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SENSOR BASED VEHICLE OVER SPEED DETECTOR OVER 207 USING ARDUINO

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ABSTRACT:

The car industry's growth has led to the creation of numerous advanced automobiles in the 21st century, and innovation has become particularly advanced. Individuals' lives have grown significantly simpler as a result of this huge quantity. However, there is another problem with this innovation: people are not abiding by the rules and regulations, and many accidents have happened as a result of hurried driving. The designers eventually developed another project, the rush vehicle speed detector, as a result of their work. This project is designed and developed by considering the previously mentioned problem. Two sensors have been used in this project. Two sensors are used in this project; the major function of each sensor is to detect and convert electrical amounts.

This project has also been driven with the assumption that when the vehicle's speed reaches a certain threshold, the LED would flicker. Several experts and strategists have argued that expanding the road network is an inefficient response to congestion, specifically stating that it is not practical to construct a sufficient number of interstates. Limit to provide a great deal of assistance in large cities. In any event, because these roads have no speed restrictions, the construction of expressways is only paving the path for accidents. We have gear called the Speed Checker for Parkways intended to overcome this problem. The suggested system would monitor excessive speeding by calculating a car's speed based on how long it takes to travel a reasonable distance between two predetermined points. An IR transmitter and an IR collector are two of the sensors that make up a set point, and they are all installed on different roadside locations.

I. INTRODUCTION:

This framework's main purpose is to support an Arduino UNO-based speed checker for highways and notify traffic experts in the event that a speed violation occurs. Because of careless and rude driving on expressways, many passengers and drivers—including employees—have died.Roadway police used to employ radar weaponry to target cars and record their rates in order to identify reckless driving back in the day. In the event that a car were to exceed its speed limit, the information would be sent to the nearest police headquarters so that the vehicle's speed could be adjusted. Lots of time would be wasted as a result of this structure. The components of this suggested framework include an Arduino UNO, displays, IR sensors, LEDs, and power supply blocks. The power supply block provides electricity to the whole structure, with the Arduino UNO serving as its main component. Infrared sensors are positioned on each side of the road to detect the speed at which the car may go. In the unlikely event that the vehicle crosses as far as feasible, hand-off is activated, the light turns "on," and the LED notifies the police that the car is crossing as far as possible while displaying the data on the LCD Display.

This project's primary goal is to regulate vehicle speeds in restricted areas, such as schools and hospitals. Smart speed breakers are traffic-

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claiming devices that, when triggered by a very fast car, elevate the speed breaker above the road's surface and provide the motorist with more physical space to slow down their vehicle. The speed bumps will stay level on the road and enable vehicles to drive past them with ease if they are traveling at the designated permitted speed limit. In practice, we're utilizing a flat speed breaker made of iron that can raise itself with the help of integrated system control circuitry. In this project, proximity sensors are used to detect speed, activate the speed breaker, and display a warning to the driver using a regular traffic light signal. The Arduino controller is used to relate speed; if it exceeds the limited speed, the controller warns the driver.

At the moment, reckless driving and excessive speeding on roadways are the main causes of accidents. Because there are more cars on the road, the number of accidents rises annually. Although the government has done a lot of action to stop these types of incidents, it is insufficient. Although the majority of manufacturers have created a laser-based control system, the price is prohibitive. Initially, we considered using laser diodes, but they were expensive. Next, we considered using an IR sensor, but it only functioned in a direct line of sight. Ultimately, we opted to utilize an RF module.The primary goal is to create an embedded system-compatible Smart Display and Controller (SDC) unit for the speed control and monitoring of vehicles. A Smart Display & Controller device may be made to fit into the dashboard of a car, and it regulates the speed of the car automatically in various zones (such as school zones, hill areas, turn zones, highways, etc.). It is made up of two independent units: the receiver (speed display and control) unit and the zone status transmitter unit. Data may be sent from the wireless transmitter module up to 100 feet distant from the car. The embedded device in the car automatically lowers the speed in accordance with the designated zone once the information from the zones is received.

