

Accidents Detection and Prevention System to reduce Traffic Hazards using IR Sensors

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Abstract: Traffic Hazards is one of the major problems facing across the world. One of the major causes of traffic hazards is increase in vehicles and dense population. Reducing traffic hazards is one the major challenges as majority of the deaths across the world are due to road accidents. Hence there is a need to provide better transportation facilities that can reduce the ratio of road accidents and save life's of people. One of the solution that is proposed in this paper is using IR sensors and Arduino Uno technology. The system has two phases-Accident Detection and Accident Prevention. The detection phase is carried out using IR sensors that could detect and alert the people by sending SMS using GSM module that contains predefined numbers and accident location using GPS module. Second Phase, Accident prevention is carried out using IR sensors by warning the driver about the neighboring vehicles when the distance between them is beyond the threshold value. Simulation results and Prototype is presented in this paper.

Keywords: Traffic Hazards, IR sensors, GSM Module, GPS module, Accident Detection and Prevention.

I. INTRODUCTION

Over Few Decades, Safety over Transportation is gaining attention because of frequent deaths around the world. Traffic Hazards is one of the major issues to be dealt with when it comes to transportation. Surveys have been conducted and found that the source of majority deaths across the world is due to road accidents [1]. Hence there is a need to provide better transportation facilities that could reduce traffic hazards and save peoples life. However, many transportation technologies have been developed and are in use but still there is a need of deploying optimized technologies that could reduce the ratio of road accidents. According to WHO Statistics, around 3500 people die every day around the world due to road accidents. Some of the victims are Elder people, Children, pedestrians crossing the roads[2]. Some of the causes for road accidents were mentioned in [1] are Bad conditions of the roads, drunk driving, pot holes, unskilled drivers etc. Many rules and regulations were implemented by the government to avoid road accidents one of which is wearing helmet is compulsory but still problem persists. Hence there must be a unique solution for transportation that could drastically reduce road accidents. In one of the paper[3], A microcontroller based system with 3 axis accelerometer sensor is developed to avoid

road accidents. Several wireless technologies have been evolved to deal with this issue. One of which is VANETS technology [4]. However, some of the technologies are heading to solve the issues of transportation. Over the last few decades, VANETS was gaining a lot of attention due to its tremendous features as it can communicate effectively between Vehicles to vehicle, Communicate among neighboring vehicles etc. Another Technology that has embraced all fields is Internet of Things [5]. The concept of Smart Cities has emerged to resolve the issues faced in the society. One of the Major branches is Transportation. IOT is one of the solutions for Transportation problems. Issues such as Accident detection, accident prevention, Traffic congestion etc. could be resolved using IOT [6]. Several techniques have been proposed such as DSS model in paper [7] to resolve the issue of transportation. Internet of Vehicles is one of the emerging technologies which enables the vehicles to predict accidents, sending information about the road conditions, neighboring vehicles through internet [8]. Several techniques and algorithms have been developed to resolve the issue of Traffic hazards such as early detection traffic flow incidents model in [9]. Some of the technologies that has contributed in the field of transportation are embedded systems, VANETS, IOT, IOV, Vehicular cloud networks, V2V Technologies, Wireless Communication technologies, Sensor networks etc.

Some of the major objectives that have been focused are

- Sending Information about accidents via SMS to predefined numbers
- Sending information about neighboring vehicles along with their distance and location to prevent road accidents

The rest of the paper is structured as follows. Section II discusses about the Existing works, Section III discusses about Methodology, Section IV discusses about proposed work. Finally, Conclusion and References were discussed.

II. EXISTING WORK

Several Literature paper have been studied and analyzed for the System Design. Several pitfalls in the existing works have been identified. In one of the paper[10], the authors have

mentioned the existing technologies and discussed about intelligent transportation system. The existing work is based on RFID and ARM controller to minimize the traffic hazards. However, RFID communication can only be effective when there is strong RF Signal strengths. In [11], VANETS technology is used to Avoid Traffic hazards using DSRC technique. In [12], Survey on various technologies have been considered such as VANETS, Wireless networks. In [13], IOT solution is provided to avoid road accidents. This survey paper could be used as a reference in the proposed system.

III. METHODOLOGY

The proposed work is carried out using SDLC methodology [14]. This methodology is organized in two phases. One is in planning phase and the other one is in Implementation phase. SDLC cycle is shown in Figure 1 SDLC, Software development Life cycle is the updated version of Waterfall methodology. The cycle involves many stages such as Analysis, Design, Implementation, Planning and Maintenance. Each unit in this methodology is properly tested and evaluated. This is applied both for software and hardware. The SDLC methodology is carried out in various phases such as Plan, test, design and build. In planning phase, the requirements for the design are collated to meet the goals. In analysis stage, two kinds of Analysis are carried out. One is System Analysis and the other one is Preliminary analysis. In preliminary analysis, problem has to be defined. Investigation of goals and objectives should be done. In the design stage, Designer would know the insights of the work. In the Implementation and maintenance stage, program and system testing done.

