iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** V **Month of publication:** May 2021

DOI: https://doi.org/10.22214/ijraset.2021.34760

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue V May 2021- Available at www.ijraset.com

Effectiveness of ADAS in Existing Vehicles

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Abstract: ***Around the whole world, lot of accidents occur due to inattentive driving and human errors. Partial Autonomous Driver Assistance System can be of lot of help to the driver in avoiding the collision and maintain the control of the vehicle by giving different warning signals. The system consists of (i) Forward Collision Warning (ii) Lane Departure Warning. In the existing vehicles, by adding RADAR Sensors and Camera and a microcontroller for processing, it can be used to track the lanes and gives an acoustic warning in advance if there is lane departure or any vehicle or pedestrian ahead. The proposed system can be implemented on raspberry pi microcontroller board.***
Keywords: FCW, LDW, Advanced Driver Assistance System.

I. INTRODUCTION

According to Overview of Road Accidents in India [1], around 78.4% of road accidents in are caused due to driver errors, so in such scenario its better to add the AdvancedDriver Assistance System (ADAS) some features into the existing vehicles in order to reduce road accidents and hence there can be possibly increase in the Road Safety Index[2]. With the advancement of the various types of sensors it is made possible to implement ADAS to prevent or minimize theconsequences caused due to accidents in the existing vehicles.

The concept of integration of the Lane Departure Warning and Forward Collision Warning System using RADAR and Camera Sensors is presented in this paper. Now-a-days, many automotive vehicle manufacturers are providing various different and useful features, which are proving to be lot of helpful in reducing the number if road accidents and passengersafety[3]. But all these ADAS features are present in the newer vehicles, whereas majorly there are old vehicles running on the roads all over the roads without all these safety features. Hence some of the existing ADAS features, which will prove very useful in reducing the number of Road accidents and increase in passenger safety, needs to be integrated in the existing vehicles. With small addition of some hardware components and integrating them in existing vehicles, some of the ADAS features can be implemented.

II. MOTIVATION AND BACKGROUND

A. Forward Collision Warning

Many a times, due to negligence of the driver (in most of the cases driver drowsiness), there are high chances that the car will hit either some steady object or any moving car or truck from the back. So, in order to bring awareness to the driver, the Forward Collision Warning Feature will be theutmost useful one. Many advance electronics High-endsensors like LIDAR, RADAR sensor and Camera Module is used to detect if any object or moving car or truck is there is front of the vehicle and if it is going too near it sends acoustic signal to the driver and hence accident can be reduced to a greater extent.

B. Lane Departure Warning

It will be one of the most useful features to beimplemented in the existing vehicles. According to study, most of the driver change lanes without giving any proper indicator while changing the lanes and also, they change lane or get deflected from their current lane because of negligence, and it is one of the major reason why accidents happens on the roads. So, with the same hardware as the Forward Collision Warning Detection system, the lane departure warning system can be also included. If any driver is going out of the lane abruptly, then the system will send a acoustic signal messageto the driver, and hence accidents can be avoided with the implementation of this system too.

III. SYSTEM OVERVIEW

The Proposed system for implementing these two major ADAS features i.e. Forward Collision Warning as well asLane Departure Warning System can be implemented in two steps (i) Forward Collision Warning System (ii) Lane Departure Warning System. The proposed system is implemented on raspberry pi board interfaced with various sensors like camera, Display, buzzer an d R AD A R sensor.

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The Block Diagram of the System is shown in Fig 3.1.

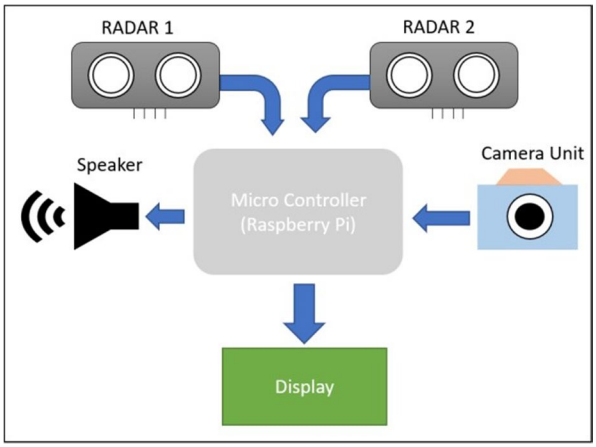

Fig. 3.1 overview of the system

In the existing system, we need to add a camera to capture images and process it using image processing algorithms for lane departure. The purpose of the RADAR will be to identify if any object or moving Car or Truck isthere in front of the test Vehicle. The Forward Collision Warning System can be implemented through the fusion of inputs from the RADAR and Camera Module, and the whole of the processing will take place in the Raspberry Pi Microcontroller.

The warnings will be given to the driver for Forward Collision Warning and Lane Departure Warning System when the situation arises in the form of acoustic output specifying that the vehicle is moving out of the specific lane and when the test vehicle is too close to hit the forward object or any moving car or truck.

