



**ULTRASONIC PARKING SENSORS USING TRIANGULATION
ALGORITHM**

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ABSTRACT

This work presents the design and implementation of ultrasonic parking sensors using the triangulation algorithm. Multiple surveys recorded in the past indicated that there are substantial amounts of backover crash incidents that occurs between vehicles and pedestrians. The main cause of this problem is the vehicle's inherent blindspot that the drivers have to face during a reversing maneuver and also the innacuracy of the parking sensors in measuring the distance accurately. Previous studies have shown that the use of triangulation can improve distance measurement accuracy. Hence, this project exhibits the proof of concept of triangulation in improving distance measurement accuracy. Two HC-SR04 ultrasonic transducers and an Arduino microcontroller were interfaced and programmed to utilize the triangulation formula in its distance measuring process. The sensors used the triangulation formula to obtain accurate readings, where a fixed object was measured at varying distances. Data was compared between the actual distance and the distance measured by triangulation. The findings revealed that the triangulation algorithm can be implemented into the parking sensor system in order to improve distance measurement accuracy with only a percentage of error in the range of 0-5%.

CHAPTER 1

INTRODUCTION

1.1 Project Background

A backover crash is defined as a type of incident, in which a non-occupant of a vehicle (*i.e.*, a pedestrian or cyclist) is struck by a vehicle moving in reverse. In the United States, it was reported that the annual backover crash injuries total approximately 180000 (4000 on-road, and 14000 off-road) in 2008 [1]. A significant portion of backover crashes occurs off-road like in driveaways and parking lots. The most prevalent cause of backover crashes involved either the driver or the pedestrian was not looking properly during the vehicle's reversing maneuver. Backover crashes often resulted in injuries for the pedestrian and damages inflicted to the vehicle. These cases should not be looked lightly upon as both sides have something to lose.