

## ABSTRACT

Exponential increase in population resulting in a dramatic increase in the need for transportation of goods and commuting on the limited road infrastructure has resulted in congestions, accidents, losses and delays. Several Collision Avoidance Systems (CAS) have been developed, but till date fool proof CASs and for the cheapest cars have not been developed. The aim of this research is to develop better algorithms for cheaper cars.

In CAS-VTSD algorithm the Variable distance Threshold values calculated from Stopping Distance, which is calculated from the speed of the vehicle, has been proposed for on-road vehicles, which has not been attempted earlier. During implementation, IR sensor's response was found smooth for white obstacles and not smooth for black, green, blue and red obstacles. Performance of ultrasonic sensor was found better than IR sensor. Code Execution Delays in software increased the probability of collision; therefore, Code Optimization Techniques must be used. In CAS-FTD algorithm, implemented for off-road vehicles, Fixed Threshold value is used for the Distance between the vehicle and obstacle. In CAS-FTDS proposed for off-road vehicles, Fixed Threshold value is used for the Distance between the vehicle and the obstacle and Speed of the vehicle (CAS-FTDS). All the three algorithms do not require more sensors since the parameters required are only distance and the speed which makes the system simpler and cost effective. CAS-Lane Center Sensing and Direction Change Algorithm (CAS-LCSDCA) and CAS-Lane-Boundary Sensing Algorithm based on Width of the Lane (CAS-LBSA-W) ensure that the vehicle moves in the center of the lane. During implementation of CAS-LCSDCA, it was observed that PID controller is a must to achieve wobble-less lane-center line following and sharp turns to ensure that the accuracy and precision of tracking rate is kept optimal, to avoid mixing of tracks, to ensure faster detection of tracks and to

achieve faster reaction time. CAS-Obstacle Sensing and Lane Changing (CAS-OSLC) algorithm using multiple sensors for Obstacle Sensing and Lane Changing has been proposed. The Feasibility of using Inter Vehicular Communication (IVC) for CA was confirmed successfully using LabVIEW. The CAS-IVC Algorithm has been successfully demonstrated using 8051 Microcontroller development boards and implemented using Freescale Smart Cars. Distance measurement was done using Received Signal Strength Indicator (RSSI) which proved to be non-linear thereby necessitating the usage of Road-Side Infrastructure for distance measurement, identification of vehicles, time of crossing of a particular location and also initiating actions to avoid collision. The idea of using hardware, infrastructure and software of ITS for collision avoidance has been successfully attempted. Low cost, universal application, less complexity and easy integration with ITS are its salient features.