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DESIGN AND IMPLEMENTAION OF SAFETY MEASURES CAUSE BY DROWSINESS DETECTION IN AUTOMOTIVE VEHICLE

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Abstract
Driver's drowsiness is the major problem that causes road accidents. Unlike normal facial expression, drowsiness is defined to be a condition of exhaustion, where the expression of the face is different from usual. The important steps in detecting drowsiness are face detection and expression detection. When the detection occurs that time the hazard lights are activate automatically to warn other drivers that the vehicle is a temporary obstruction. Also we have proposed new safety method using Ultrasonic sensors. It is used to detect the obstacles in which by using transmitter and receiver signals. The barrier principle determines the distance from the sensor to the reflector (Retro-Reflective Sensor) or to an object (Through-Beam Sensor) in the measuring range. The distance measurement using ultrasonic sensors to detect obstacles and their distances. Once the obstacle has been detected and safe separation distance is reached, the vehicle will automatically get stopped and also shared control concept for lane keeping assist (LKA) systems of intelligent vehicles. The core idea is to combine system perception with robust control so that the proposed strategy can successfully share the control authority between human drivers and the LKA system. This shared control strategy is composed of two parts, namely an operational part and a tactical part. Two local optimal-based controllers with two predefined objectives (i.e., lane keeping and conflict management) are designed in the operational part. The control supervisor in the tactical part aims to provide a decision making signal which allows for a smooth transition between two local controllers. The control design is based on a human-in the-loop vehicle system to improve the mutual driver-automation understanding, thus reducing or avoiding the conflict. In particular, the control design is formulated as an LMI optimization which can be easily solved with numerical solvers. The effectiveness of the proposed shared control method is clearly demonstrated through various hardware experiments with human drivers. Its controls the steering and to go on the straight road.

Keywords: Advanced driver assistance systems (ADASs), control authority transition, human-in-the-loop control, linear matrix inequality (LMI), shared control, vehicle control.

INTRODUCTION

The report noted that Tamil Nadu has maintained the top position in the number of accidents on national highways for the fifth continuous year since 2018. Further, the state also recorded a total of 64,105 road accidents in 2022, an increase of 15.1 per cent from 2021. In recent years, an increase in the demand for modern transportation necessitates a faster car-parc growth. At present, the automobile is an essential mode of transportation for people. In 2017, a total of 97 million vehicles

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were sold globally, which was 0.3% more than that in 2016. In 2018, the global total estimation of the number of vehicles being used was more than 1 billion. A report by the National Highway Traffic Safety Administration showed that a total of 7,277,000 traffic accidents occurred in the United States in 2016, resulting in 37,461 deaths and 3,144,000 injuries. In these accidents, fatigue driving caused approximately 20% 30% traffic accidents.

Every time we open the newspaper there are news articles and cases about road accidents happening all over the world due to the driver falling asleep behind the wheel. Car accidents are a major cause of death claiming about 1.3 million deaths every year, and each year this figure is increasing [1]. Statistics have suggested that this could be even more deadly than drunk driving [2]. In India alone, drowsy driving is a cause of 40% of the total accidents in the country [3]. This is a very huge problem because a driver being drowsy. Many people who prefer booking cabs or rides at night are at a higher risk if they are allotted a driver who is in a sleepy or a drowsy state.

Many industries (manufacturing, logistics, transport, emergency ambulance, and similar) run their operations 24/7, meaning their workers work in shifts. Working in shifts causes misalignment with the internal biological circadian rhythm of many individuals, which can lead to sleeping disorders, drowsiness, fatigue, mood disturbances, and other long-term health problems [4–7].

