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Smart Vehicle System for Accident Prevention

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Abstract - *We present a smart night vision system for automobiles in this paper. This system, developed mostly by adopting infrared cameras and computer vision technology, aims at improving safety and convenience of night driving by providing functionalities such as adaptive night vision, road sign finding and recognition, scene zooming and spotlight projection. We have tested the system in both replicated laboratory environments and in field highway environments. Initial results show the possibility of constructing such a system.*

Driving without buckle the seat belt was one of the most common traffic offenses in India. With 6,175 charges left in the first six months, Young drivers were the minimum likely to buckle up seat belt. In the year 2011 an analysis conducted, it was found that 55% university students did not regularly wear a seat belt. We all thought on this careless behavior and came to a solution that can resolution this problem. We have decided to work on this project that ensures that the driver wear's his or her seatbelt accurately and compulsory.

The safety locking system is designed to prevent accidents happening while opening the car door and to provide protection to passengers and pedestrians. To prevent accident due to passenger's inattention, in this planned to control the car door locking automatically using distance computing system, child lock and ultrasonic sensors. Due to this passengers cannot open their car door from inside while object is moving in the direction of the car. The whole system is controlled with the help of advanced microcontroller. In this proposed system we used ultrasonic sensor to detect obstacle. If the obstacle is detected within the range the card door will not open from inside.

***Key Words*: Raspberry pi 4B, Camera, display, Hall Effect Sensor, Ultrasonic Sensor, Relay, Buzzer, Door Lock Gun.**

1.INTRODUCTION

The main aim of this project is to construct a smart vehicle system with reducing the limitations of the existing method and also reduces accidental injuries. The system contains night vision for good visibility at night driving, Wearing of a seat belt is compulsory for ignition of engine and to prevent an accident happening while open the car door carelessly.

2. LITERATURE SURVEY

Accident scientists show that the driving at the night represents a substantial potential danger. In Germany, some 50 percent of the lethal car accidents happen at night, although an average of the 75 percent of all driving is for the duration of a day. A similar condition is found in a US. With a 28 percentage share of all driving, 55 percent of all fatal accidents happen at night. Accidental statistics throughout Europe as an entire also justify intensive consideration of the issue of nocturnal driving. According to estimates, approximately 560,000 people injured in the dark and 23,000 are killed. Over 25,000 accidents per year involving walkers and cyclists occur during the night in the Germany. The reason are clear; poor or significantly limited sight situations on highways and country highways, obstacles or narrow bends which are recognized too late with low beam, unsuitable judgment of the speed or distance due to deficiency of the orientation for the eye, driving into the "black hole" of the head lights of oncoming traffic, possibly exacerbated by wet, reflecting road surface. Our eyes are the first line of the defense against the hazards so, the recent innovation to help driver see better at night and in most diverse weather situations, is the "Night Vision System" The primary of this system is FLIR system thermal imaging camera. BMW is the first European premium car manufacturer that started to implement the technology in the cars. Night vision camera is assembled in the United States, installed in BMW in Germany and then spread worldwide. After its application, it goes to waste (End of life) and then

mostly recycled. Manufacturing of raw materials takes place all over world and conveyed to Autoliv[2].

