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IMAGE PROCESSING BASED ROAD SIGN RECOGNITION USING RASPBERRY PI

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Abstract:

Over 1, 37,000 people were killed in road accidents in 2015 alone, 16 children die on Indian roads daily and also 1214 road crashes occur every day in India. Two wheelers account for 25% of total road crash deaths and 20 children under the age of 14 die every day due to road crashes in the country mainly over 377 people die every day, equivalent to a jumbo jet crashing every day. The above report for accident is increasing now a day's mainly due to unlimited speed and also due to violate the rule of speed sign board recognize on road side. To avoid this type of violation of speed sign on road side we have implemented the digital image processing and control the speed limit using Raspberry. The Pi camera is implemented on roof of vehicle to capture the image processing of speed sign board. The road sign recognition system based on an embedded system that reads and recognizes speed signs. The digital image captured is sent to the Raspberry Pi and limited speed is recognized and compared with vehicle speed. The Raspberry Pi controls the speed of vehicle by setting the speed of vehicle motor. From Raspberry Pi we can get the audio output signal regarding the speed limit and alert the driver.

1. INTRODUCTION:

In modern life we have to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high volume of vehicles, the inadequate infrastructure and the irrational distribution of the development are main reasons for increasing traffic jam. The major cause leading to traffic congestion is the high number of vehicle which was caused by the population and the development of economy. Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queuing. The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, these results in some congestion. As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. The proposed system provides the speed control is automatic by using Raspberry Pi. The digital image captured is sent to the Raspberry Pi and limited speed is recognized and compared with vehicle speed. The Raspberry Pi controls the speed of vehicle by setting the speed of vehicle motor. From Raspberry Pi, we can get the audio output signal regarding the speed limit and alert the driver. Ultrasonic sensor and brake failure sensor used to find the obstacles and if any brake failure happens, the abnormal condition of these sensors will produce the buzzer sound. The current status is displayed in LCD. L293D motor driver will drive the motor load. LDR is used to measure the light intensity of the nearby vehicles.

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2.BLOCK DIAGRAM:

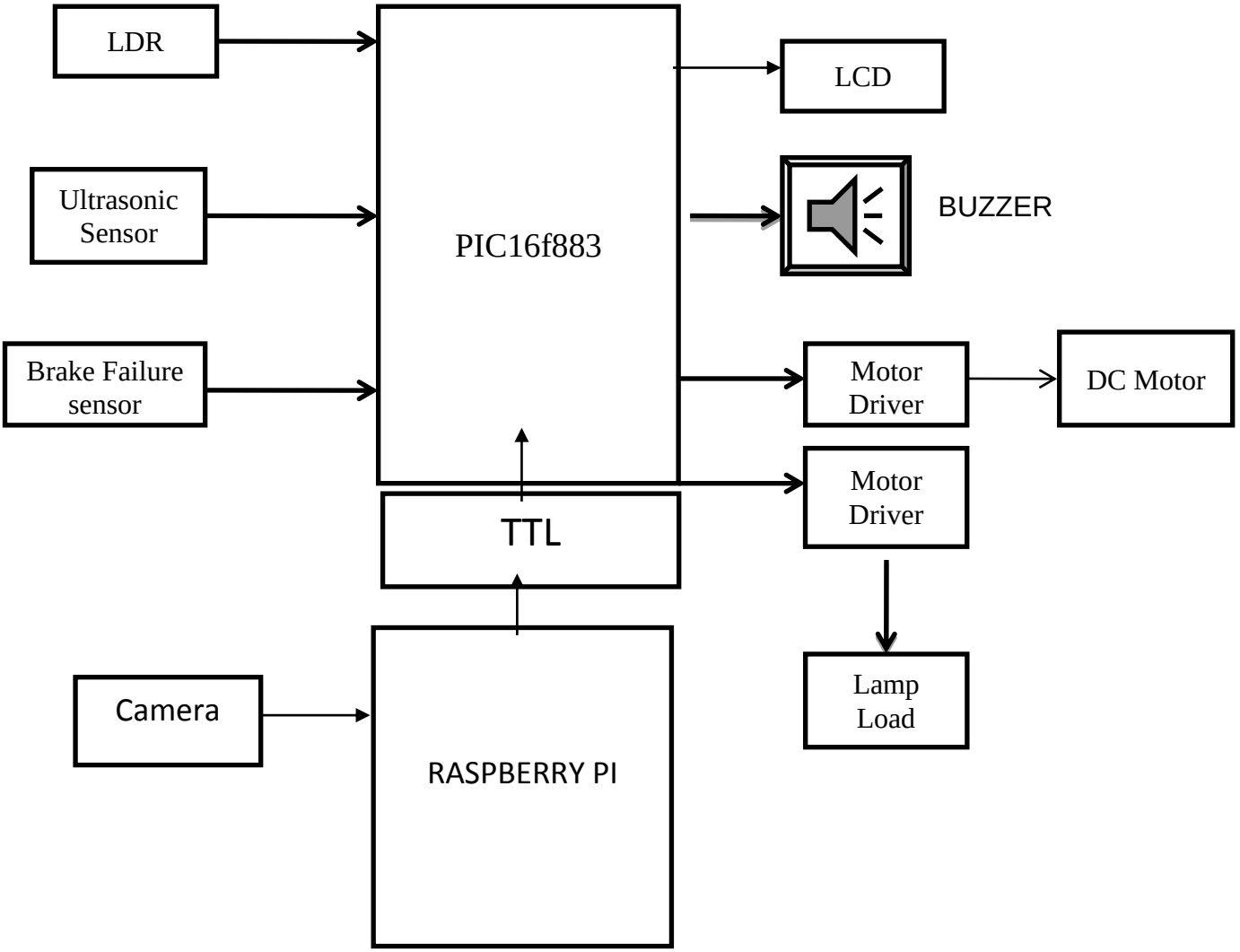

Figure 2. Block Diagram

The Raspberry Pi is used for Road sign recognition. The camera is connected to Raspberry Pi, which is used to capture the road signs and send to Raspberry Pi, it recognizes the sign and displayed their meaning. Ultrasonic Sensor, IR sensor and LDR are connected to PIC Microcontroller for additional safety parameters.

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3. Circuit Diagram

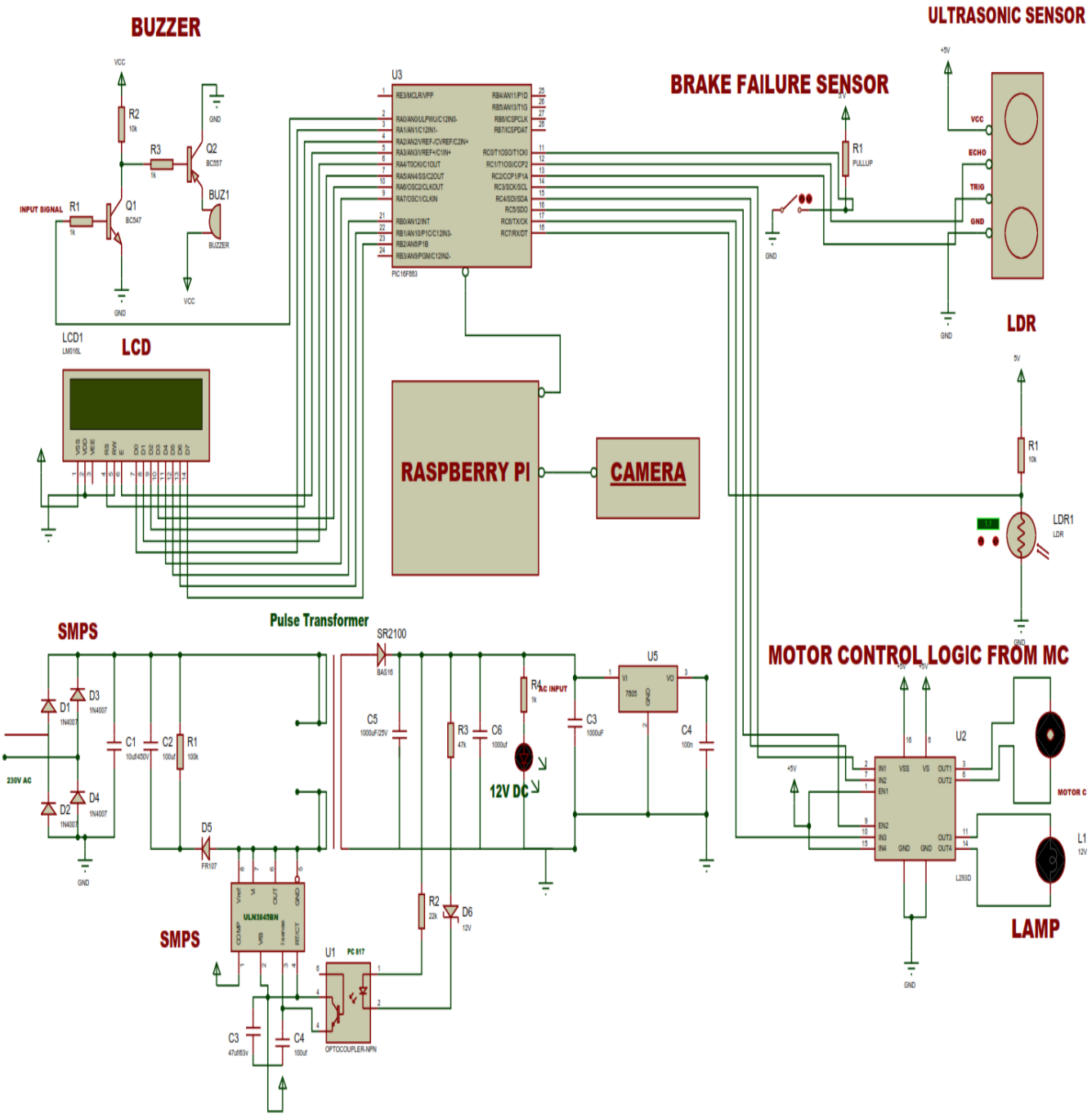

Figure 3 Circuit Diagram

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4. HARDWARE IMPLEMENTATION

4.1 Buzzer

A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signaling device. A piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed.