LITERATURE SURVEY

1. This paper presents a novel shared control concept for every time we open the newspaper there are news articles and cases about road accidents happening all over the world due to the driver falling asleep behind the wheel. Car accidents are a major cause of death claiming about 1.3 million deaths every year, and each year this figure is increasing. (Ref [1]).
2. In this paper, statistics have suggested that this could be even more deadly than drunk driving. (Ref [2]).
3. In India alone, drowsy driving is a cause of 40% of the total accidents in the country. This is a very huge problem because a driver being drowsy. Many people who prefer booking cabs or rides at night are at a higher risk if they are allotted a driver who is in a sleepy or a drowsy state. (Ref [3]).
4. Many industries (manufacturing, logistics, transport, emergency ambulance, and similar) run their operations 24/7, meaning their workers work in shifts. Working in shifts causes misalignment with the internal biological circadian rhythm of many individuals, which can lead to sleeping disorders, drowsiness, fatigue, mood disturbances, and other long-term health problems. **(Ref [4-7]).**
5. This paper presents a novel shared control concept for lane keeping assist (LKA) systems of intelligent vehicles. The core idea is to combine system perception with robust control so that the proposed strategy can successfully share the control authority between human drivers and the LKA system. (Ref [8]).
6. Although technological advances have been significantly made to improve the performanceof ADAS, the control issue of active safety systems being able to share the driving responsibility with human drivers still remains challenging. (Ref [9-10]).
7. A Ultrasonic sensor is used to detect the obstacles. In the Ultrasonic sensor there is an transmitter and receiver signals which is used to detect the vehicle. A Ultrasonic setup is placed in front of vehicle and that setup consists of an emitter and a receiver. Ultrasonic emitter always emits the ultrasonic waves, whenever a obstacle is detected then wave gets reflected and receiver receives the signal. Reflected wave sends the signal to the Aurduino Nano from that based upon distance of object it actuates the brakes and then it will continue moving of the vehicle. (Ref [11]).

EXISTING SYSTEM

This paper presents the development of a solution to detect a driver's drowsiness in real time and issue alerts to avoid possible traffic accidents. In particular, an analysis of the methods used for the detection of drowsiness by computer vision is performed, focusing on the use of facial reference points. Distraction, drowsiness, tiredness, speeding and fatigue are the main causes of accidents and,

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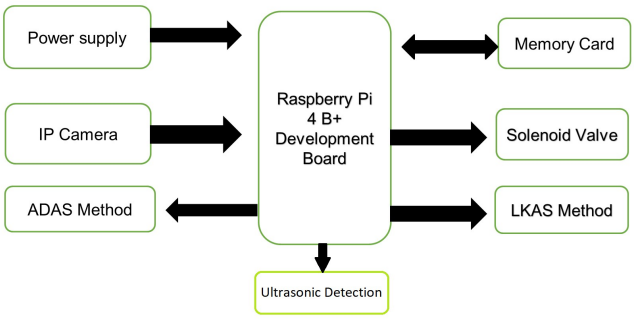
precisely, advanced driver assistance systems ADAS help reduce these serious human errors. In this system it will only detect and indicates alarm then it will slow the speed of the vehicle.

PROPOSED METHOD

Driver drowsiness is a common cause of fatal traffic accidents. In this study, Ultrasonic sensor is used to detect the obstacles. In the Ultrasonic sensor there is an transmitter and receiver signals which is used to detect the vehicle. A Ultrasonic setup is placed in front of vehicle and that setup consists of an emitter and a receiver. Ultrasonic emitter always emits the ultrasonic waves, whenever a obstacle is detected then wave gets reflected and receiver receives the signal. Reflected wave sends the signal to the Aurduino Nano from that based upon distance of object it actuates the brakes and then it will continue moving of the vehicle. A driver assistance system with a dual control scheme is developed; it attempts to perform simultaneously the safety control of the vehicle and identification of the driver's state. The assistance system implements partial control in the event of lane departure and gives the driver the chance to voluntarily take the action needed. If the driver fails to implement the steering action needed within a limited time, the assistance system judges that "the driver's understanding of the given situation is incorrect" and executes the remaining control. We used a driving simulator equipped with the assistance system to investigate the effectiveness of identifying driver drowsiness and preventing lane departure accidents and continue driving by Lane Keeping Assist System method. This process will help to continue the travel without accidents with medium speed of the vehicle.

HARDWARE BLOCK DIAGRAM



MODULE LIST

- Power Supply
- IP Camera
- Raspberry pi 4 B+
- Memory Card
- Ultrasonic Sensor
- Web Server
- Solenoid Valve
- Ultrasonic Sensor

MODULE DESCRIPTION

Power Supply:
SMPS
A Switched Mode Power Supply (switching-mode power supply, switch-mode power supply,

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switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads, such as a personal computer, while converting voltage and current characteristics. Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low-dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. Voltage regulation is achieved by varying the ratio of on-to-off time (also known as duty cycles). In contrast, a linear power supply regulates the output voltage by continually is spiting power in the pass transistor. Switching regulators are used as replacements for linear regulators when higher efficiency, smaller size or lighter weights are required. They are, however, more complicated; their switching currents can cause electrical noise problems if not carefully suppressed, and simple designs may have a poor power factor.