II. LITERATURE SURVEY

According to recent research, changes in the highway, such as the presence of road construction or unforeseen obstructions, and excessive or suitable speed are linked to one-third of fatal or catastrophic accidents. Transportation research organizations, the car industry, and traffic authorities are all very concerned in reducing the frequency of accidents and lessening their effects. Using modern driver aid systems, which are visual, aural, or haptic signals generated by the car itself to alert the driver of the risk of a collision, is one crucial course of action. Commercial vehicles now come equipped with some of these technologies, and trends for the future point to automated driving controls being able to attain even greater safety levels.

In India, driving is a major form of transportation. India has a vast road network that stretches throughout the nation. The world's greatest rate of accidents and unintentional deaths occurs in India. According to a Ministry of traffic Transport & Highways study, one traffic accident occurs in India every minute throughout the year, taking one life every three minutes. Contrary to common assumption, poorly constructed roads are only the cause of 1.5% of accidents. 77 percent of the time, the driver is at fault. In densely crowded areas like schools or hospitals, this becomes more risky. Although there are speed breakers available in school zones, drivers must manually use them to slow down their cars. A driver's error often results in uncontrolled speed. RF communication may be used to automate this

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procedure, controlling the speed in an automated manner.

III. DESIGN OF HARDWARE

This chapter briefly explains about the Hardware. It discuss the circuit diagram of each module in detail.

ARDUINO UNO

A microcontroller board based on the ATmega328 is called the Arduino Uno (datasheet). It has a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (six of which may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; all you need to do is power it with a battery or an AC-to-DC converter or connect it to a computer via a USB connection to get going.The FTDI USB-to-serial driver chip is not used by the Uno, setting it apart from all previous boards. As an alternative, it has the Atmega16U2 (or Atmega8U2 up to version R2) configured as a serial-to-USB converter. The 8U2 HWB line on the Uno board is pulled to ground by a resistor, which facilitates DFU mode entry. The Arduino board now includes the following updates:

• 1.0 pin out: two further new pins, the IOREF, are positioned next to the RESET pin, the SDA and SCL pins that were introduced, and they enable the shields to adjust to the voltage supplied by the board. Shields will eventually work with both the Arduino Due, which runs on 3.3V, and the boards that utilize the AVR, which runs on 5V. The second pin is unconnected and set aside for future uses.

• A more robust RESET circuit.

• The 8U2 is replaced with an ATMega 16U2.

"Uno" is an Italian word for one, and it was chosen to commemorate the impending introduction of Arduino 1.0. Going future, the Arduino reference versions will be the Uno and version 1.0. The Uno is the most recent in a line of USB Arduino boards and the platform's standard model; see the index of Arduino boards for a comparison with earlier iterations.

Fig: ARDUINO UNO

POWER SUPPLY:

The purpose of the power supplies is to convert the high voltage AC mains energy into a low voltage supply that is appropriate for use in electronic circuits and other devices. One may disassemble a power supply into a number of blocks, each of which carries out a specific task. "Regulated D.C. Power Supply" refers to a d.c. power supply that keeps the output voltage constant regardless of differences in the a.c. main or the load.

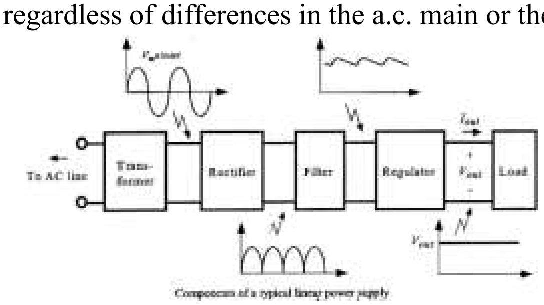

Fig: Block Diagram of Power Supply

LCD DISPLAY

The model shown here is the one that is most often utilized in practice due to its cheap cost and enormous potential. Its HD44780 microcontroller (Hitachi) platform

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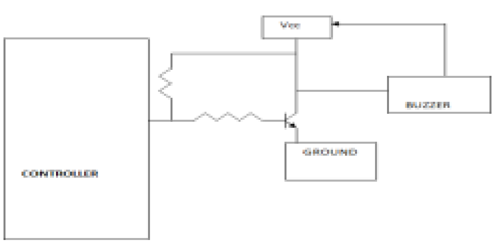
allows it to display messages in two lines of sixteen characters each. All of the alphabets, Greek letters, punctuation, mathematical symbols, etc., are shown. Furthermore, it is possible to show custom symbols created by the user. Some important features are the automatic changing of the message on the display (shift left and right), the presence of the pointer, the lighting, etc.

