Design and Implementation of a Device for Reducing Road Accident at Foggy, Rainy and Drowsy Conditions

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Abstract. The main objective of this project is to design and implementation of microcontroller-based circuitry for vehicles to detect obstacles and hence to minimize road accident. The microcontroller is programmed in such a way that, it can give command to the other apparatus to work according to the receiving pulse from the LDR (Light Dependent Resistor). When reflection of light falls on LDR then the function of LED will start to work and after having this pulse, the microcontroller allows to turn on the dc motor instead of vibrator to aware the driver at foggy, rainy or drowsy conditions.

1. Introduction
Most of accidents occurred at night, rainy conditions, and foggy conditions and for driver’s drowsiness [1]. It has been observed that most of the road accidents happened for having problem to detect opposite vehicle [2], and this device will help to detect obstacles. The main purpose of this project is to develop a system with low cost and effective at foggy, rainy weather which can be used in underdeveloped countries like Bangladesh.

2. Hardware Description
Electrical equipment was carefully selected and properly installed. The following equipment were used in this project they are: resistor, transistor (pn2222) [3], light dependent resistor (LDR), 7 segment display [4], 16x2 LCD display, laser light [5], voltage source, dc motor, 220V/12V transformer [6], microcontroller (ATMEGA16), variable resistor.

2.1. Methodology
The Project is divided into 2 steps: Simulation & Real-world development.

Simulation:
• Step 1: The circuit diagram was implemented in PROTEUS.
• Step 2: The code was constructed in mikroC PRO for AVR and run into microcontroller.
• Step 3: The implemented circuit was simulated and run successfully.

Real-world development:
• Step 1: All equipment was collected for physical implementation of the circuit.
• Step 2: The circuit was implemented in bread board according to the design.
• **Step 3:** The code was burned into the microcontroller with the help of AVR burner.
• **Step 4:** The implemented circuit was précised to install a vehicle.
• **Step 5:** The meter box was constructed for placing inside the car.
• **Step 6:** The whole system has been checked successfully in different conditions.

3. **Design of Circuit & Working Plan**

3.1. **Working Principle**
The module of the power source was 5V dc battery. In this circuitry common cathode 7-segment display [4] was used to show the time of fallen light over LDR and LCD display was used to show the command message. At first all the laser light was turned on. When the reflection of light was fallen on the LDR, the LDR would receive that signal and then LED [5] will glow on and the system has lost some voltage. To minimize this problem transistor Q1 was used that supply the full voltage to the circuit. When transistor Q2 got this voltage then 7 segment display [4] was started the show the time with the help of microcontroller and LCD display was also ready to display the message. When the 7-segment display was displayed 3.the motor which was used instead of vibrator was rotator and on that time LCD display was displayed the command message.

3.2. **Block Diagram**
The block diagram helps to demonstrate the working cycle of the component. In this block diagram all the apparatus of this circuit is assigned with working function and with this diagram the decision making of microcontroller is shown whether the vibrator either vibrate or not.

![Figure 1. Block Diagram of Experimented Circuit.](image)
3.3. Circuit Diagram
The circuit was connected as shown in the diagram. Microcontroller ATMEGA16 was used to make circuit work easier. PORT40 in the microcontroller was used to get the input pulse to show the output result. PORTB, PORTC, PORTD was used as output and connected with various components. The higher level of voltage was set to 5V.

4. Principle and Simulation

4.1. Software Simulation
The code was simulated in mikroC PRO for AVR to estimate the design.
4.2. Software Simulation with Time

7-segment display [4] and LCD display will be on upon passing through microcontroller. The LCD display will show “Welcome” when seven segment display shows time 0. There will be no change in LCD display upon seven segment display showing time 1 and time 2. Whenever 7-segment display shows 3 vibrator will turn on and there will be change in LCD display displaying ‘Move Left’.

Figure 4. Software Simulation of Experimented Circuit.

Figure 5. Initial condition of simulation

Figure 6. Simulation condition after passing 1 second

Figure 7. Simulation condition after passing 2 seconds

Figure 8. Simulation condition after passing 3 seconds
5. Experiment and Result
In this section implementation was evaluated by final result. To obtain accuracy of the model, trial the system and the controller test is needed in different angle.

5.1. Practical implementation
In practical simulation the result was observed under distinct 6 cases. Case 1 is for device’s attachment in vehicle whereas case 2 is for LED’s function upon face to face position of opposite vehicle. Case 3 define LED’s function when two opposite vehicle passes two thirds portion of each other. Case 5 for foggy condition and case 6 for rainy conditions.

![Alignment of car and proposed warning system for avoiding accidents](image)

**Figure 9.** Alignment of car and proposed warning system for avoiding accidents
Conclusion
The project was intended to implement and design a simple and low-cost device for declining the road accidents in foggy, rainy and drowsy conditions. The Atmega16 microcontroller was taken and it roles the main part of this exciting project. The main objective for making this device will help to save human life and reducing road accidents as well.

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