Raspberry Pi 4 B+:

The Raspberry Pi 4 Model B is the latest version of the low-cost Raspberry Pi computer. The Pi isn't like your typical device; in its cheapest form it doesn't have a case, and is simply a credit-card sized electronic board of the type you might find inside a PC or laptop, but much smaller. The Raspberry Pi 4 can do a surprising amount. Amateur tech enthusiasts use Pi boards as media centres, file servers, retro games consoles, routers, and network-level ad-blockers, for starters. However that is just a taste of what's possible. There are hundreds of projects out there, where people have used the Pi to build tablets, laptops, phones, robots, smart mirrors, to take pictures on the edge of space, to run experiments on the International Space Station and that's without mentioning the more wacky creations teabag dunker anyone. With the Pi 4 being faster, able to decode 4K video, benefiting from faster storage via USB 3.0, and faster network connections via true Gigabit Ethernet, the door is open to many new uses.

IP Camera:

An Internet Protocol camera, or IP camera, is a type of digital video camera that receives control data and sends image data via an IP network. They are commonly used for surveillance but unlike analog Closed-Circuit Television (CCTV) cameras, they require no local recording device, only a local area network. Most IP cameras are webcams, but the term IP camera or net cam usually applies only to those that can be directly accessed over a network connection, usually used for surveillance. Some IP cameras require support of a central Network Video Recorder (NVR) to handle the recording, video and alarm management. Others are able to operate in a decentralized manner with no NVR needed, as the camera is able to record directly to any local or remote storage media**.**

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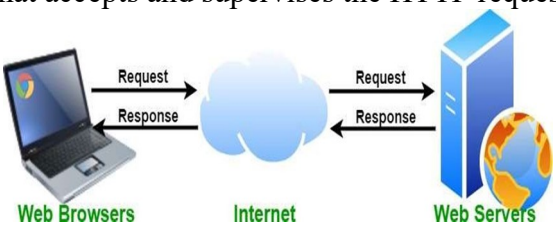
Memory Card:
A memory card or memory cartridge is an electronic data storage device used for storing digital information, typically using flash memory. These are commonly used in portable electronic devices, such as digital cameras, mobile phones, laptop computers, tablets, PDAs, portable media players, video game consoles, synthesizers, electronic keyboards and digital pianos, and allow adding memory to such devices without compromising ergonomic, as the card is usually contained within the device rather than protruding like USB flash drives.

Web Server:
A web server is a computer system that processes requests via HTTP, the basic network protocol used to distribute information on the World Wide Web. The term can refer to the entire system, or specifically to the software that accepts and supervises the HTTP requests.



The primary function of a web server is to store, process and deliver web pages to clients. The communication between client and server takes place using the Hypertext Transfer Protocol (HTTP). Pages delivered are most frequently HTML documents, which may include images, style sheets and scripts in addition to text content.

Open CV:
Open CV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage (which was later acquired by Intel). The library is cross-platform and free for use under the open-source Apache 2 License. Starting with 2011, Open CV features GPU acceleration for real-time operations.

Solenoid Valve:
A fuel shutoff solenoid is an electromagnetically-operated valve used to remotely cut the fuel supply to an engine. The solenoid typically consists of a valve body with an integral solenoid

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assembly connected to the valve stem. When the solenoid is energized, the motion of its plunger retracts the spring-loaded valve poppet from its seat, allowing fuel to pass through the valve. When the solenoid is deactivated, the valve spring pulls the poppet back onto its seat effectively cutting the flow of fuel. The shutoff solenoid may be manually activated or be part of an automated engine management system.

ULTRASONIC SENSOR:

The ultrasonic sensor is used to detect the lane on the road and then the vehicle will follow the centre inbetween the lane. The steering will be automatically controlled by the LKAS process, Then it will be keep going for few distance or upto the drowsy driver will be alright and take control the steering.

RESULT:

This paper has discussed an assistance system that is effective for preventing of sleep-related vehicle accidents. A multilayered assistance with a dual control scheme, which could assist in reducing sleep-related accidents, was presented. The assistance system judges the driver's state in a multilayered way through the interaction between the driver and the assistance system in addition to executing the first- and second-stage controls to maintain safety.

The assistance system assisted the driver only when almost really needed in lane departure situations and braking by Ultrasonic sensor.

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