Fig: LCD

BUZZER

Relays, buzzer circuits, and other circuits cannot be driven by the current available on digital systems and microcontroller pins. The microcontroller pin can provide a maximum of 1-2 milliamps of current, even though these circuits need around 10 milliamps to work. Because of this, a driver—such as a power transistor—is positioned between the buzzer circuit and microcontroller.



WIFI MODULE:

A low-cost Wi-Fi microprocessor with complete TCP/IP stack and microcontroller functionality, the ESP8266 is made by Chinese firm Espressif Systems, located in Shanghai.[1]

In August 2014, a third-party producer named Ai-Thinker's ESP-01 module brought the chip to the attention of western manufacturers for the first time. With the help of this little module, microcontrollers may establish basic TCP/IP connections and connect to Wi-Fi networks by utilizing Hayes-style instructions. But at the time, there wasn't much documentation available in English on the chip or the commands it could execute.[2] Many hackers were drawn to investigate the module, chip, and software on it as well as translate the Chinese documentation because of its very cheap cost and the fact that it had very few external components, suggesting that it may someday be very affordable in production.[3]

With its 1 MiB of integrated memory, the ESP8285 is an ESP8266 that enables single-chip Wi-Fi capable devices.[4]

The ESP32 is these microcontroller chips' replacement.

LED:

A light source made of semiconductors with two leads is called an LED. When turned on, this p-n junction diode generates light.[5] Within the device, electrons may recombine with electron holes when a proper voltage is given to the leads, releasing energy in the form of photons.

This phenomenon is known as electroluminescence, and the energy band gap of the semiconductor controls the hue of the light, which corresponds to the photon's energy. Since LEDs are usually tiny—less than 1 mm2—the radiation pattern may be modified by integrated optical components.

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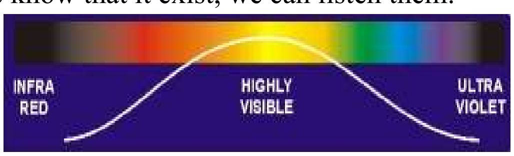
Early LEDs were often utilized to replace tiny incandescent bulbs as indication lighting for electrical equipment. They were quickly bundled into seven-segment displays for use as numeric readouts, and digital clocks became popular with them. Modern advancements have led to the creation of LEDs that are appropriate for task and ambient lighting. New displays and sensors have been made possible by LEDs, and modern communications technology benefits from their rapid switching rates.

IR SENSOR

Infrared is a energy radiation with a frequency below our eyes sensitivity, so we cannot see it Even that we can not "see" sound frequencies, we know that it exist, we can listen them.



Even that we can not see or hear infrared, we can feel it at our skin temperature sensors.

When you approach your hand to fire or warm element, you will "feel" the heat, but you can't see it. You can see the fire because it emits other types of radiation, visible to your eyes, but it also emits lots of infrared that you can only feel in your skin.

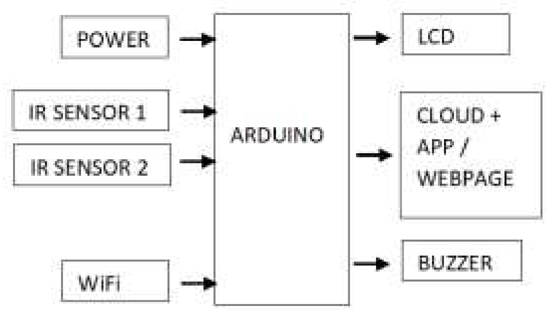
INFRARED IN ELECTRONICS

Although infrared is readily created and immune to electromagnetic interference, making it a useful tool for communication and control, it is not ideal; infrared emissions from other sources may also include other wavelengths of light, which might interfere with infrared transmission. As an example, consider the sun, which produces radiation with a broad spectrum. The market saw the introduction of inexpensive infrared diodes (emitters and receivers) as a result of the experimentation with extensive infrared use in TV/VCR remote controls and other applications.

