Accident Avoidance Robot using IoT

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***Abstract*- The project is design to build an accident avoidance robotic vehicle using ultrasonic sensors for its movement. A micro-controller (AT mega 8) is used to achieve the desired operation. A robot is a machine that can perform task automatically or with guidance. Robotics is a combination of computational intelligence and physical machines (motors). Computational intelligence involves the programmed instructions. The project proposes robotic vehicle that has an intelligence built in it such that it directs itself whenever an accident comes in its path. This robotic vehicle is built, using a micro-controller of AT mega 8 family. An ultrasonic sensor is used to detect any accident ahead of it and sends a command to the microcontroller. Depending on the input signal received, the micro-controller redirects the robot to move in an alternate direction by actuating the motors which are interfaced to it through a motor driver.**

Key Words: Robotic vehicle, Ultrasonic sensor, Motor driver.

1. INTRODUCTION

Accident avoidance is a primary requirement of any autonomous mobile robot.Accident avoidance Robot is design to allow robot to navigate in unknown environment by avoiding collisions.Accident avoiding robot senses accidents in the path,avoid it and resumes its running. There are some very famous methods for robot navigation like wall-following, edge detection, line following. One of the commercial systems uses wallfollowing method on a floor cleaning robot for long hallways. A more general and commonly employed method for accident avoidance is based on edge detection. A disadvantage with accident avoidance based on edge detecting is the need of the robot to stop in front of an accident in order to provide a more accurate measurement. All mobile robots feature some kind of collision avoidance, ranging from primitive algorithms that detect an accident and stop the robot in order to avoid a collision, using some sophisticated algorithms, that enable the robot to detour accidents. The latter algorithms are more complex, since they involve detection of an accident as well as some kind of quantitative measurements concerning the accident's dimensions. Once these have been determined, the accident avoidance algorithm needs to steer the robot around the accident and resume motion toward the original target. In this paper the steering algorithm ensures that the robot does not have to stop in front of an accident during its navigation.Hence the robots may overcome some of the problems during navigation, which are discussed above and it can navigate smoothly during its operation avoiding the collisions. We have presented a basic algorithm and design which can be further improved depending upon the required applications.

2. RELATED WORKS

2.1 TURNING CONVENTIONAL VEHICLES IN SECURE PUBLIC AREAS INTO CONNECTED VEHICLES FOR MONITORING APPLICATIONS

Remote and mobile vehicular monitoring has become a very important need since over speeding vehicles or reckless driving can be a threat to life and property. In this work, we propose a framework to convert the conventional vehicles into connected vehicles in secured areas such as educational institutions, residential societies, hospitals and etc. where the entry and exit points are secured by gates. We designed a GPS based wireless hardware system to monitor the speed and location of a moving vehicle. As the conventional vehicle enters through the gate, the security guard gives this device to the driver and removes it when the vehicle exits. Once activated inside the region, the system monitors the speed of the vehicle and communicates any rule violations to the security station in the premises and also to the driver. If the speed of the vehicle increases beyond the threshold limit, the vehicle driver is alerted and a warning message is communicated to the system. A record of the driving patterns is separately maintained at the receiver unit so that the penalizing action can be taken against the defaulters. The effectiveness of the proposed system is validated with the results of a field trial with different drivers, with and without our hardware prototype installed in the vehicle for a period of two days on a pre-defined route. The average number of over speeds from day 1 to day 2 was reduced by 63%. Our system is promising to increase safety in secured residential areas.

2.2 VEHICLE TO VEHICLE COMMUNICATION

In this project, we proposed the V2V technique in the field of accident safety. Here we proposed, each module are installed in the each vehicles to sense the status of alcohol consumption of driver, status of vehicle speed, status of drowsiness of the driver, status of vehicle brake by means of corresponding sensor and microcontroller. RF transceiver is used for V2V wireless sensor network communication. V2V is used for communicating the status of the vehicle to other vehicles. RF range is about 300 meters. The status of the vehicle can be communicated while the other vehicles are come inside the RF range. One vehicle vehicle's status is indicated by voice to other vehicles if abnormal status is occurred. And also vehicle data status can be updated on AOT system.

2.3 VEHICLE INSTRUMENTATION FOR CRASH TESTING

Apparatus and method for verifying effects of a motor vehicle accident involving at least one vehicle adapted to be advanced towards a pre-defined point of collision at a predetermined speed. The apparatus and method provides for the employ of a drive mechanism for setting the vehicle into motion.

