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ACCIDENT CONTROLLER USING ATmega328P MICROCONTROLLER AND ULTRASONIC SENSORS

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***Abstract*- Accident is an unfortunate incident that happens unexpectedly and typically resulting in damage or injury. Accident Controller Using Microcontroller (ATmega328) is a method which uses ultrasonic sensors to prevent chances of accident. The proposed system includes two types of driving modes, Automatic and Manual. In automatic mode, sensors will be active, depending on which sensor has sensed the obstacles it will perform the corresponding task of taking a turn, reducing speed and applying brakes. In manual mode, sensors will be inactive, steering and braking system will be under the control of driver.**

I. INTRODUCTION

Driving is an obligatory action used by most people. The numbers of vehicles are increasing day by day. India accounts for more than 2,00,000 deaths because of accidents, according to the Global Road Safety Report, 2015 by the WHO. Most of the accidents on highways have been taking hundreds of lives each year. Accident may occur anytime and anywhere that cause harm to nature or human violation and death. The main reason behind the happening of most of accidents is due to the delay in applying of brakes. The proposed method is designed to progress a new system that can give solution to a problem where the driver fails to apply the brake manually but the brakes will be automatically applied by the vehicle on detecting the obstacles by the sensors.

In this proposed system, for the purpose of safety, the braking system and speed of the vehicle can be controlled automatically. The system uses ultrasonic sensors which act as a ranging sensor, whose functions rely on the ultrasonic waves. The main target of this system is to reduce the possibility of an accident. When sensors sense an incoming obstacle very close to the car, it triggers a signal indicating a hazardous situation. The signal generated is then handled by the microcontroller and required actions are taken, which includes automatic braking of vehicle to steer clear of an accident from taking place and to reduce extreme or austerity of injury.

The system also allows the driver to manually handle the situation i.e. by disabling the "automatic-mode". This is very helpful in the case of city-drive where the system can avoid dealing with frequent traffics. This perceptive and combination of innovative sensors and systems are a benchmark on the road to automatic control and an accident preventive driving.

Fig. 1. Collision of vehicles

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II. EXISTING RESEARCH

Many researchers have discussed the potential advantages of various accident avoiding systems. Shweta I Hiremath and Shruti M Sampagoan researched about Adaptive Cruise Control System for Two Wheelers to Avoid and Reduce Accidents which controls the speed of the vehicle through brake control and fuel flow control [1]. Vehicle Movement Control and Accident Avoidance in Hilly Track in which GPS technology takes care of the location of the vehicles with respect to the hairpin bend to decide the priority in which vehicles have to move [2]. Vehicular Collision Avoidance Support System (VCASS) based on IVC in order to prevent a vehicular accident beforehand. The system grasps the relative locations vehicles by exchanging the GPS information with each other. The system warns drivers if it estimates the possibility of vehicular collisions [3]. A Review paper on Automotive Crash Prediction and Notification Technologies it provide brief review on the technologies proposed to predict the collision between vehicles, before the collision happens itself and smart activation of safety systems like air bag deployment, seat belt tightening etc. [4]. Fuzzy Blind-Spot Scanner for Automobiles. This system exploits the power of sensor technology using multiple low-cost ultrasonic sensors to monitor the designated blind spots in a vehicle [5]. Rear-end collision warning system on account of a rear end monitoring camera in which they attempted to analyze the driving environmental data and built up the rear-end collision warning logic on account of image processing. The main idea of the warning system is to prevent accidents caused by inattentive drivers [6]. Vehicle Collision Avoidance System Using Wireless Sensor Networks a feasibility study on vehicle collision avoidance system using wireless sensor networks. The collision avoidance can be done by Laser sensor. Vehicle collision avoidance system can be identified by using Laser rays with the laser transmitter and laser receiver [7]**.** Inter-vehicle Collision Avoidance Using Zig-bee Sensor Networks provides timely safety information for drivers who do not have any idea of happening collision. This system calculates the distance covered by vehicle from the moment brakes are applied till it stops and the time taken by it, at variable speeds [8].

III. PROPOSED SYSTEM

To reduce the happening of an accident, the system is going to use the Arduino tool kit and the ultrasonic sensor. The following terms gives the brief explanation about the working of each component.

A. Arduino -

The proposed system works on the Arduino Uno tool kit. The below Fig. 2 shows the technical details and architecture of an Arduino. Arduino is an open-source prototyping platform based on easy-to-use hardware and software.

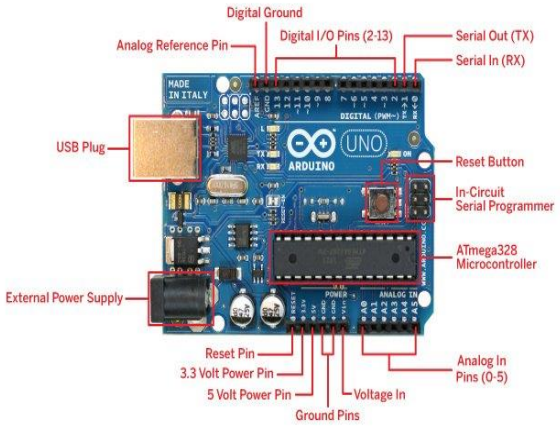

Fig. 2. Arduino Uno tool kit

B. Sensors Working -

The system includes ultrasonic sensors, microcontroller (ATmega328) and Bluetooth module as shown in Fig.3. The ultrasonic sensors uses electrical to mechanical energy transformation to measure distance from sensor to the target object and to sense the obstacles or the things which comes in the sensing range of the ultrasonic waves. The system emits an ultrasonic pulse, and records the received signal during a time of 0.1 seconds. This operation is carried out every 0.2 seconds, which is more than sufficient time to process the ultrasonic signal.