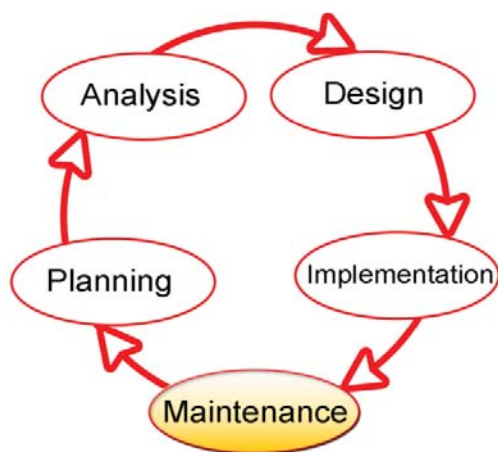


Fig. 1. SDLC Methodology

IV. PROPOSED WORK

The proposed design consists of various components such as IR sensor, Crashing switch, GSM module, LCD, LED and RF module Transmitter and Receiver. All these devices are

interfaced to Arduino Uno board. The IR sensor and crashing switch is responsible for detecting the accidents and sends the command to the microcontroller. GSM and GPS are the devices that send SMS and location to the users. Figure 2 shows the block diagram of the proposed system.

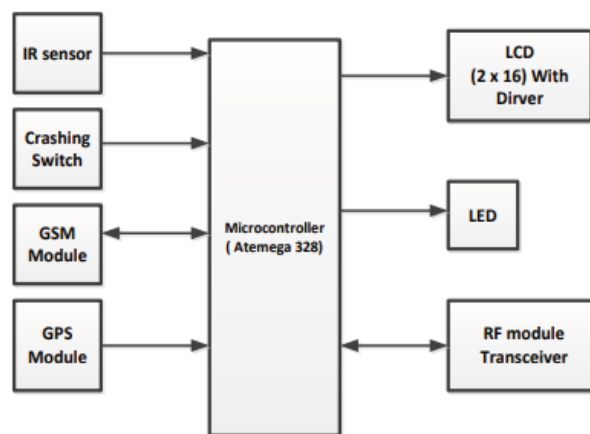


Fig. 2. Block diagram of the proposed system

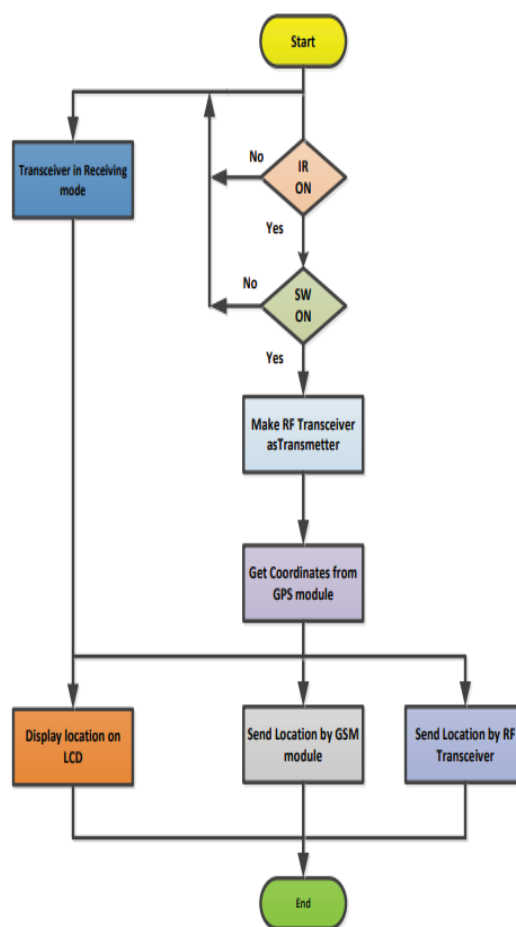


Fig. 3. Flowchart of Proposed work

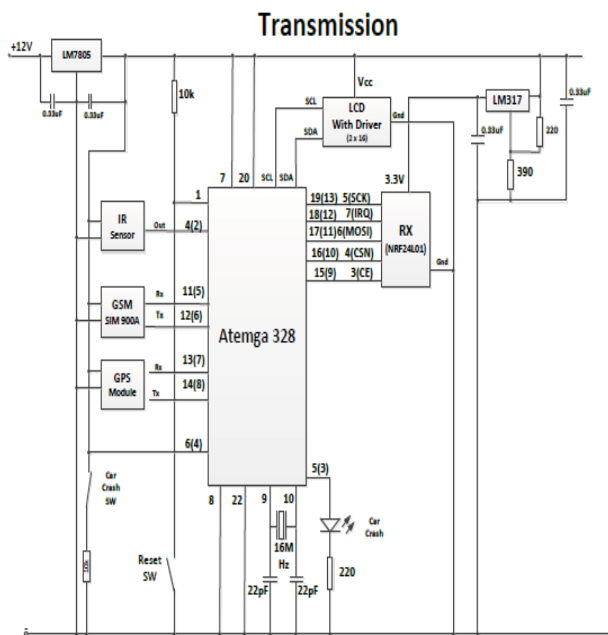


Fig. 4. Schematic diagram of Transmitter Section

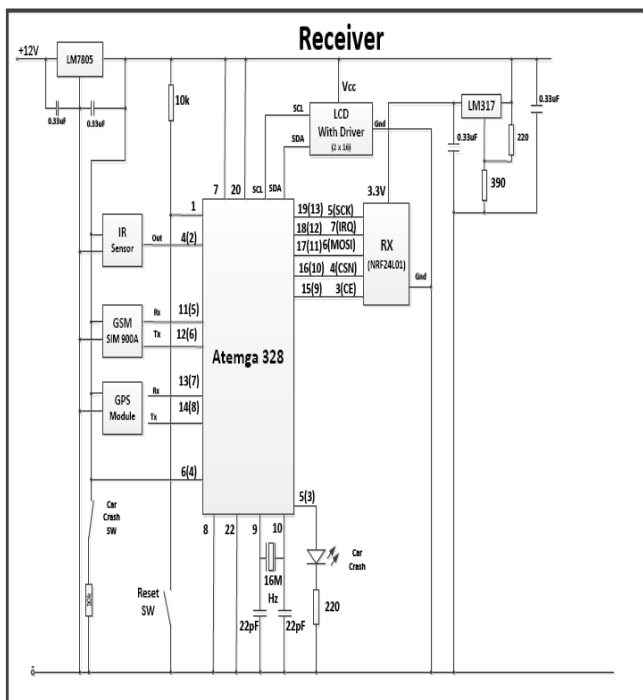


Fig. 5. Flow chart of Receiver Section

The flowchart of the proposed work is shown in figure 3 which includes various conditions for accident detection and prevention. The transmitter and receiver sections are shown in Figure 4 and 5.

The simulation circuit is shown in Figures 6, 7, 8 which shows individual simulations for transmitter and Receiver.

