SENSOLIGHT SYSTEM FOR HUMP DETECTION IN MOTORCYCLE

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ABSTRACT

This paper presents about a sensor light system which makes use of LIDAR, microcontroller along with other peripherals which work together for the detection of humps and other obstacles that a motorcycle would face. When an automobile approaches a speed-breaker at a speed greater than a threshold velocity, the risk of accident or injury to the passengers becomes substantial. The sensor detects the speed bumps and sends the data to microcontroller unit which analyze with the help of predefined parameters like colour and height of the bumps sends an alert signal to the output world. An acoustic output will be taken out as an audio warning alert and visuals are displayed through an LCD indicator. Thus using this indication speed humps are detected and thus reducing the cause of accidents.

Keywords*: LIDAR, Arduino IDE, PMW, LCD, Acoustic signal, Sensolight.*

1. INTRODUCTION

Speed-breakers (speed humps/speed bumps/sleeping policeman) are traffic calming devices commonly installed to reduce speed related accidents. Speed-breakers are designed to be driven over at a predetermined comfortable speed, while causing exceeding discomfort at higher speeds. In an average vehicular speed significantly improves the safety of people in the neighboring areas. Even though there is evidence that speed-breakers reduce speed related accidents, they have also been known to cause accidents and injuries. When an automobile approaches a speed-breaker [2] at a speed greater than a threshold velocity, the risk of accident or injury to the passengers becomes substantial. Motorcycles and scooters are especially vulnerable because inconspicuous speed-breakers can throw them off balance. Crossing a speed bump at higher than recommended speed may also damage vehicles. Speed-breakers are inconspicuous under special conditions, like when there is snow, fog, or rain [3]; or at night when they are hard to see.

2. PROPOSED DESIGN

The sensor detects the speed bumps and sends the data to microcontroller unit which analyze with the help of predefined parameters like color and height of the bumps sends an alert signal to the output world as shown in the Fig1.

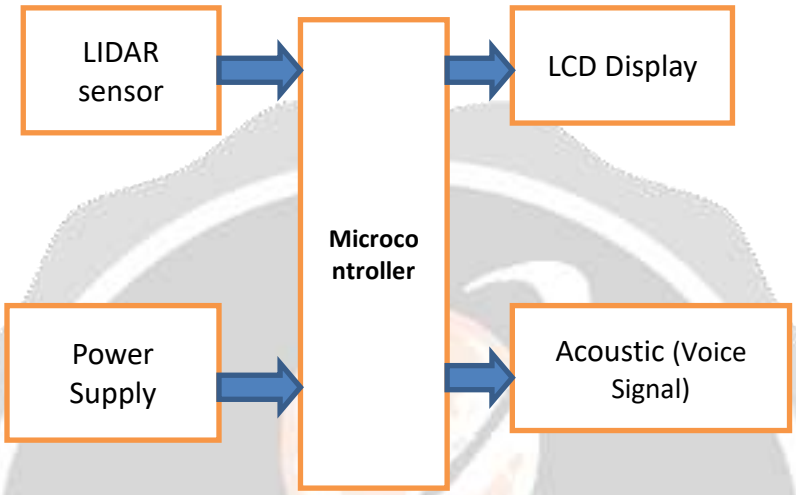

Fig1. Block diagram of the proposed design

An acoustic output will be taken out as an audio warning alert and visuals are displayed through an LCD indicator. The device is expected to show the visual indication to alert and also gives an acoustic signal to the rider. It gives a curve based rotation of the sensor light unit to help out minimum sight banking to rider.

3. HARDWARE IMPLEMENTATION

3.1 LCD

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

3.2 Driver Circuit

The Hitachi HD44780 LCD controller is a commonly used alphanumeric dot matrix liquid crystal display (LCD) controller developed by Hitachi. The control interface and protocol is a de-facto standard for this type of display. The character set of the controller includes ASCII characters, Japanese Kana characters, and some symbols in two 28 character lines. Using an

extension driver, the device can display up to 80 characters. Compatible LCD screens are manufactured in several standard configurations.

3.3.Arduino

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world.
The specifications are as follows:

*Operating Frequency 16 MHz
* 32Kb Programmable Flash program memory
* 1Kb EEPROM
*2Kb SRAM
*Six PWM Channels
*6-channel 10-bit ADC
*Byte-oriented 2-wire Serial Interface

3.4 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. The Sounds are commonly used to indicate that a button has been pressed are a click, a ring or a beep.

3.5 LIDAR

Light Detection and Ranging (LiDAR) [7] is a technology that has been used for years with the variety of applications including the production of digital terrain models (DTMs), and high-accuracy mapping. LiDAR offers a very detailed collection of 3-D point clouds of the earth surface which can be used in generating orthophotos.

4 HARDWARE INTERFACE

Hardware interface includes the connections between the arduino and the different peripherals such as LCD, Driver Circuit, Buzzer, and LIDAR [7].