In order to be independent of the type of vehicle and at the same time to be able to achieve a realistic accident sequence including the simulation of different braking operations and speed variations as well as a start motion procedure building up to a preselected speed, the vehicle's own drive mechanism, an optionally provided clutch and the vehicle's brake are adapted to be controlled by actuators connected to a fluid pressure actuating and control system including a supply reservoir and a number of selectively controllable valves for the simulation of an accident.

3. METHODOLOGY

We have presented a basic algorithm and design which can be further improved depending upon the required applications.

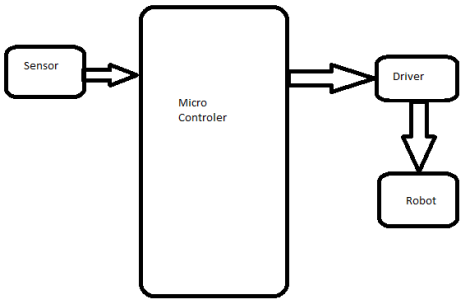

Fig 3.0 Block diagram

All mobile robots feature some kind of collision avoidance, ranging from primitive algorithms that detect an accident and stop the robot in order to avoid a collision, using some sophisticated algorithms, that enable the robot to detour accidents.

The latter algorithms are more complex, since they involve detection of an accident as well as some kind of quantitative measurements concerning the accident's dimensions. Once these have been determined, the accident avoidance algorithm needs to steer the robot around the accident and resume motion toward the original target.

3.1 ARDUINO UNO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

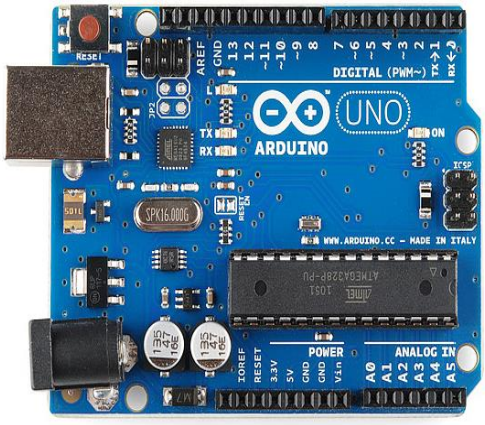

Fig 3.1 Arduino Uno board

3.2 GAS SENSOR DETECTOR AND WORKING PRINCIPLE

Gas detectors measure and indicate the concentration of certain gases in an air via different technologies. Typically employed to prevent toxic exposure and fire, gas detectors are often battery operated devices used for safety purposes. They are manufactured as portable or stationary (fixed) units and work by signifying high levels of gases through a series of audible or visible indicators, such as alarms, lights or a combination of signals.

Fig 3.2 Gas sensor module

A reliable method of measurement for gas quantity is found in a gas sensor based on taguchi principle . this gas sensor is essentially heated element inside a porous semi conductive tube. The tube has a large surface and is able to freely absorb gas modules on the semiconductor surface. Electron transfer occurs between the gas molecules and the already absorbed oxygen molecules. This causes a relatively large increase in conductivity for a small change in gas concentration. This change occurs quite quickly. As detectors measure a specified gas concentration, the sensor response serves as the reference point or scale. When the

sensors response surpasses a certain pre-set level, an alarm will activate to warn the user. There are various types of detectors available and the majority serves the same function: to monitor and warn of a dangerous gas level. However, when considering what type of detector to install, it is helpful to consider the different sensor technologies.

4.CONCLUSION

In this paper we proposed a framework to connect the conventional vehicles with each other and a receiving unit to monitor the speed of the vehicle in a particular region. We designed a GPS based vehicle speed monitoring and data collection system. This system was designed to cater to the real time safety application to avoid the accidents in public places like residential societies, educational institutions and etc. due to over speeding vehicles. The hardware prototype was tested on a vehicle to study the driver behavior and a field study was done to evaluate the requirement and effectiveness of the proposed system for the real life implementation. With the help of the field trial results, it was found that the average effectiveness of the system is 63%. It was observed that with continuous monitoring of the driver with our system, the driver behavior can be changed and the number of over speeds can be reduced. The proposed framework has a great potential in the development of the structure of vehicular ad hoc networks. With more real time and smart applications, the system can also be an add on for the autonomous vehicles and the smart city concepts.

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