Seatbelts are the secondary safety devices that operate to decrease the risk of serious or fatal injury when a crash occurs. Seatbelts have been required to be fitted to the driver's seating place to new goods-carrying vehicles over 4.5 tons since 1977 and for buses over 3.5 tons since 1987. Since seatbelt use by heavy vehicle occupants in New South Wales became compulsory in 2000, there has been a notable increase in seatbelt usage from an initial low rate of around one-third of truck occupants. Observational studies by the Center for Road Security showed that, in New South Wales in 2011, around one quarter of heavy truck drivers still unsuccessful to wear seatbelts at all times[4]. However, the wearing rates have been increasing in recent years. Among truck driver deaths, New South Wales crash data for the five-year period 2010-12 (2012 preliminary data) shows that only 24% of these drivers were not tiring a seatbelt at the time of the crash. This compares favorably to 50% of truck driver fatalities in 2008-10 and 38% in 2009-11[5]. Some attempts have been made to know the reasons for non-use of seatbelts by this driver group. This research identified factors like: restriction in the use of side mirrors, discomfort during normal driving, inconvenience when performing deliveries and sensitivities of impeding the driver's ability to move or escape from the cabin to avoid injury during or after a crash[6]. In the past, public education campaigns have been used in New South Wales to promote seatbelt use between heavy vehicle drivers. (e.g., 'Do or die: seatbelts save truckers too'). Evaluation of the campaign suggested that it was nominal in growing heavy vehicle driver awareness of the effectiveness of seatbelts in decreasing death and injury. However, it was felt that further communication was necessary to ensure that drivers are alert of their legal requirements to wear seatbelts and that operators are aware of their obligations under Workplace Health & Safety law to provide a safe working environment for their drivers. With the improvement of improved in-vehicle technology such as seatbelt warning systems, there are currently more options for ensuring seatbelt usage by heavy vehicle drivers and greater awareness of the need to encourage wearing. Investigation from the US suggests that some fleet managers discuss seatbelt use during safety meetings or have company policies requiring seatbelt use[8].

With the enlargement of road facilities, motorization and suburbanization of the country, the number of road accidents have surged. Road traffic injuries (RTI) and mortalities have Emerged as a main public health concern, with RTIs having becoming one of the prominent reasons of deaths, incapacities and hospitalizations which impose severe socio-economic Costs across the world. World Health statistics 2008 cited in global report on rod safety states that the RTIs in 2004 were the 9th prominent cause of death and at current rates by 2030 are expected to be the 5th leading cause of death, overtaking HIV/AIDS [7]. During the year 2010, there were around 5 lakh road accidents, which caused in deaths of 134,513 people and damaged more than 5 lakh persons in India. These numbers translate into 1 road accident per minute and 1 road accident death each four minute. Now India is foremost china in number of road accidents. The road safety is an issue of national concern, considering its magnitude and gravity and the consequential negative impacts on the economy, public health and the general welfare of the people. The motorist and cyclist met most number of accidents in the car. The 35% of accidents happen in the car doors. The motor vehicle occupants and non-occupants killed and injured exposes most are due to pedestrian cars. The accidental opening of door due to inattention leads to such an accident. Even the well-developed countries which are providing door zone in the road also have significant amount of accident due to opening doors. In developing countries these accidents are increasing now due to the more number of usages of cars in the latest days, the absence of door zone and the less awareness about the car door accidents. There is a need for control measures to escape this type of accident rather than to reduce these types of accidents[7].

3. SYSTEM OVERVIEW

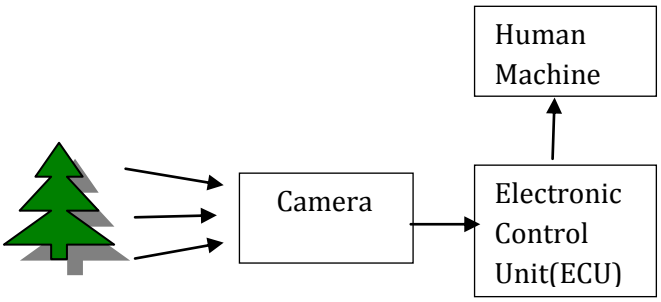

Fig 1. Block Diagram of Automotive Night vision system

We present a smart night vision system for automobiles. This system, developed mostly by implementing infrared cameras and computer vision technology, aims at improving safety and convenience of night driving by providing functionalities such as adaptive night vision, road sign detection, scene zooming and spotlight projection.

Far Infrared System (FIR)

FIR night-vision enhancement systems receive thermal radiation radiated by objects in the far infrared wavelength range between 7 and 12 µm. These so-called passive systems do not require any extra source of radiation to illuminate the objects. The picture of the camera can be processed by an ECU for picture quality enhancement and is then presented by a graphic display to the driver. The pyro-electrical thermal-image camera or micro-bolometer camera is capable to take heat images only in the wavelength range mentioned above and, therefore, cannot be used for day-applications like track recognition. The camera requires a temperature control. As these wavelengths can't pass through the windscreen glass, the camera must be mounted to the outside of the vehicle's compartment. Most thermal-image cameras use Germanium optics.