4.2 Brake Failure Sensor

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object.

4.3 Ultrasonic Sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

4.4 Light Sensor

A Light Dependent Resistor (LDR) is special type of resistor that reacts to changes in light level. The resistance of the LDR changes as different amounts of light fall on the top window of the device. This allows electronic circuits to measure changes in light level. A Light Dependent Resistor (LDR) is special type of resistor that reacts to changes in light level. The resistance of the LDR changes as different amounts of light fall on the top

4.5 Light Dependant Resistor – LDR

A Light Dependent Resistor (LDR) is special type of resistor that reacts to changes in light level. The resistance of the LDR changes as different amounts of light fall on the top window of the device. This allows electronic circuits to measure changes in light level.

4.6 Raspberry Pi

Several generations of Raspberry Pi have been released. All models feature a Broadcom system on a chip (SOC) with an integrated ARM compatible central processing unit (CPU) and on-chip graphics processing unit (GPU). Processor speed ranges from 700 MHz to 1.2 GHz for the Pi 3 on-board memory ranges from 256 MB to 1 GB RAM.

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Figure 4. Raspberry Pi

4.7 PIC Microcontroller

Peripheral Interface Controller (PIC) was originally designed by General Instruments. In the late 1970s, GI introduced PIC 1650 and 1655 RISC with 30 instructions. PIC was sold to Microchip Features: low cost, self-contained, 8-bit, Harvard structure, pipelined, RISC, single accumulator, with fixed reset and interrupt vectors.

Pin Diagram of PIC16f883

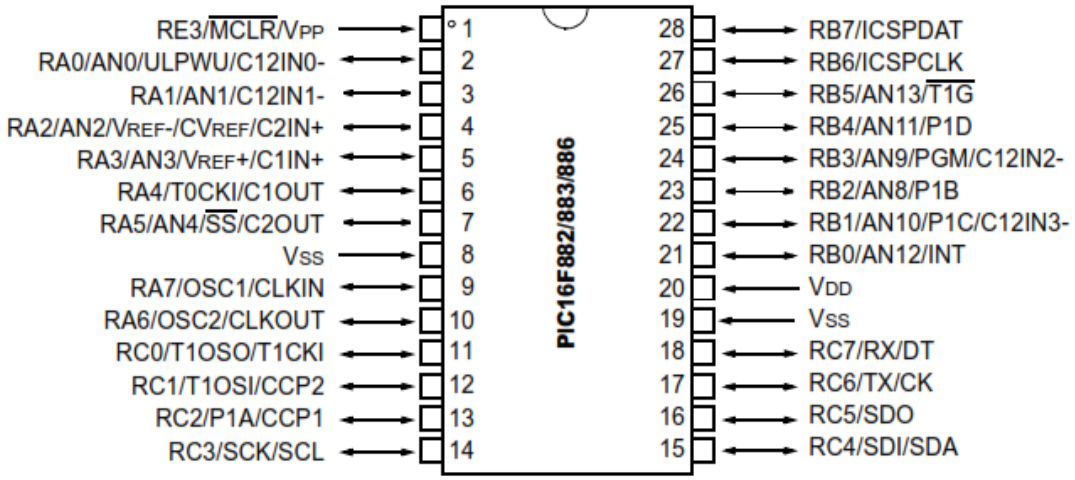

Figure Pin diagram of PIC16f883

5. SOFTWARE IMPLEMENTATION

5.1 Proteus

Proteus 7.0 is a Virtual System Modeling (VSM) that combines circuit simulation, animated components and microprocessor models to co-simulate the complete microcontroller-based designs. This is the perfect tool for engineers to test their microcontroller designs before constructing a physical

prototype in real time. This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC, switches and buttons. One of the main components of Proteus 7.0 is the Circuit Simulation a product that uses a SPICE3f5 analogue simulator kernel combined with an event-driven digital simulator that allow users to utilize any SPICE model by any manufacturer. Proteus VSM comes with extensive debugging features, including breakpoints, single stepping and variable display for a neat design prior to hardware prototyping. In summary, Proteus 7.0 is the program to use when we want to simulate the interaction between software running on a microcontroller and any analog or digital electronic device connected to it

CCS Software

A compiler is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language (the target language, often having a binary form known as object code). The most common reason for wanting to transform source code is to create an executable program. This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high-level language. The compiler includes built-in functions to access the PIC microcontroller hardware such as READ_ADC to read a value from the A/D converter. Discrete I/O is handled by describing the port characteristics in a PROGRAM. Functions such as INPUT and OUTPUT_HIGH will properly maintain the tri-state registers. Variables including structures may be directly mapped to memory such as I/O ports to best represent the hardware structure.

