IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

IOT BASED SPEED CONTROL AND ACCIDENT AVOIDANCE USING AI ROAD SIGN DETECTION SYSTEM

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ABSTRACT

Despite significant advances and innovations in deep network-based vehicle detection methods, finding a balance between detector accuracy and speed remains a significant challenge. Revolution comes all over the world. Road transportation has become the most valuable element of modern communication. With the increase in population, traffic jams and road accidents have become a massive issue. Most of the time, people can't get advanced traffic jam alerts. As a result, after moving into an area, we noticed a traffic jam. At present situation the human beings are faced many accidents during the road ways transportation. The increasing number of vehicles on Indian roads and low traffic rules enforcement lead to multiple human-error induced crashes and fatalities. At the same time, they lose our life and valuable properties in those accidents. For this reason, traffic accidents involving driver fatigue and driver carelessness of traffic rules follow. In this project, a Multi-tasking Convolutional Neural Network (MCNN) model is proposed to detect traffic sign and vehicle parameters like vibration and position. Traffic sign and physical characteristics are utilized for driver's model. Changes to these characteristics are used to monitor vehicle state and speed control. In this project, a new detection scheme MCNN is proposed to accurately achieve real-time speed detection, classification of small traffic signs and driver state of drunk and vehicle parameters. Here implements this project in real time using Webcam and also extend this system with embedded application to reduce the speed and stop the vehicle while the abnormal activities were detected. Over the past ten years there has been an enormous increase in road accidents, where millions of people left their souls on the roads and it's due to speeding and avoiding safety gear.

Keywords: Convolutional Neural Network, Communication, Webcam and Traffic.

1. INTRODUCTION

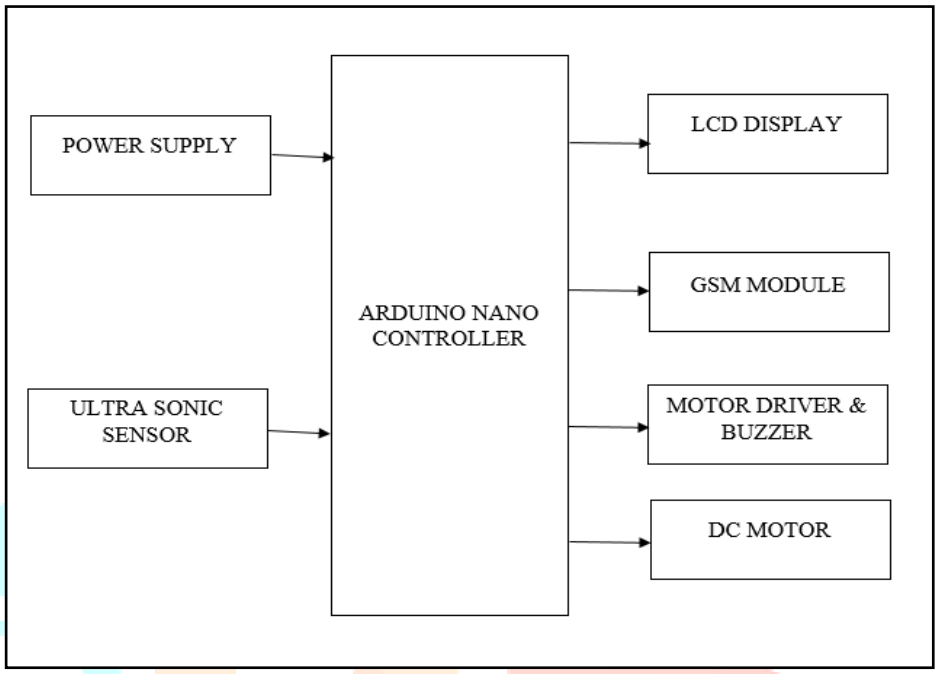
As the population grows, the need for vehicles is rising tremendously. The percentage of traffic accidents has significantly increased over the past few years. Over the speeding is the primary contributing factor to accidents, according to a recent study. The location of the accident scene is crucial for any rescue operation. If there is a city or there is a lot of traffic emergency help will soon be accessible, however in low-traffic zones or on roads, it is not. It's challenging to deliver timely emergency relief. Significant injuries are observed to transform into mortality brought on by inadequate medical attention. Due to the rise in traffic accidents, road safety receives a lot of attention from industries. An intelligent system for accident detection and warning is necessary to reduce the number of deaths from the road accidents. Once the system identifies an accident, it will notify all emergency services, including hospitals, police stations, and so on. In our project, we suggest a force detection system for accident detection. ESP8266 controller, camera, Raspberry Pi, GSM module, sensor, GPS module, alarm controller, alarm controller, GSM module, and GSM module to gather and send accident- related data to the cloud or server. And then by using deep