Along with the acoustic output, the output of the Warnings can be also given on one display unit which can be placed in the driver cabin so that driver can be alerted. And also for further advancements and improvement in theForward Collision Warning and Lane Departure Warning System, the steering wheel can be vibrated a bit, in order to awake the drowsy driver, and with all these implementations, the road accidents can be reduced to a greater extent.

IV. METHODOLOGY

The major parts involved in lane detection is capturing theimage, processing that image via the Raspberry Pi microcontroller and also taking input from the RADAR module and then integrate the input received from the RADAR as well as the Camera Module, and give appropriate warnings to the driver, in order to improve the Road Safety.

V. CONCLUSION

This paper has presented a Lane Departure Warning and Forward Collision Detection System that can be integrated in the existing vehicles using a camera module, RADAR, and Raspberry PI microcontroller and for warning the driver Acoustic and Visual Display units can be used. If any forward object is detected or any moving car or truck is very near toour test vehicle and if lane departure is detected, the raspberry pi will process the received inputs according and provide necessary instructions to the driver in order to reduce the number of accidents.

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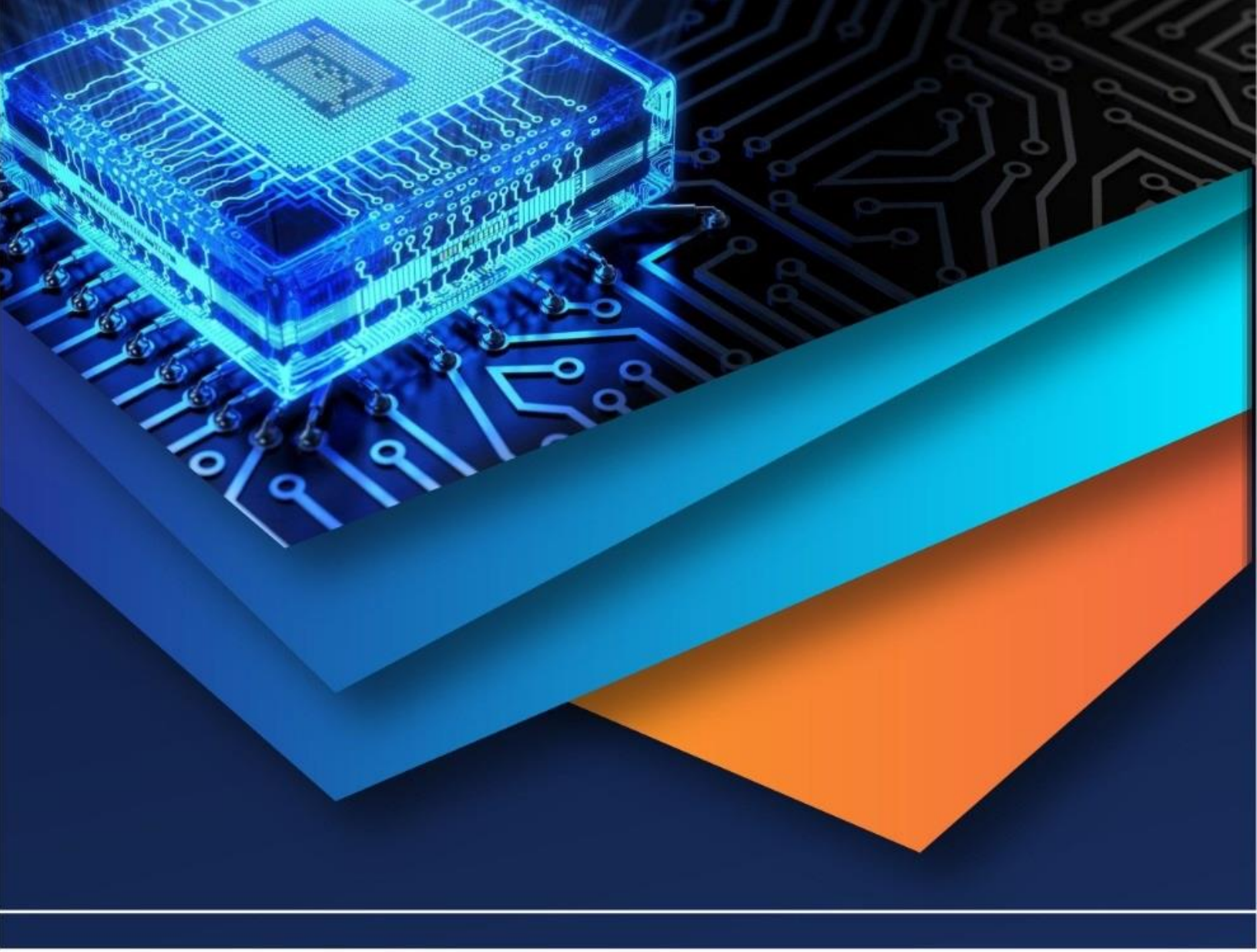

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