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Driver Assistance Vehicle with Road Sign Detection Using Raspberry Pi Lakireddy Bali Reddy College Of Engineering (Autonomous)

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Abstract: *Driver assistance systems become one of the most important features of the modern vehicles to ensure driver safety and decrease vehicles accidents on roads. According to their type and functionality, they intervene in different levels of the control processes involved in driving. In this proposed system, multitasking of driver assistance system has been proposed. First, the system provides the driver with real time information from lanes markers, red signal and road signs, which consist the most important and challenging tasks. Secondly, generate an acoustic warning to the driver in advance of any danger. This warning then allows the driver to take appropriate corrective actions in order to mitigate or completely avoid the event. The proposed system also able to automatically regulate the speed of vehicle at special zones.*

Keywords-Driver Assistance; Raspberry Pi; Lane detection; Sign Board Detection; Obstacle Avoidance;

1. INTRODUCTION

Advanced driver-assistance systems, or ADAS, are systems to help the driver in the driving process. When designed with a safe human-machine interface, they should increase car safety and more generally road safety.

Most road accidents occurred due to the human error. Advanced driver-assistance systems are systems developed to automate, adapt and enhance vehicle systems for safety and better driving. The automated system which is provided by ADAS to the vehicle is proven to reduce road fatalities, by minimizing the human

error. Safety features are designed to avoid collisions and accidents by offering technologies that alert the driver to potential problems, or to avoid collisions by implementing safeguards and taking over control of the vehicle. Adaptive features may automate lighting, provide adaptive cruise control, automate braking, incorporate GPS/ traffic warnings, connect to smartphones, alert driver to other cars or dangers, lane departure warning system, automatic lane centering, or show what is in blind spots.

An increasing number of modern vehicles have advanced driver-assistance systems such as electronic stability control, anti-lock brakes, lane departure warning, adaptive cruise control and traction control. These systems can be affected by mechanical alignment adjustments. This has led many manufacturers to require electronic resets for these systems, after a mechanical alignment is performed, ensure the wheel aligner you are considering to allow you to meet these safety requirements.

There are many forms of ADAS available; some features are built into cars or are available as an add-on package. Also, there are aftermarket solutions available ADAS relies on inputs from multiple data sources, including automotive imaging, LiDAR, radar, image processing, computer vision, and in-car networking. Additional inputs are possible from other sources separate from the primary vehicle platform, such as other vehicles, referred to as Vehicle-to-vehicle (V2V), or Vehicle-to-nfrastructure (such as mobile telephony or wifi data network) systems.

Advanced driver-assistance systems are one of the fastest-growing segments in automotive electronics, with steadily increasing rates of adoption of industry-wide quality standards, in vehicular safety systems ISO 26262, developing technology specific standards, such as IEEE 2020 for Image Sensor quality and communications protocols such as the Vehicle Information API.

2. LITERATURE REVIEW

[1] R.H.Brasil and A.M.C.Machado [2017] designed Automatic Detection of Red Light Running Using Vehicular Cameras. In their work, they proposed a red light runner detection to be performed by a system that consists of a camera and a computer embedded in the vehicle. An algorithm is also proposed to process the recorded videos and a prototype was implemented. The prototype's goal is to monitor work vehicles without any

intervention in driving, acting only in as an educational tool. Tests are performed with video recorded in the streets of Belo Horizonte during the day and with a benchmark video using the implemented prototype. The results are compared based on the execution time and accuracy. The video processing took less one tenth of the video duration and the accuracy was about 95.8%.

[2] Mohabbath Rubaiyat Tanvir Hussain and Md Asif Shahjalal designed a web controlled partially autonomous vehicle system which highlights the idea to develop a remote controlled car which can be driven from anywhere using internet over a secured server. The system mainly consists of a Raspberry pi, an Arduino a Picamera, a sonar module, a web interface and internet modem. The proposed system is very cheap in terms of automation.