5.2 Python

Python is a general-purpose interpreted, interactive, object-oriented and high-level programming language. Python was created by Guido van Rossum in the late eighties and early nineties National Research Institute for Mathematics and Computer Science in the Netherlands. Like Perl, Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

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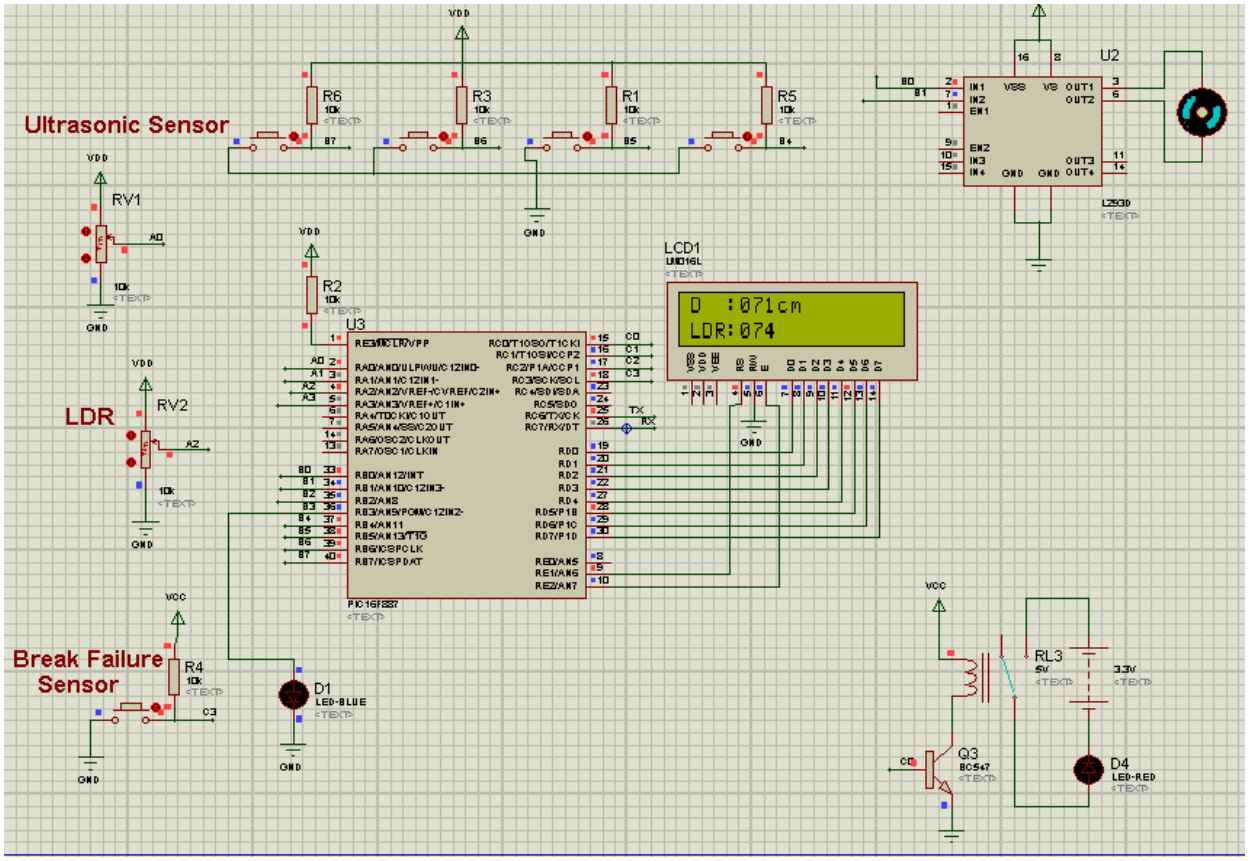
SIMULATION OUTPUT

6.1 Range Setting



The basic simulation schemata of project is drawn as seen in the above image with almost all the components which use in project.