4.1 Interfacing LCD to Arduino

The LCD and the Hitachi driver circuit are mounted on bread board in such a way that all the pins of the LCD are connected to all the pins of the driver circuit.

The SCL and SDA pins of the driver circuit are connected to the A5 and A4 pins respectively. The 5V and GND pins of the driver are connected to 5V and GND pins of arduino respectively.

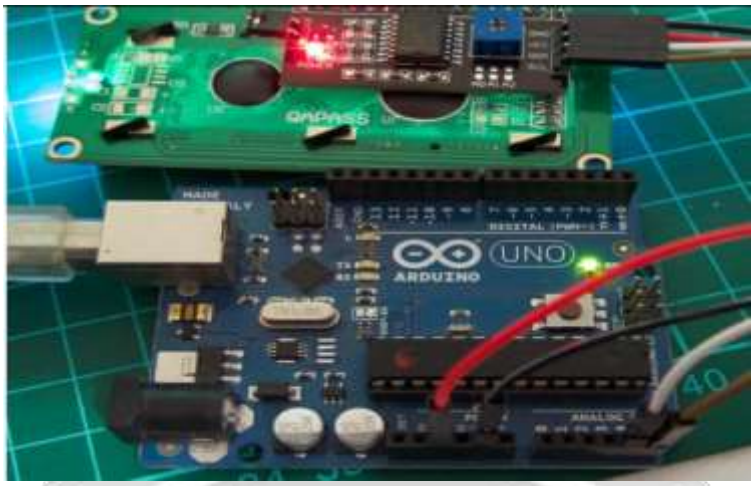

Fig2. LCD interfaced with Arduino.

The additional libraries are imported to the arduino IDE [5] [6] such as I2C library and the LCD library for the ease of coding. Then the program is loaded and burned in to the microcontroller.

4.2 Interfacing the Buzzer to Arduino

The positive pin of the buzzer is connected to pin & of the arduino board. The pin 7 of the arduino is configured as output pin. Whenever the system detects the humps the pin 7 of the arduino goes high and buzzer goes on making a sound

4.3 Interfacing the Lidar

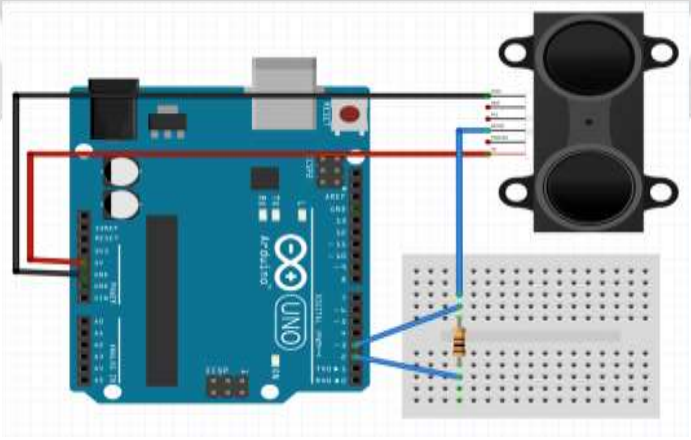

Fig3. Pin configuration of PWM setup in LIDAR Mode.

In PWM setup the mode pin of the LIDAR is the bi directional pin. The mode pin is connected to the 10k resister and to the pin 3 of the arduino. The other end of the resister is

connected to the pin 2 of the arduino. The power pin of the LIDAR is connected to the 5V port of the arduino and ground pin of the LIDAR is connected to the ground pin of the arduino. In this project we have used this setup.

5 SOFTWARE IMPLEMENTATION

This work is implemented on the arduino board. So, the main software used here is arduino IDE. This IDE uses embedded c programming language. The code under void setup () is executed only once and the code under void loop is executed infinite no of times. The code is written according to the number of times a particular code has to execute.

For only one time execution the code is written in void setup () and for infinite no of times it is written in void loop. The code is then saved to the destination folder. Once the compiling is done the program is uploaded to the arduino. There is an upload button right next to the verify button, just by clicking it the program will be uploaded.

6 WORKING PROCEDURE

The sensor detects the speed bumps and sends the data to microcontroller unit which analyze with the help of predefined parameters like color and height of the bumps sends an alert signal to the output world. An acoustic output will be taken out as an audio warning alert and visuals are displayed through an LCD indicator.

7 RESULTS AND DISCUSSION

The below listed prototypes are the testing stages that have been verified.

