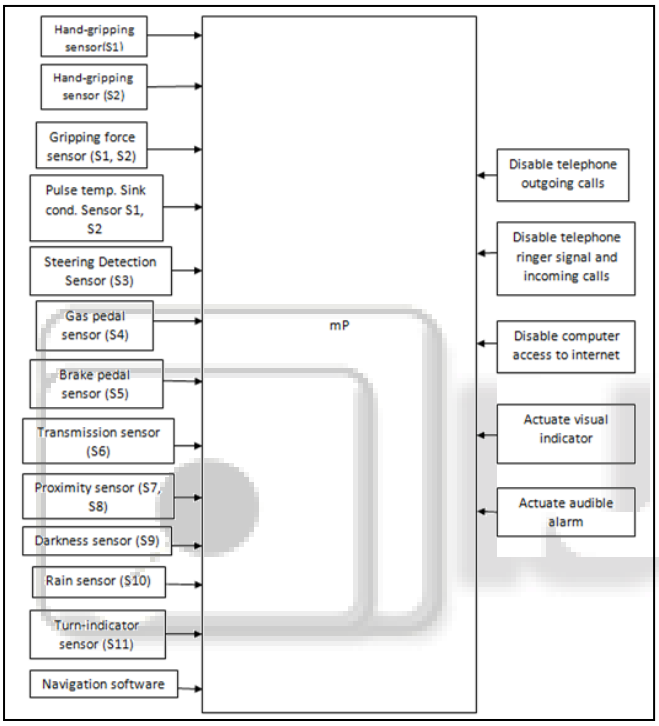

Fig. 3: Association of sensors to a Microprocessor

The entire sensor discussed on the above-proposed system schematic Fig.2. are connected to a single microprocessor that process data from various nodes. The functionalities of various sensors are as follows:

- Sensors S1, S2 and S3 are present on the steering wheel helps in sensing the changes in steering direction or actuation. It also detects whether the driver's hands are on the steering wheel if not it performs according to the block diagram that is given in Fig. 4.

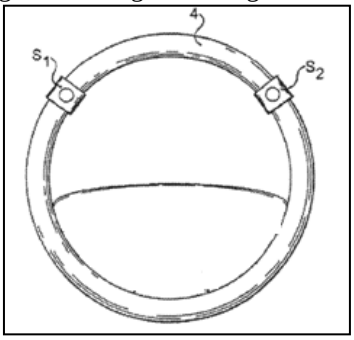

Fig. 4: Sensor alignment on the steering wheel

- S4 senses the speed and acceleration level of the vehicle while S5 has the ability to sense braking pedal condition. For sensing the transmission, S6 sensor is also available.
- In certain conditions, it is mandatory to check the proximity conditions of other vehicles and for this purpose, S7 and S8 sensors are fixed in the processor.
- To sense darkness within the vehicle and activation of any headlight, Sensor S9 is exclusively fitted within the circuit.
- One of the causes of distraction is the change in weather conditions and in order to sense the weather conditions like temperature, rain, and snow, we have Sensor S10 in hand that sense activation of rear and front wipers.
- All these sensors have the ability to execute their functions only when the vehicle is moving. Also, in order to disable the telephone calls and other email notifications there are built-in nodes like 10 and 11 in the software. They have the ability to suppress those external signals and once the drive is complete the driver can access the missed activities.
- As discussed before, one of the aspects is drowsiness and to overcome it, an audio alarm is also available. As an alternate, vibration in the seat, blower speed can also be included.