In the image of a thermal camera warm objects appear as bright curves against the dark (colder) background while cold objects are displayed dark. Only objects having a greater temperature than the ambient are detected by the camera. The supreme striking feature of the FIR image is the wide reach of the system. Pedestrians and other objects can be detected at ranges of 300 m and more. Lane markings and traffic signs, however, can be seen only ambiguously if they have adapted their temperature to the ambient air.

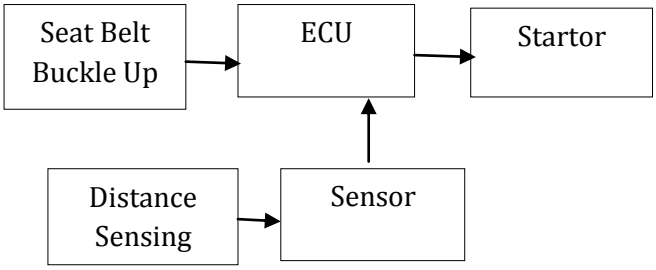

Fig 2.Block Diagram of Seatbelt alert system with ignition control

Driver does not wear the seat belt which is provided for their protection.This system consist of Hall Effect sensor to alert the driver to wear the seat belt. If it doesn't wear seat belt the car does not start until driver wear the seat belt.

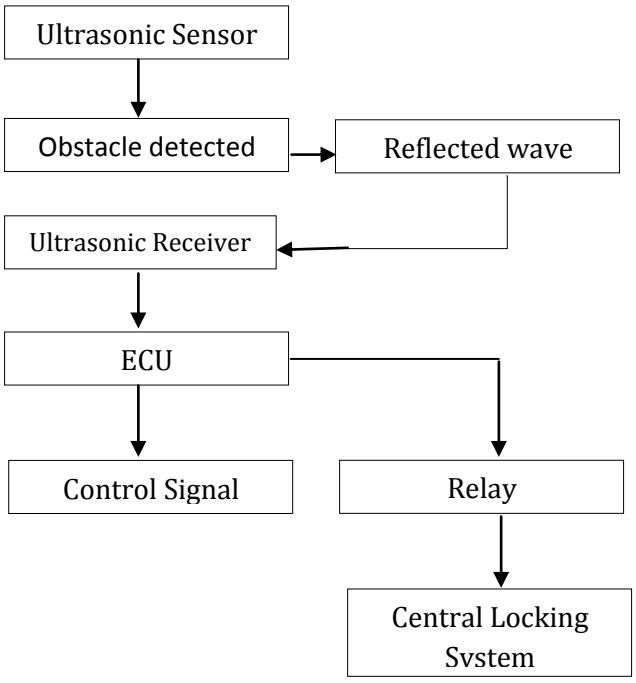

Fig 3. Block Diagram of Automated door lock system

Aim of this work is to develop dynamic safety system for the automobiles using ultrasonic sensors. Currently,

in automobiles there are not actual technologies to prevent accidents. In this work we have established a system to detect obstacles behind the vehicle, to identify road brakes or pot holes which sends signal to the driver prior to the accidents.

Table -1: Automotive Night Vision System

S. No.	Parameter	Values obtained by propsed model
1	Infrared Camera	6 m
2	Display	800x480 hardware resolution
3	Raspberry pi 4B	Quad core 64-bit ARM-Cortex A72 running at 1.5GHz

Table -2: Seat belt alert system with ignition Control

S. No.	Parameter	Values obtained by propsed model
1	Hall effect Sensor	Sensing distance Depends On field strength(Up to 1.0 inch)
2	Raspberry pi 4B	Quad core 64-bit ARM-Cortex A72 running at 1.5GHz

Table -3: Automated Door Locking System

S. No.	Parameter	Values obtained by propsed model
1	Ultrasonic Sensor	Distance: 2cm to 400 cm
2	Relay	Voltage rating 6v to 12v
3	Door lock gun	12 v DC

4. CONCLUSION

In this project we construct a smart vehicle system with minimizing the limitations of the existing method and also reduces accidental injuries. The system contains night vision for better visibility at night driving, Wearing of a seat belt is mandatory for ignition of engine and to prevent an accident happening while open the car door carelessly.

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