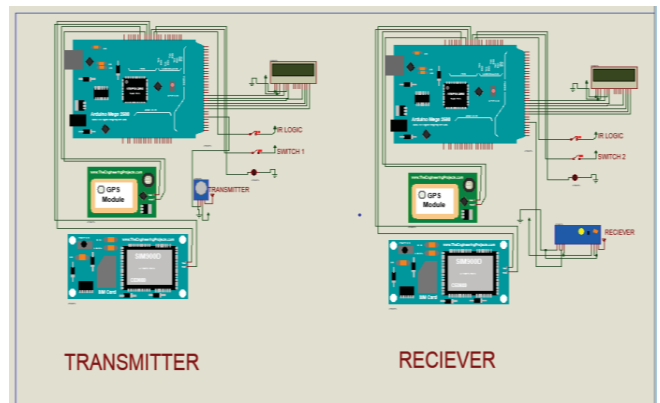


Fig. 6. Simulation Circuit using ISIS Proteus

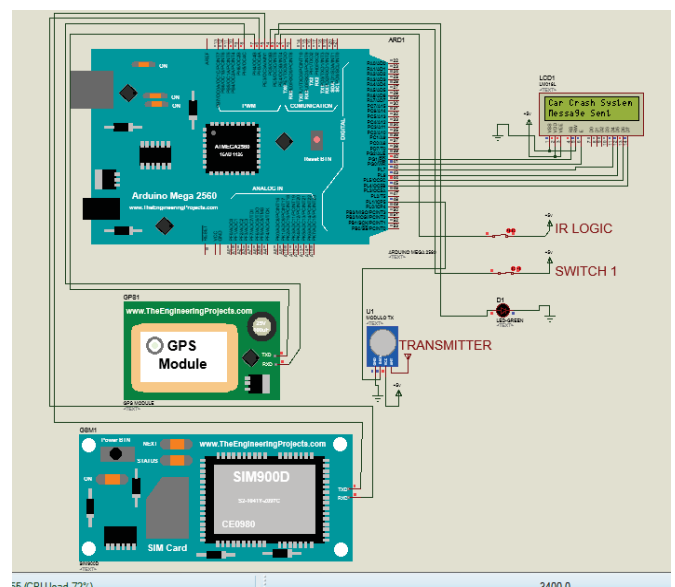


Fig. 7. Simulation Circuit using ISIS Proteus for Transmitter Section

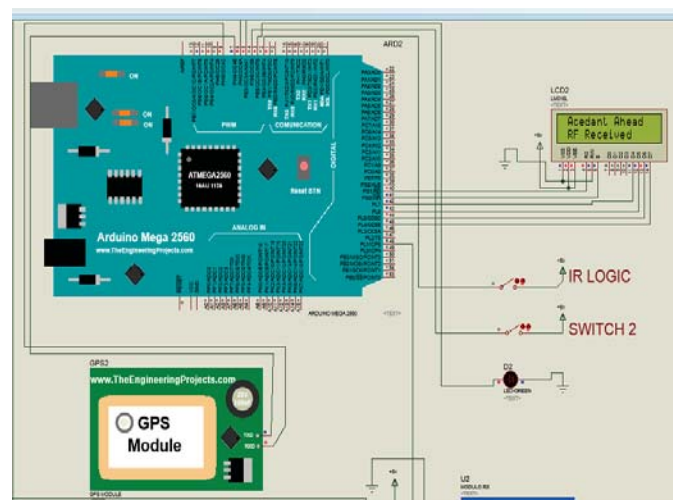


Fig. 8. Simulation Circuit using ISIS Proteus for Receiver section

The Hardware setup for the proposed work is shown in Figure 9.

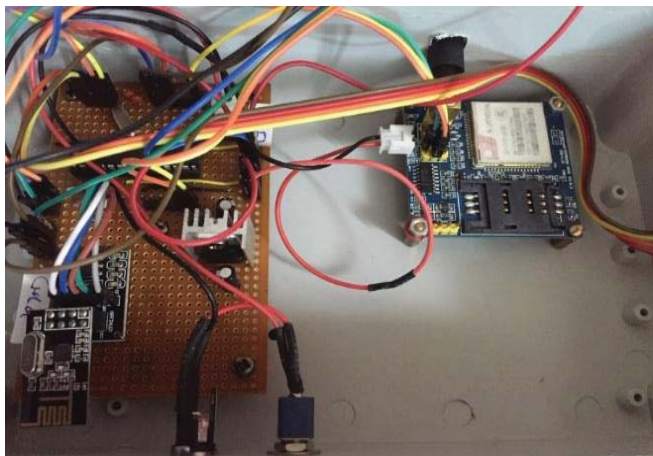


Fig. 9. Hardware setup

Figures 10, 11 and 12 shows the various results for Car crash system which is used for testing purposes. Figure 12 shows the SMS sent by GSM in LCD.

Figure 13 shows the complete hardware design in which one box is treated as Transmitter section and the other box is treated as Receiver section.

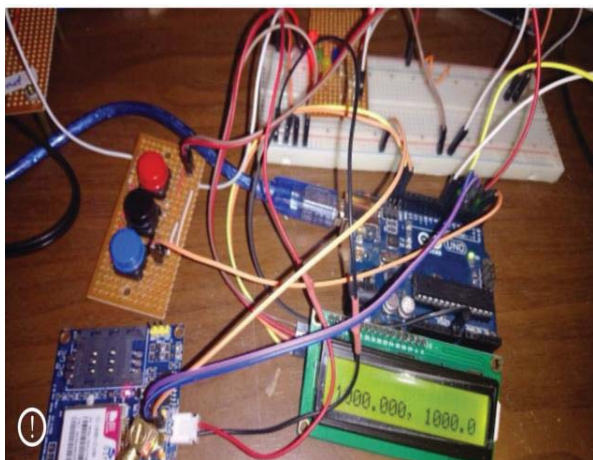


Fig. 10. Complete hardware setup for testing

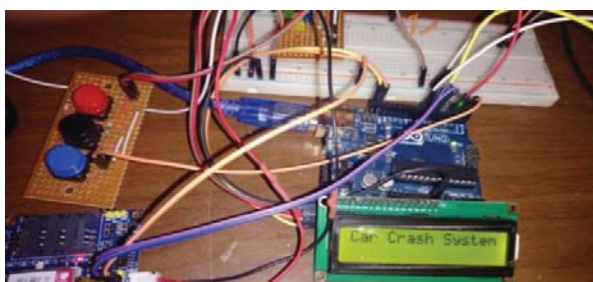


Fig. 11. LCD displaying message Car Crash system



Fig. 12. LCD connected to the final design displaying message



Fig. 13. Complete design

V. CONCLUSION

The paper presented the existing issues of Transportation system and discussed various technologies that have contributed to reduce traffic hazards. The proposed paper mainly focused on Accident detection and Prevention system. Simulation and Prototype results were discussed in detail. The proposed system could be helpful for traffic officials to track the accidents through receiving SMS and Locations to aid before leading to any disaster to the lives of people.

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