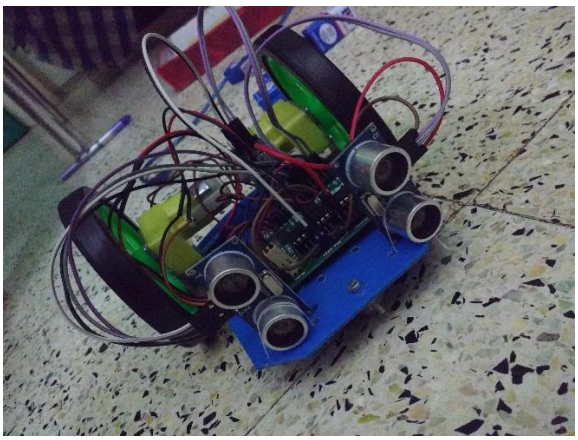

Fig.3. A smart robot car

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An ultrasonic sensor consists of a transmitter and receiver which are available as embedded unit as shown in Fig. 4. The waves transmitted are received by receiver and hence measure of time taken can be calibrated to find distance. Automatic steering is controlled based on which sensor (Left or Right) has sensed an obstacle.

The automatic brake system activates when the both sensors sense an obstacle simultaneously. System allows 2 mode of operation- Manual-mode and Automatic-mode.

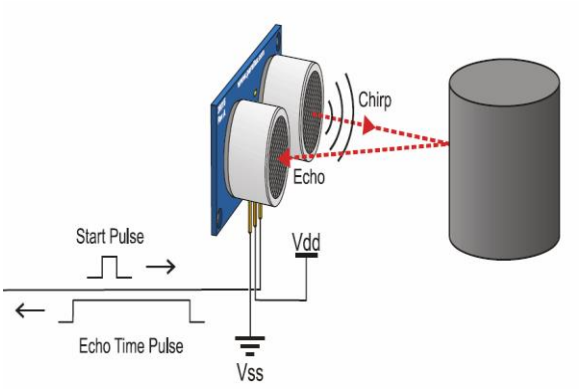

Fig. 4. Ultrasonic sensor

MANUAL-MODE:

In manual mode, the sensors will be inactive. The steering of vehicle and the brake system will be under the control of driver. This is very helpful in the case of city-drive where the system can avoid dealing with frequent traffics.

AUTOMATIC-MODE:

In Automatic mode, the sensors will active. The steering of vehicle and brake system will be automatically controlled by the proposed system. When the left sensor sense an obstacle the steering is automatically steered in right direction and applies the brake after some specified time avoiding the collision.

When the right sensor sense an obstacle the steering is automatically steered in left direction and applies brake after some specified time avoiding the collision.

When some other vehicle or obstacle which comes exactly opposite to our vehicle, then any one of two sensors (either Left or Right sensors) will sense the vehicle or obstacle and performs the corresponding task as shown in Fig. 5.

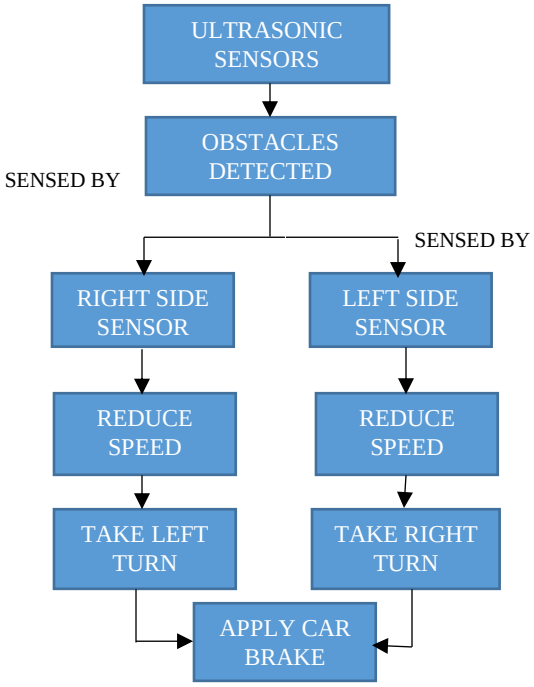

Fig. 5. Block diagram of proposed module

C. Results And Discussions -

Implementation of this system in all vehicles will reduce the chances of happening of accidents and improves the safety levels for vehicles. The below Table -1 shows the action taken by the vehicle depending on the distance of the obstacle and the sensor which have sensed that obstacle.

Table -1 Results of the project

DISTANCE (in cm)	ACTIVE SENSOR	ACTION TAKEN
10	LEFT	RIGHT TURN, STOP
10	RIGHT	LEFT TURN, STOP
7	LEFT	RIGHT TURN, STOP

7	RIGHT	LEFT TURN, STOP
11 to 30	LEFT	REDUCE SPEED
11 to 30	RIGHT	REDUCE SPEED
Above 30	NONE	NONE

IV. CONCLUSION

The framework of the proposed system is developed for a safety car braking system using ultrasonic sensor and to design a vehicle with less human attention to the driving. Although accidents in the city do not normally have very grave consequences, their high number justifies the use of new systems like the one proposed. The same can be implemented in aircrafts, submarines. But automatic brakes cannot be used always. So it can be replaced by action of automatic diversion with the help of various sensors such as radar sensors, distance sensors, etc. There are experiments which are being conducted with challenging on-road datasets. The results displayed are that of a combined approach which outperforms than a feature-based approach in a disturbed environment.

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