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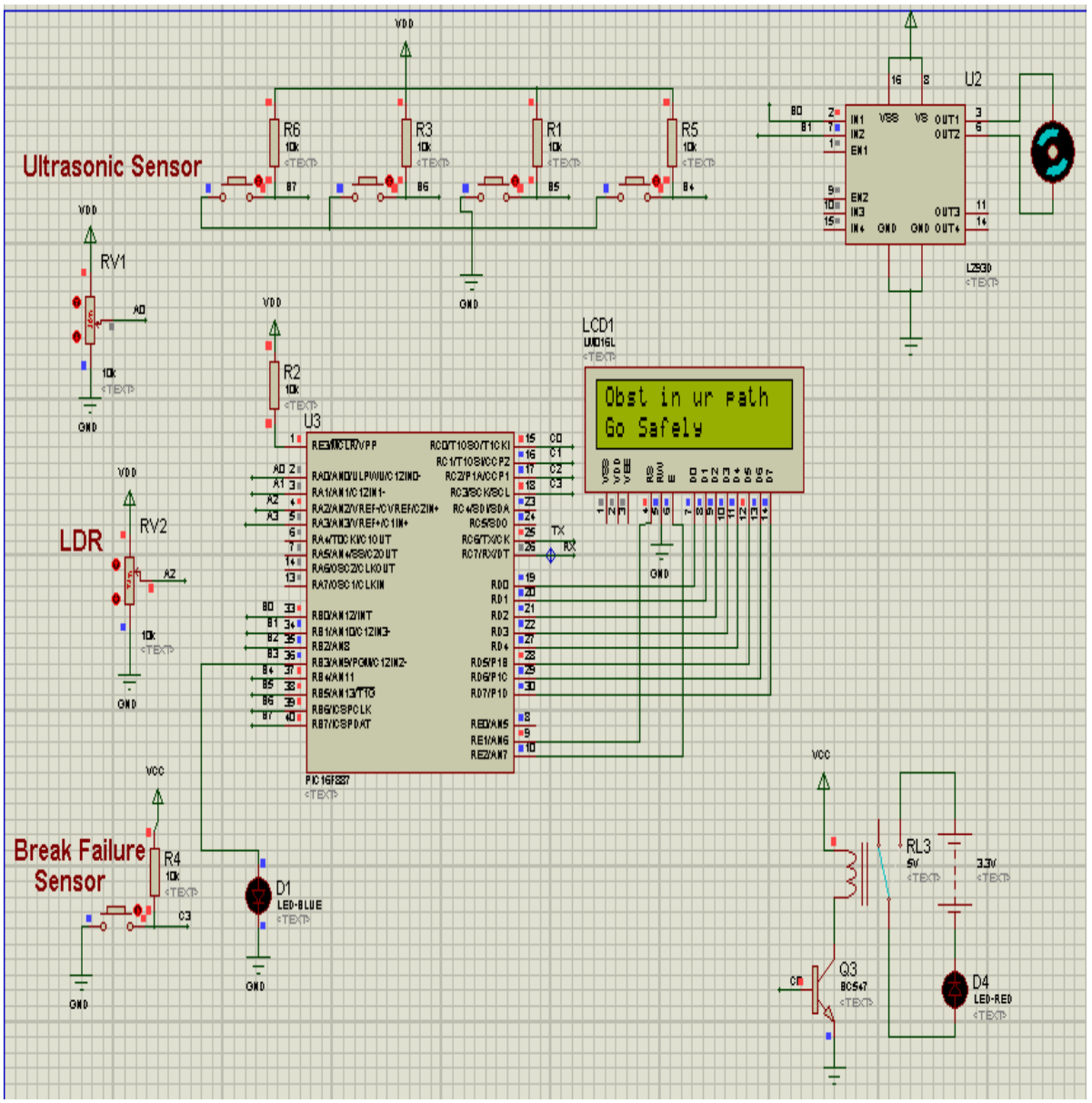
6.2 When Ultrasonic Sensor Sense any Obstacles



In the system, if any obstacles present in the path, the ultrasonic sensor sense the obstacle and gave an acknowledgment to the user through LCD display “obst in ur path Go safely” or else the system remains in normal state.

