OVER HEIGHT VEHICLES ACCIDENT PROTECTION IN BRIDGES AND TUNNELS

Vimalakeerthy Devadoss¹, Suha Said Al Sulaimani²

Abstract- Collisions of over-height vehicles with low clearance bridges is a worldwide problem. The proposed method can be used to detect big over-height vehicle moving towards bridges, tunnel entrances and overhead structures, and warn the drivers. The vehicle detection system uses an Ultrasonic sensor to monitor the vehicle. An audio-visual alarm is activated when the over-height vehicle is detected by the system. For example, a truck loaded with hazardous gases colliding with an overhead bridge can be dangerous. If a vehicle is too high to safely pass under the bridge, a sensor triggers an alarm placed at the highest point on the vehicle. The alarm warns the driver to alter the course or stop before colliding with the overhead structure. This research will contribute to reduce the human and material losses.

Keywords – Over-height, Collisions, Sensor

1. INTRODUCTION

Accidents are human error that occurs due to elevated velocity, reckless driving, overweight trunk, over height trunk, and highway design infrastructure mistakes. The suggested system is utilized for alerting the driver if his vehicle cannot pass through the bridge. The existing methods warn the drivers regarding over-height of bridges using sign and sound message. A system is developed that can identify the vehicle’s capability of moving towards the bridge. This project can be employing to revelation large over-height vehicle moving towards bridges, subway entrances and overhead body, and warn the drivers. It can be developed for monitoring vehicle approaching bridge at night.

The vehicle detection system uses an infrared ultrasonic sensor to monitor the vehicle. Activates the visual audio alarm when excessive vehicle altitude is detected by the system. For example, a truck loaded with hazardous gases that collides with a dangerous overpass can be dangerous. An alarm will be launched at a distance from the road if the car is too high to be able to pass safely under the bridge. The alarm clock gives the driver a warning of changing the track or stopping before colliding with the upper structure.

Different types of sensor technologies are used for over height vehicle detection. One type detects the over-height vehicles by the transmission of the optical beam from transmitter to receiver. When a vehicle breaks or interrupts the beam, it is detected as an over-height vehicle. The other type, laser radar, operates in more similar manner, except that it transmits longer wavelength energy in the near-infrared spectrum. In this system Ultrasonic is the chosen sensor to detect the over height vehicles which having a frequency above the human ear's audibility limit of about 20,000 hertz —used of waves and vibrations and that make it a good choice.

2. BLOCK DIAGRAM

The block diagram of the proposed system is shown in figure.

![Block Diagram of Proposed System](image)

Figure 1. Block diagram of proposed system

¹,² Department of Electrical Engineering, Nizwa College of Technology, Nizwa
3. DESIGN MODEL
Arduino requires DC supply for its operation. First, the battery gives supply to Arduino. Arduino controls all parts of system. The ultrasonic sensor act as input pin for the Arduino to send the signals. Ultrasonic sensor is placed at the top of the vehicle to detect the levels of objects at the same level. It senses any overhead structure that came in its same level, so to avoid the collision, sensor send signals to Arduino about it. The Arduino will read that signals and according to that it will make supply to LCD and Buzzer. If any high vehicle is detected Arduino sends HIGH signal to the buzzer to make sound and alert the driver. In addition in case of any noisy atmosphere is the driver cannot listen to the buzzer sound, an extra LED is fixed in front of the driver to alert him by making it ON. Hence on receiving the alerting signal, the driver should change his path. Otherwise, if no overhead structure is sensed, LCD display shows “path is clear”.

![Figure 2. Circuit diagram of the proposed system](image)

The flowchart of the software is illustrated in the following figure.

![Figure 3. Circuit diagram of the proposed system](image)
4. RESULT AND DISCUSSION
The proposed model contains many individual components like ultrasonic sensor, LCD display, I2C, LED and buzzer. Before connecting the components as per the circuit diagram, individual components are tested with test program to understand the working of each component. The components are connected in bread board for testing. The proposed model is working effectively to sense the over-height of Vehicles. Arduino program controls the piezo buzzer, LED display and buzzer to alert the vehicles driver that the height of vehicle is more than bridge height. The working of project is illustrated using table below. The result of the model is if ultrasonic sensor becomes HIGH on detection of object LED is high, buzzer is high and sensor remains in LOW if not object is detected making LED low and buzzer low.

Table -1 Experiment Result

<table>
<thead>
<tr>
<th>SNO</th>
<th>HEIGHT OF BRIDGE in Inches</th>
<th>SENSOR</th>
<th>LCD DISPLAY</th>
<th>LED</th>
<th>BUZZER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 - 5</td>
<td>HIGH</td>
<td>Please stop</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>HIGH</td>
<td>Please stop</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>HIGH</td>
<td>Please stop</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>LOW</td>
<td>Path is clear</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>LOW</td>
<td>Path is clear</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>6</td>
<td>&gt;20</td>
<td>LOW</td>
<td>Path is clear</td>
<td>Off</td>
<td>Off</td>
</tr>
</tbody>
</table>

Table 1 shows the different operating conditions of the proposed system under the detection of over height vehicles.

5. CONCLUSION
An efficient warning system for over high vehicles is successfully completed. The project is working to alert driver from hitting the lower objects which could cause an accident. The main principle of protection is to install, a sensor on the top of vehicles or trucks to sense the wave which came from sender device on the bridge side. Further on that, the project is facilitated to have LCD display, LED alert and buzzer alert to make driver to go or stop his vehicle. This project could be more useful for all the trucks carrying loads at different height at different situations.

6. REFERENCES