Stage 1:

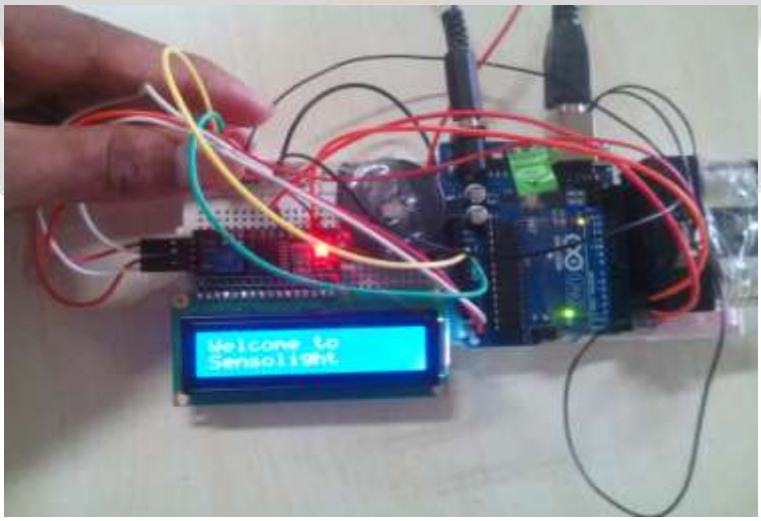

Fig4. The prototype model for hump detection system.

This stage is the first stage where it displays a welcome message when the system is turned on.

Stage 2:

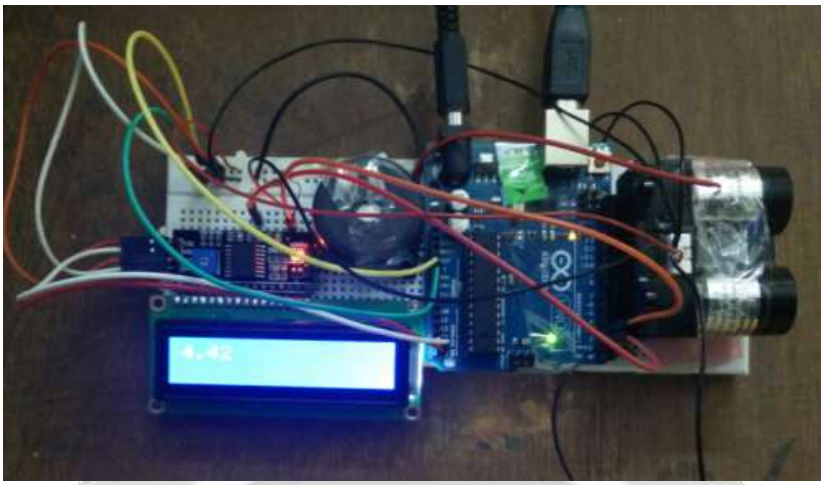

Fig5. The prototype model shows the testing of LIDAR.

At this stage the LIDAR system takes the threshold value of 4.42 meters. When there is a hump, this distance decreases. An alert message is given to the rider which is shown in the next stage.

Stage3:

This is the message that is displayed when hump is detected, that is when the distance is below threshold value.

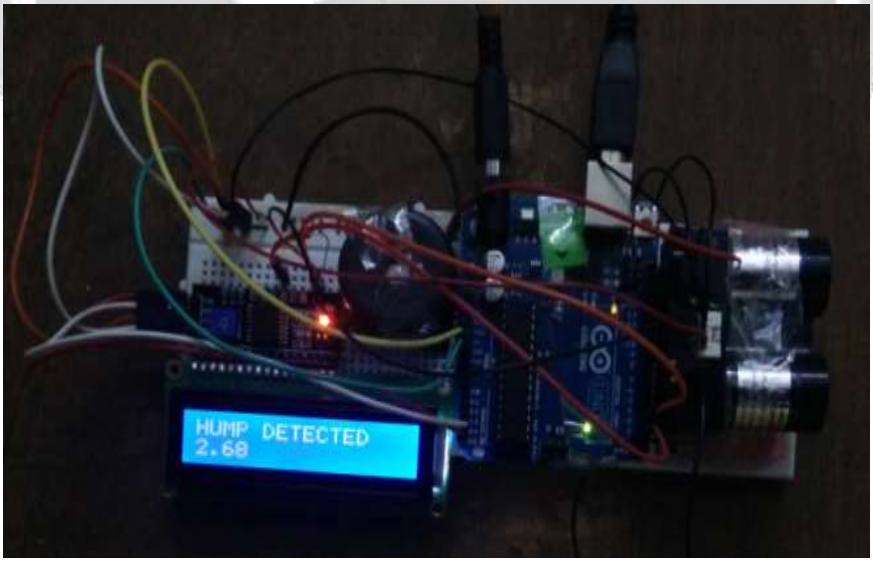

Fig6. The prototype model shows the validation of sensolight.

8 CONCLUSION

This sensolight system assists the rider to identify the hump and give an early warning before he approaches. This system works well in low light conditions i.e. during night and also

works in bad weather conditions. The main limitation of this system is it can't differentiate different obstacles. And during the turning it fails to detect the humps.

In future this system can be enhanced with high end LIDARs which can differentiate between the obstacles, which improve the accuracy rate of detecting humps. A stepper motor can be included in the system to rotate the whole system during the turn.

9 REFERENCES

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