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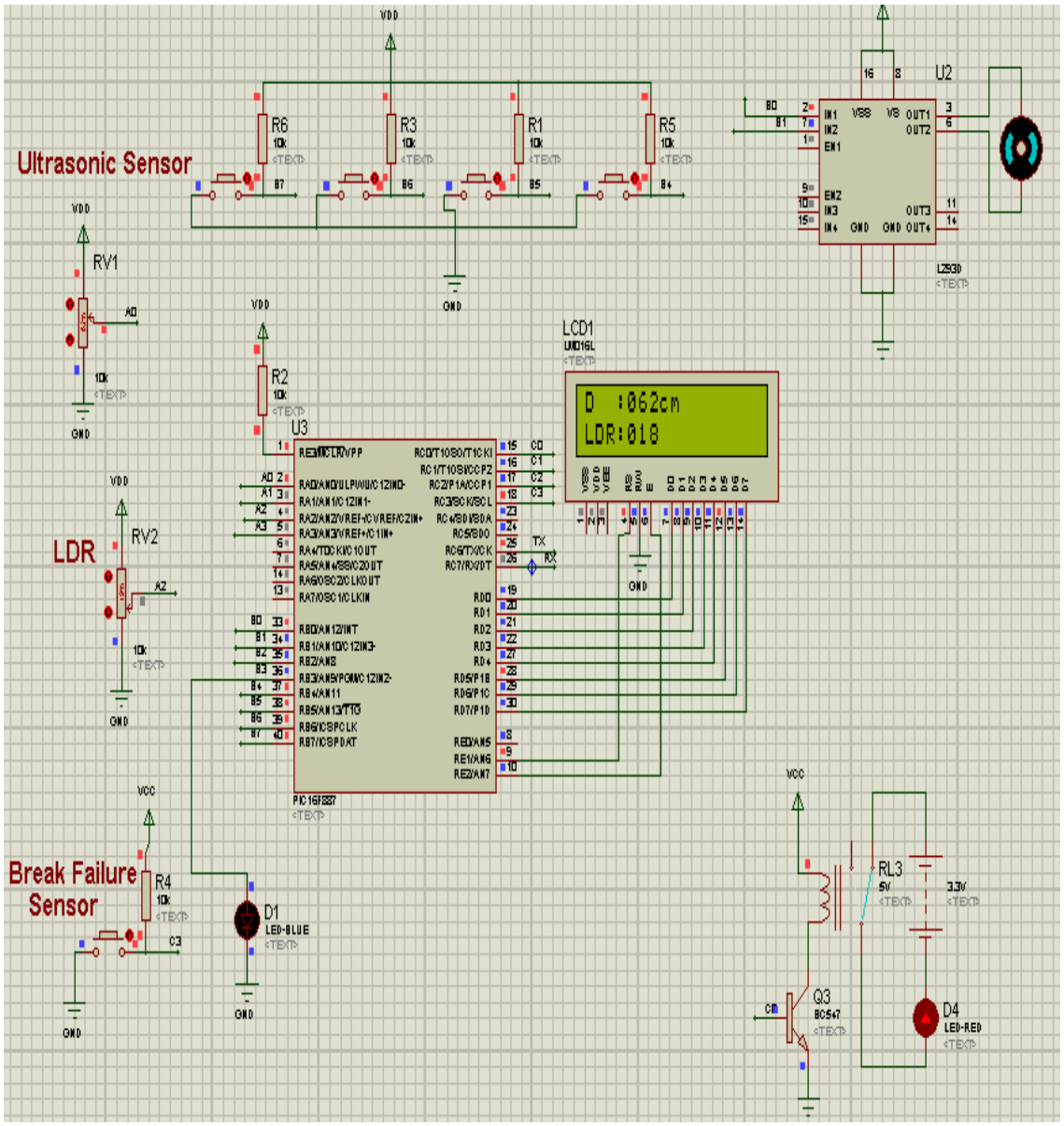
6.3 Automatic head light dimming system



In the system, Light Dependent resistor (LDR) senses the intensity of light. If the intensity of light high, the head light is in OFF condition. If the intensity is Low, the LDR offer low resistance path to the head light and Turn ON. Depends upon the light intensity the headlight of vehicle is ON or OFF.