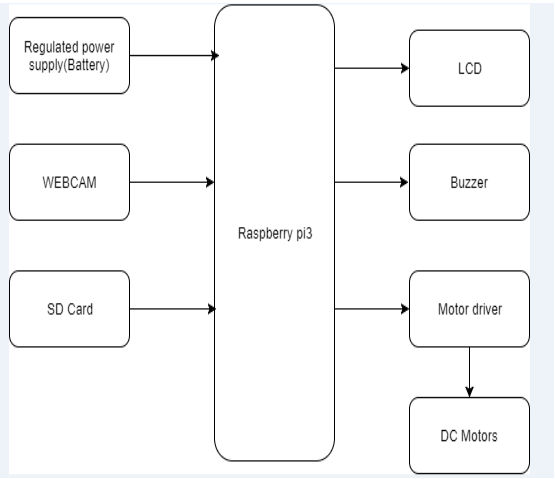
[3] San Jose, CA, USA designed the real time processing techniques being investigated in the next generation driver assistance systems. It will compare and contrast conventional digital signal processing methodologies versus the emerging use of parallel processing engines such as Field Programmable Gate Arrays (FPGAs) to implement true real time systems.

1. **SYSTEM DESCRIPTION**.

The proposed system has two main parts hardware and software. The hardware part consists of three main hardware components Raspberry Pi, Ultrasonic Sensor, Web Cam, and IR sensor and . Software part consists of Python software.

2. METHODOLOGY

In the block diagram, the Raspberry Pi 3 is the main block. It includes all the loads which are connected to it. In this block diagram the processor is provided with dc motors which will be driven by motor driver L293 chip and all those road signs and signals will be monitored by the camera connected to it. An external sd card is provided to the Raspberry Pi in order to extend the storage for the processor as it does not have enough memory space in it to store the data in it. An additional buzzer is provided to it in order to indicate the buzzer sound when needed. A regulated power supply is continuously given to the circuit which is of 5V that is required by the processor..



After initializing sensor nodes, each of the sensors will continuously check for the data. Every node after obtaining the real time data, it will send the data to raspberry pi.

3. HARDWARE ARCHITECTURE

The proposed system consists of hardware components like Raspberry Pi, Ultrasonic Sensor, Web Cam, and IR sensor and DC motor.

Raspberry Pi

The Raspberry Pi has a Broadcom BCM2835 System on Chip module. It has an ARM1176JZF-S processor.

The Broadcom SoC used in the Raspberry Pi is equivalent to a chip used in an old smartphone (Android or iPhone). While operating at 700 MHz by default, the Raspberry Pi provides a real world performance roughly equivalent to the 0.041 GFLOPS. On the CPU level the performance is similar to a 300 MHz Pentium II of 1997-1999, but the GPU, however, provides 1 Gpixel/s, 1.5 Gtexel/s or 24 GFLOPS of general purpose compute and the graphics capabilities of the Raspberry Pi are roughly equivalent to the level of performance of the Xbox of 2001. The Raspberry Pi chip operating at 700 MHz by default, will not become hot enough to need a heatsink or special cooling.

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.

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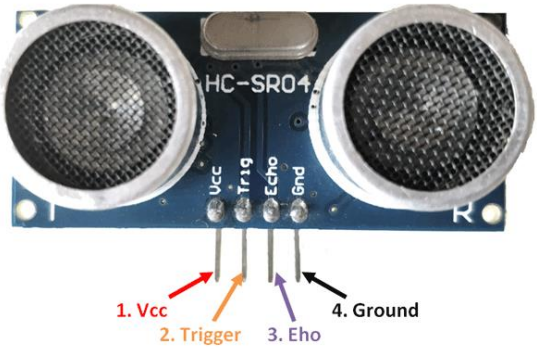


INFRARED SENSOR

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 and detecting motion.