You should now consider infrared to be merely "red" light. The "on" or "off" radiation in this light might convey diverse signals to the recipient.Anything that radiates heat, such as our bodies, lights, stoves, ovens, friction between your hands, and even hot water from the tap, may produce infrared radiation.

IV. BLOCK DIAGRAM AND HARDWARE DISCRIPTION

BLOCK DIAGRAM:



WORKING

Vehicle overspeed detectors that use infrared sensors are designed to measure a car's speed and alert users when it exceeds a certain limit. The system makes use of an Arduino microcontroller to determine the speed based on how long it takes the car to go between two places and infrared sensors to detect vehicle movement. The system records the infraction data or sounds a warning if the vehicle goes beyond the predetermined speed limit. This is a detailed explanation of how this system operates:

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1. System Components

- IR Sensors: On the road, two IR sensor modules—IR transmitter and receiver pairs—are spaced out at a specified distance from one another, such as one or two meters. These sensors look for breaks in the infrared beam to determine if a car is nearby.
- Arduino: The central processing unit that computes the vehicle's speed and decides if it is above the speed limit based on information from the infrared sensors.
- LCD Display (Optional): Shows the speed of the car or sounds a warning if the speed limit is crossed.
- Optional buzzer/LED: Sounds or lights up when a vehicle goes above the posted speed limit.
- Juice Supply: Gives the IR sensors and Arduino juice.

2. System Setup

- A preset distance D separates the locations of the two infrared sensors along the track or road.
- Every IR sensor is wired to the Arduino's digital input pins, and when a car obstructs the infrared beam, the sensor's output signals the Arduino.

3. Detection of Vehicle Passage

- The Arduino records the interruption of the infrared beam that occurs when the car passes by Sensor 1 (IR1). T1 is the precise moment when this event takes place.
- The Arduino logs the second beam interruption that occurs when the vehicle passes by Sensor 2 (IR2), which is situated D distance from Sensor 1. This time is designated as T2.

4. Speed Calculation

  - When the car travels between IR1 and IR2, the Arduino determines the time difference (ΔT) between the two events: Delta T = T2 - T1 and ΔT = T2 - T1
  - The following formula is then used to determine the vehicle's speed (V): \frac{D}{\Delta T}V=ΔTD = V=DΔTV Where:
  - The two infrared sensors' distance, measured in meters, is denoted by D.
  - The vehicle's journey time (in seconds) between the two sensors is measured by ΔT.
  - V is the vehicle's speed in meters per second (m/s), which is multiplied by 3.6 to get kilometers per hour (km/h).

5. Over-Speed Detection

- Following the speed calculation, the Arduino checks the car's speed against a predetermined speed restriction that is programmed into the code.
- Should the computed speed surpass the specified limit:
- An LED lights or a buzzer sounds to alert the driver that the car is speeding.
- An LCD panel may optionally show the speed and violation status of the car.
- If the car stays under the speed limit, nothing happens; alternatively, the system can only show the vehicle's speed on the LCD.

V. CONCLUSION

Monitoring and regulating vehicle speeds at certain locations on roadways is made simple and economical with the Arduino-based IR sensor-based vehicle overspeed detector. The system precisely monitors the amount of time a vehicle takes to pass between two checkpoints, computes its speed, and compares it to a predetermined speed restriction by using infrared sensors and an Arduino microcontroller.

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By discouraging overspeeding, the system promotes road safety by activating alarms via buzzers or LEDs when the speed exceeds the limit.

Due of its simplicity, affordability, and ease of deployment, the system may be used in sensitive locations including construction sites, school zones, and highways. Limitations include environmental sensitivity and the set detection range of IR sensors may hinder its accuracy in certain situations, even if it offers real-time speed detection and alarm capabilities.

In summary, this system is a useful tool for enhancing traffic control and lowering the number of accidents caused by speeding. It has the potential to be much better by integrating cutting-edge data recording and communication technology.

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