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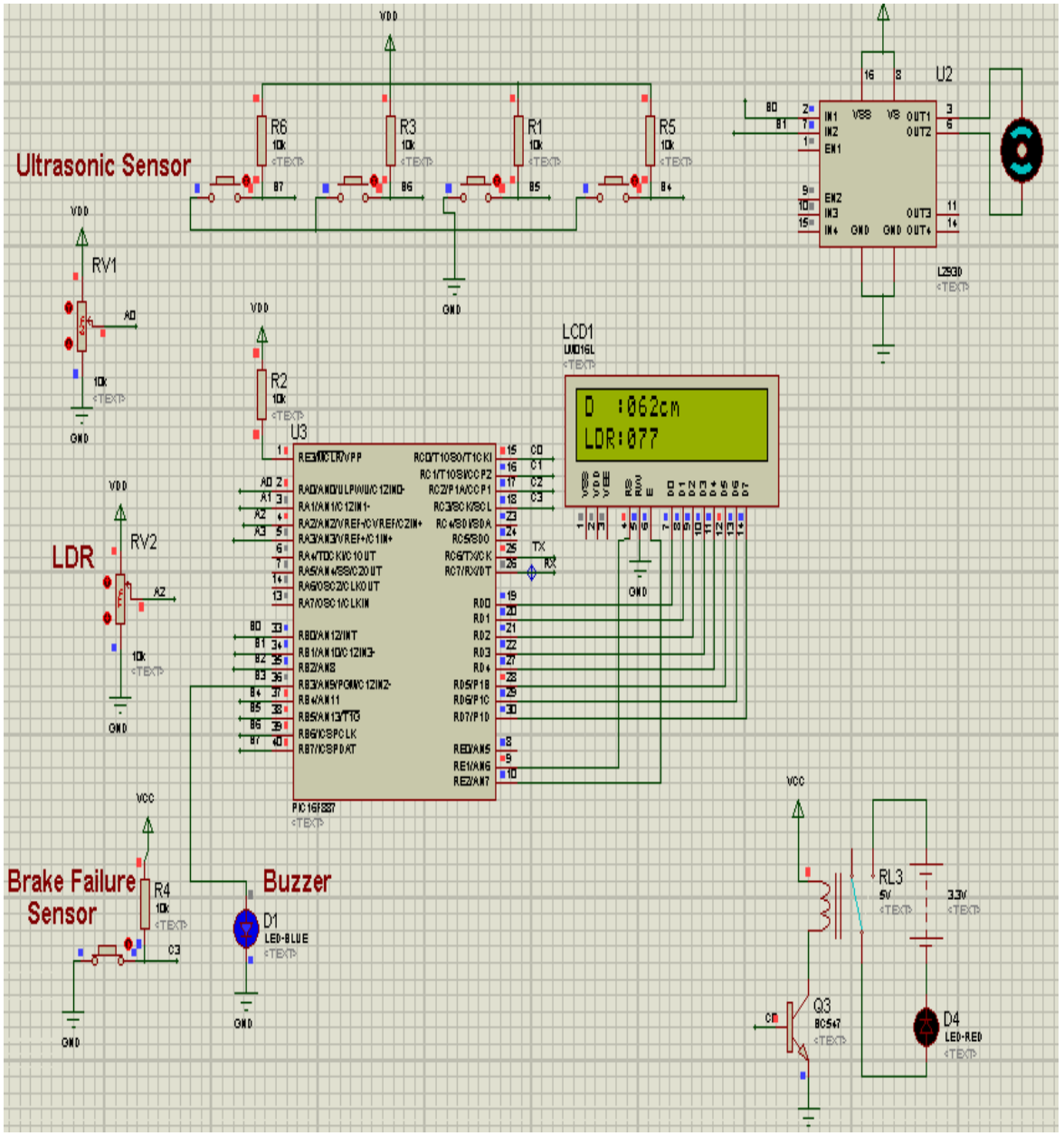
6.4 Brake Failure Sensor



Brake Failure Sensor (IR Sensor), in the vehicle, if break wire has cut off or any kind of brake failure occurs, the Buzzer triggered to acknowledge the user about the brake failure and the vehicle engine is stopped.

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7. HARDWARE OUTPUT

HARDWARE SETUP

Figure 7.1 Hardware Output

SPEED CONTROL

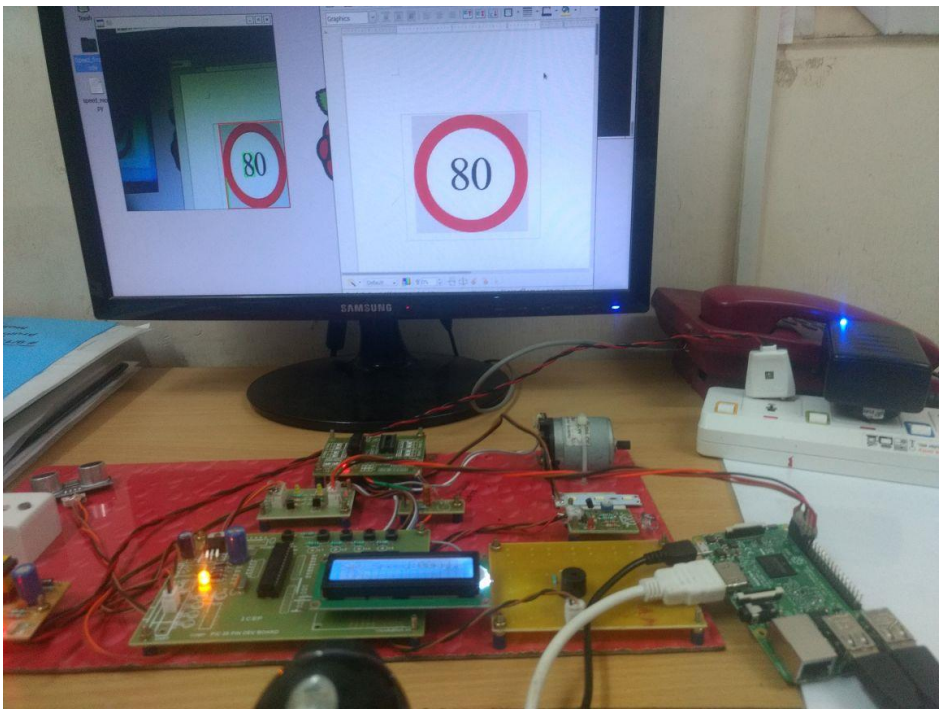

Figure 7.2 Speed Limit 80

Camera detects the sign board and sends to Raspberry Pi and recognizes the meaning of sign board and displayed into LCD

