Micro-Controller based Anti-Collision System

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Abstract---In this project Microcontroller based Anti-Collision System ATmega 16 microcontroller is used. By using anti-collision system in any automobile, we can prohibit the vehicles colliding with each other. This system is used to stop or avoid accidents, used for Car-parking, used in ROBOTICS, or any device in which Anti-Collision is required.

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I. INTRODUCTION

Safety is a necessary part of man's life. Due to the accident cases reported daily on the major roads in all parts of the developed and developing countries, more attention is needed for research in the designing an efficient car driving aiding system. It is expected that if such a device is designed and incorporated into our cars as a road safety device, it will reduce the incidence of accidents on our roads and various premises, with subsequent reduction in loss of life and property.

However, a major area of concern of an engineer should be safety, as it concerns the use of his/her inventions and the accompanying dangers due to human limitations. When it comes to the use of a motor vehicle, accidents that have occurred over the years tell us that something needs to be done about them from an engineering point of view. According to the 2007 edition of the Small-M report on the road accident statistic in Malaysia [1], a total of 6,035 people werekilled in 2000 and the fatality spring up to 6,287 in 2006 from accident cases reported in250, 429 and 341,252 cases of accident for 2000 and 2006 respectively. These road accidents were mainly at Kelang and KL area of Malaysia. The obtained results show that, high rate of accident is reported each year [1].

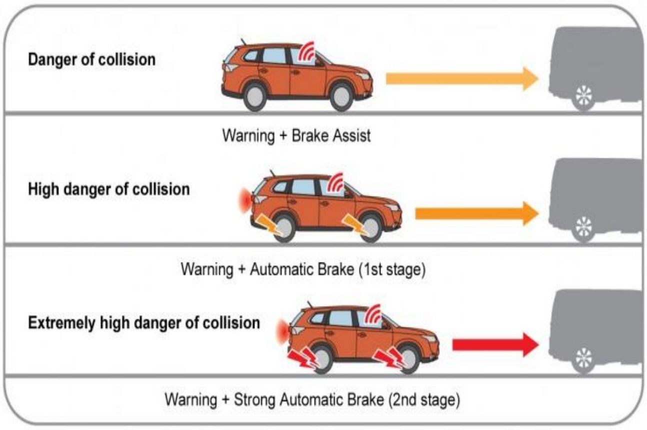

Fig. 1: Anti-Collision device in cars.

The idea of incorporating radar systems into vehicles to improve road traffic safety dates back to the 1970s. Such systems are now reaching the market as recent advances in technology have allowed the signal processing requirements and the high angular resolution requirements from physically small antennas to be realized. Automotive radar systems have the potential for a number of different applications including adaptive cruise control (ACC) and anti-collision devices [2]. The problem with this brand of cars is that they are expensive. This becomes an even bigger challenge when you consider a developing country like Malaysia. A real example of such cars in metropolitan areas is shown below in Fig. 2.

Fig. 2: High traffic loads in metropolitan areas.

II. MATERIAL AND METHODS

A micro controller (ATMEGA 16) receives echo signals from ultrasonic range finding sensor. This information is used to excite solenoids to create electromagnetic field. Ultrasonic sensors continuously read distance between two vehicles and output is displaying on dashboard of vehicle. If the distance reduces to certain level, excitation circuit starts working to create electromagnetic field. The developed Circuit can be interfaced with PC with the help of USB to serial cable. The program of each node is written on embedded C through coder and debugger AVR studio 4.

The power measuring unit measures the power from main line. This data is fed to microcontroller. Microcontroller fetches the data and transmits it over the network. The following is the list for the components used in the proposed model:

- ATmega16
- MAX232
- Power supply units
- Ultrasonic Range finder
- Solenoids
- LCD Display

A. *Atmega16*

It is a microcontroller from Atmel which is powered by the AVR core. It is an 8-bit, low powered microcontroller with

16 kilobytes in-system self-programmable flash. This core is capable of running 16MIPS with a 16MHz crystal. It has an advanced RISC architecture with 32 X 8 general purpose working registers. The microcontroller features programmable serial USART and master/slave SPI serial interface. It has 32 programmable I/O lines and 40 pin PDIP. It is capable of executing one instruction per cycle.

B. Max232

This is level converter IC from MAXIM which is used to make logic compatibility between TTL and RS232 logic. The IC converts the 5V logic into an 8V negative logic. This converter is located between the almega16 microcontroller and the zigbee module, the microcontroller uses TTL logic whereas the zigbee module uses RS logic. The main purpose of this converter is to convert the TTL logic to RS logic.

C. Power Supply Unit

This unit is basically designed to power up the node 1 and node 2. This provides 5 V, 500mA output to drive the nodes. Here, the AC voltage at 220V is stepped down to 20V using a 220/20V steps down transformer. This AC voltage at 20V is fed to rectifier that converts it to DC voltage and is then filtered using 40 Farad shunt capacitor. The filtered DC voltage is then regulated using a 7805 regulator, and is then supplied to the the microcontroller at 5V, 500 mA.

D. LCD

This is most widely used display device for embedded systems. The LCD unit receives character codes (8 bits per character) from a microprocessor or microcomputer, latches the codes to its display data RAM (80-byte DD RAM for storing 80 characters), transforms each character code into a 5 ´7 dot-matrix character pattern, and displays the characters on its LCD screen.

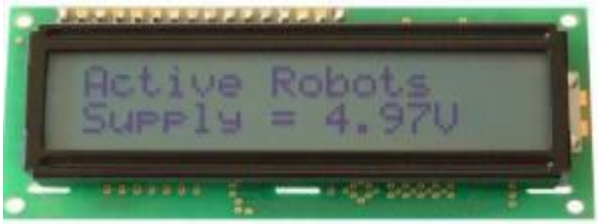

Fig. 3: LCD16x2

III. Result And Discussion

The module was successfully developed and tested in the laboratory with dummy environmental conditions. The ultrasonic was able to measure the data up to 500cms distance and below 200cms excitation circuit start working . The results are accurate with a minor tolerance value.

During the tests, it was noted that one of the devices kept signal an alarm even when it had gone beyond the safe range (0.4m). This was due to the nature of the transmitter bought. There was a problem with purchasing a good one, as it was hard to tell from the point of purchase, which one would work and which would not, though, it was later replaced by another one and the whole system work perfectly. There was also a power supply problem as the speaker actually drained a lot of power from the battery, causing instability in the system thereby. Much of the testing was done with the speaker disconnected, and finally it was rectified as there was a short circuit on the board.

IV. Conclusion And Future Scope

The system which is the design and construction of an anti-collision system for vehicles was designed considering some factors such as economy, availability of components and research materials, efficiency, compatibility, portability and also durability. The performance of the system after test met design specifications. The general operation of the system and performance is dependent on the presence of two moving cars as they get closer to each other.However, it should be stated here that the system was aimed at fabricating prototype, a replica of the actual thing. It is economically viable to undertake certain system this way since testing would not cost so much. Any desire to implement this design into a vehicle would require a laser detector. The problem of power supply would not arise due to the amount of battery power from the car battery. Also the operation of the system is dependent on how well the soldering is done, and the positioning of the components on the Vero board. The IC’s were soldered away from the power supply stage to prevent heat radiation which, might occur and affect the performance of the entire system. The construction was done in such a way that it makes maintenance and repairs an easy task and affordable for the user should there be any system breakdown. All components were soldered on one Vero-board which makes troubleshooting easier. In general, the system was designed, and the real time implementation done with a photo-type of the model.

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