learning method it's possible to know the accident's severity and notify the police station and hospitals appropriately. The suggested system comprises two stages:

Using IOT and deep learning, an accident is discovered in the first phase.

The second phase involves sending accident data to the emergency departments for the rescue effort

2. BLOCK DIAGRAM

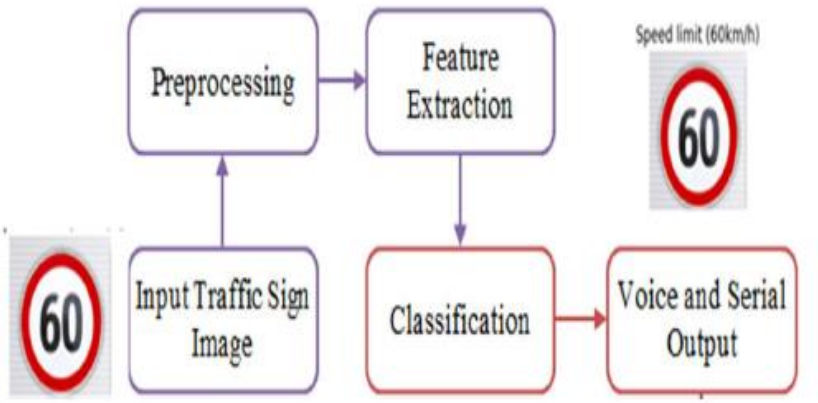


2.1 WORKING PRINCIPAL

In this proposed system. We used ultrasonic sensor to monitor and control the speed of the vehicle. The ultrasonic sensor will interface with Arduino nano controller. If the ultrasonic sensor detects any object, speed backer and any vehicle nearby means it will alert through buzzer and send the notification through GSM module. Based on the data received vehicle speed will controlled

3. SYSTEM DESIGN

3.1 ARCHITECTURE DIAGRAM



Here we take the traffic sign image as main progress. Once the image will take means it pre-processes to controller and check with the data base with help of cloud and act according. Based on the data updated in controller. It will process and updated to the user through voice as serial output communication

3.2 MODULES DESCRIPTION

Data Collection and Pre-processing Module

This module is responsible for collecting raw data from various sources such as traffic cameras, vehicle sensors, and driver monitoring Systems. It pre-processes the data to remove noise, normalize values, and prepare it for training the MCNN model

Data Acquisition: Collect data from traffic cameras, vehicle sensors, and biometric devices.

Data Cleaning: Remove noise, outliers, and irrelevant information from the data.

Data Transformation: Normalize and standardize the data to prepare it for model training. Interfaces with the Data Storage Module to store Pre-processed data and the MCNN Training Module to provide training data

Training Module

This module is responsible for training the Multi-tasking Convolutional Neural Network (MCNN) model using the pre-processed data. It fine-tunes the model to accurately detect traffic signs, vehicle parameters, and driver states. Define the architecture of the MCNN model tailored for traffic sign detection, vehicle parameter estimation, and driver state monitoring Split the dataset into training, validation, and test sets. Set up hyperparameters and training configurations. Train the MCNN model using the prepared dataset, optimizing for accuracy and speed. Interfaces with the Data Storage Module to retrieve training data and the Model Evaluation Module for performance evaluation.