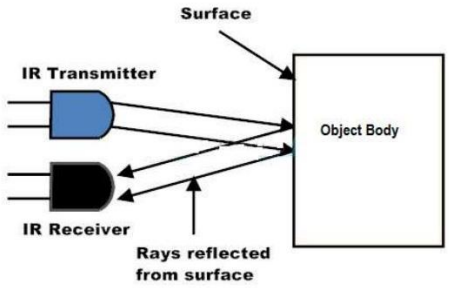
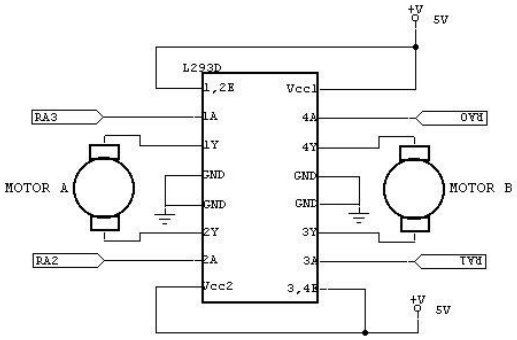


fig. IR Sensor

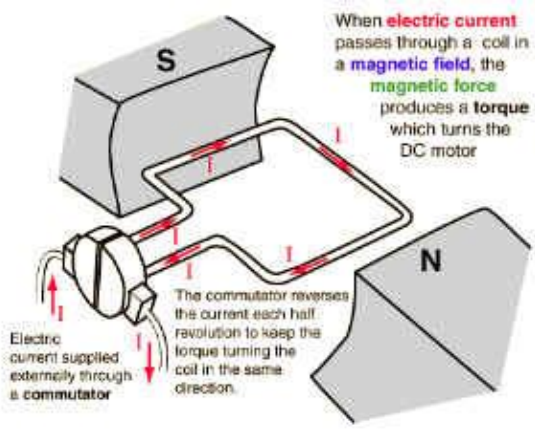
L293 MOTOR DRIVER

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.



DC MOTOR

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.



BUZZER

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows.

It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an

electric bell without the metal gong . Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Son alert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

CAMERA

A camera is an optical instrument for recording or capturing images, which may be stored locally, transmitted to another location, or both. The images may be individual still photographs or sequences of images constituting videos or movies. The camera is a remote sensing device as it senses subjects without any contact . The word camera comes from camera obscura, which means "dark chamber" and is the Latin name of the original device for projecting an image of external reality onto a flat surface. The modern photographic camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the human eye. The first permanent photograph was made in 1826 by Joseph Nicéphore Niépce.

5. FUTURE SCOPE

The future scope involves the development of these vehicles to replace the traditional methods of manual driving by autonomous vehicles that do not need any drivers and also a drastic decrease in reducing the accidents. The development of smart vehicles will greatly reduce human effort in terms of risk and also provides comfort.

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A camera works with the light of the visible spectrum or with other portions of the electromagnetic spectrum. A still camera is an optical device which creates a single image of an object or scene and records it on an electronic sensor or photographic film. All cameras use the same basic design: light enters an enclosed box through a converging lens/convex lens and an image is recorded on a light-sensitive medium(mainly a transition metal-halide). A shutter mechanism controls the length of time that light can enter the camera. Most photographic cameras have functions that allow a person to view the scene to be recorded, allow for a desired part of the scene to be in focus, and to control the exposure so that it is not too bright or too dim. A display, often a liquid crystal display (LCD), permits the user to view the scene to be recorded and settings such as ISO speed, exposure, and shutter speed.

4. CONCLUSION

In this project, a reliable, compact, fast and low cost driver assistance system using Raspberry Pi has been proposed, implemented and tested. The proposed system utilizes image processing technique using camera and ultrasonic sensors and infrared sensors to implement lane detection, road sign detection and obstacle avoidance. It uses Raspberry Pi software and implements the above functions. A system is developed to implement sophisticated, advanced and high safety vehicle model.

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