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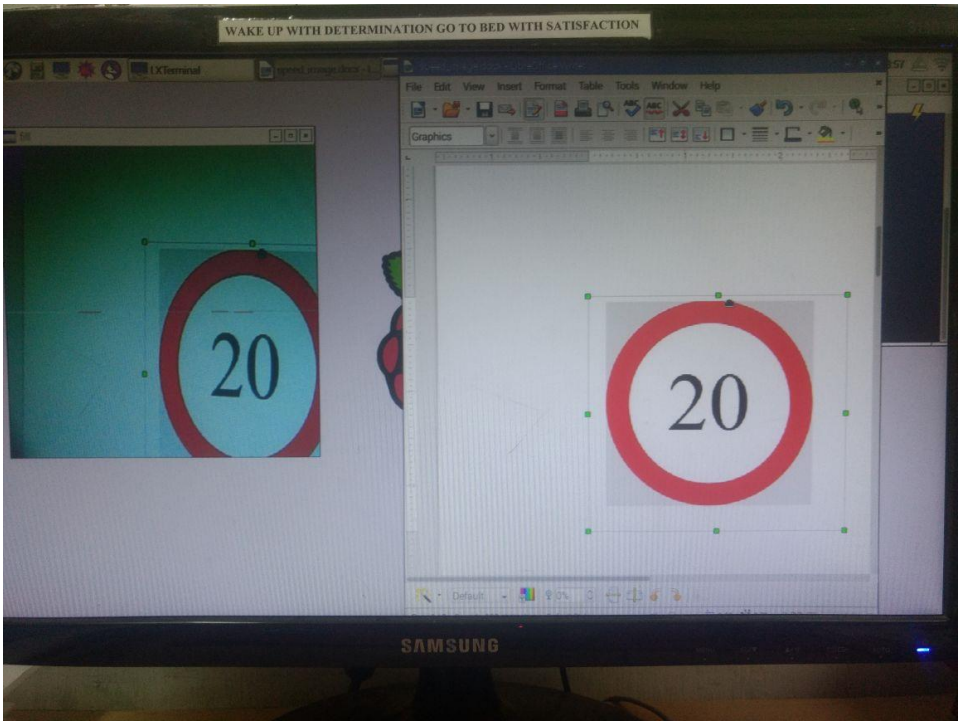

Figure 7.3 Speed Limit 20

When the camera detect the sign board of speed limit 20 km/hr

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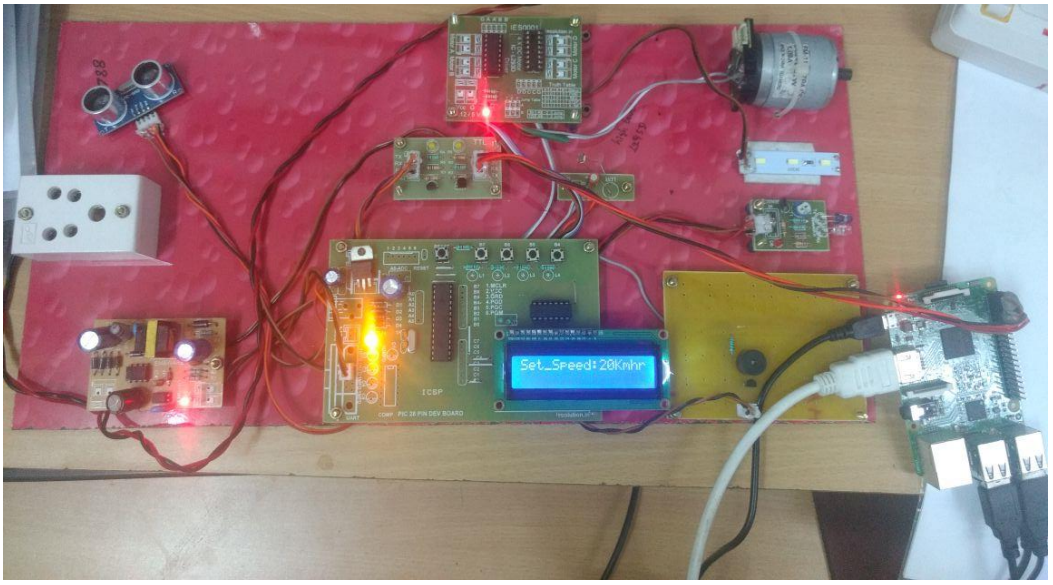

SPEED COTROL UNDER 2

Similarly Raspberry Pi recognizes the sign board and automatically controls the speed in 20 km/hr

CONCLUSION

The Pi camera is implemented on roof of vehicle to capture the image processing of speed sign board. The road sign recognition system based on an embedded system that reads and recognizes speed signs. The digital image captured is sent to the Raspberry Pi and limited speed is recognized and compared with vehicle speed. The Raspberry Pi controls the speed of vehicle by setting the speed of vehicle motor. From Raspberry Pi we can get the audio output signal regarding the speed limit and alert the driver.

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