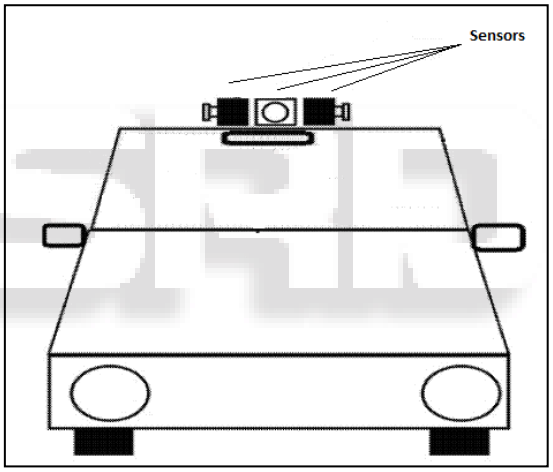

Fig. 5: Front view of a sensor that is present on top of a vehicle to avoid glare by means of sunlight

In the top of the vehicle, we have a sensor that helps in sensing the temperature or sunlight and in turn helps in avoiding the glare caused by it that is what illustrated in Fig.5. Further, energy or power sets as a major challenge in the sensor and to overcome it, the solar energy can be harvested and converted into a conventional source of energy that can be used to energize the operation of the sensor and thereby, image transferring and processing is made possible.

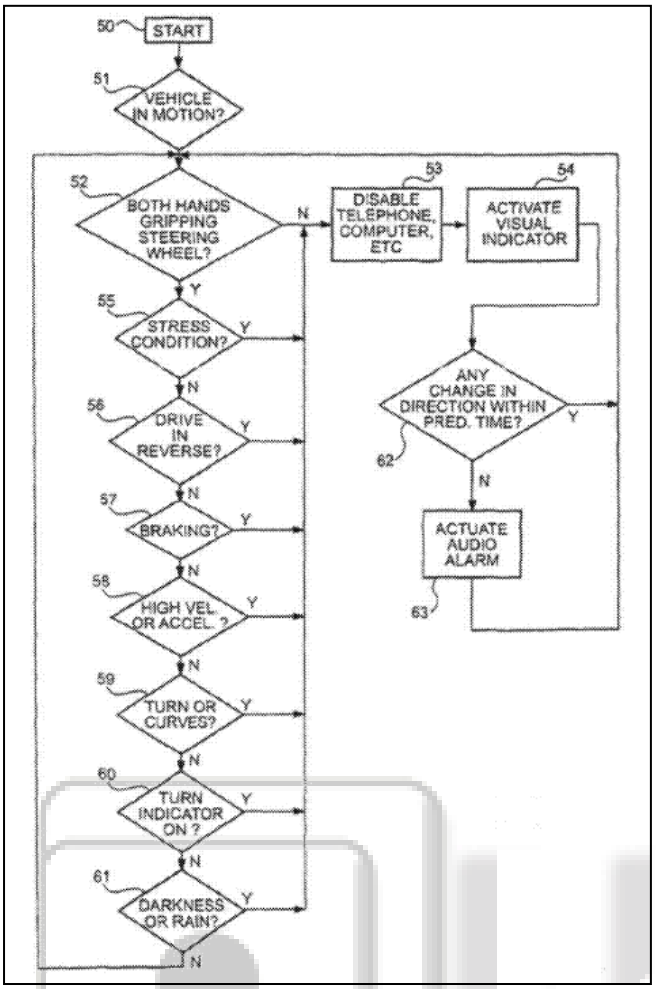

Fig. 6: The Flow chart on serious of operation followed by sensors

The operation and execution of the proposed work are based on a simple flow chart that is explained in Fig. 6. When the vehicle is in motion, the sensors S1, S2, S3 checks whether both the hands of the driver is on the steering wheel. If it is yes, it tests the stress condition else it disables the telephone calls, computer, email notifications and so on…additionally, it activates the visual actuator as well. If there is any change in the pre-defined direction, it alerts the driver with an alarm thus helping the driver to wake up from drowsiness. If stress condition is normal, further braking and other sensors are activated.

V. Conclusion

Thus with the help of a simple WSN that comprises of various sensors into consideration, we can build a safety control system for vehicles. The implementation is really easy and the energy issue is overcome with the help of usage of a conventional source of energy. The operation is hence explained in detail.

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