Real-time Monitoring Module

This module processes real-time data streams from traffic cameras and sensors to detect traffic signs, vehicle parameters, and driver states in Realtime. Continuously stream data from traffic cameras and sensors. Analyze the data using the trained MCNN model to detect traffic signs, vehicle parameters, and driver states. Generate real-time alerts and notifications for detected anomalies or violations. Interfaces with the MCNN Training Module to utilize the trained model and the User Interface Module to display real-time alerts

3.3 HARDWARE DESCRIPTION

POWER SUPPLY

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only RMS output.

ULTRA SONIC SENSOR

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo.

ARDUINO NANO

The Arduino Nano is a small, flexible, and easy-to-use microcontroller board based on the ATmega328P. It is compact in size, making it ideal for breadboard applications, and it can be used for a variety of projects such as DIY electronics, automation, robotics, and prototyping.

Here are some key features of the Arduino Nano:

Microcontroller: ATmega328P
Operating Voltage: 5V
Input Voltage (recommended): 7-12V
Digital I/O Pins: 14 (of which 6 can be used as PWM outputs)
Analog Input Pins: 8
Flash Memory: 32 KB (ATmega328P) of which 2 KB used by bootloader

SRAM: 2 KB (ATmega328P)
EEPROM: 1 KB (ATmega328P)
Clock Speed: 16 MHz
Dimensions: 45mm x 18mm

The Arduino Nano is compatible with the Arduino IDE, which allows you to program the board using a simplified version of C++.

LCD DISPLAY

LCD 16x2 is a 16-pin device that has 2 rows that can accommodate 16 characters each. LCD 16x2 can be used in 4-bit mode or 8-bit mode. It is also possible to create custom characters. It has 8 data lines and 3 control lines that can be used for control purposes.

SPECIFICATIONS OF 16X2 LCD:

Display Size: 16 characters × 2 rows
Operating Voltage: 4.7V to 5.3V
Current Consumption: 1mA (without backlight)
Interface: Parallel (4-bit or 8-bit mode)
Driver IC: HD44780 (or compatible)
Character Size: 5×8-pixel matrix
Backlight: LED (optional)

BUZZER

An arduino buzzer is also called a piezo buzzer. It is basically a tiny speaker that you can connect directly to an Arduino. You can make it sound a tone at a frequency you set. The buzzer produces sound based on reverse of the piezoelectric effect.

GSM MODULE

The SIM800A is a popular GSM/GPRS module that allows for communication over GSM networks. It's widely used in various IoT and embedded applications due to its compact size and versatile features.

Here are some key features of the SIM800A module:

Quad-band Support: Operates on GSM 850MHz, EGSM 900MHz, DCS 1800MHz, and PCS 1900MHz2.
Interfaces: RS232 interface for easy connection with computers or microcontrollers2.
Power Supply: Requires a voltage supply of 9VDC to 12VDC with at least 2A peak current capability.
Low Power Consumption: Down to 1mA in sleep mode.
AT Commands: Controlled via AT commands for easy integration and control.
Built-in SIM Card Holder: For easy SIM card installation.
Network Status LED: Indicates the status of the network connection.

The SIM800A module is ideal for applications such as remote data monitoring, fleet management, vending machines, and more

L298 MOTOR DRIVER

The L298 is an integrated monolithic circuit in a 15-lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors.

The L293D IC receives signals from the microprocessor and transmits the relative signal to the motors. It has two voltage pins, one of which is used to draw current for the working of the L293D and the other is used to apply voltage to the motors

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A. Let's take a closer look at the pinout of L298N module and explain how it works

4. CONCLUSION

In this project the Convolutional Neural Network (CNN) algorithm has shown great promise in accurately recognizing traffic signs. With its ability to automatically learn relevant features from raw image data, CNNs have demonstrated high accuracy rates in classifying traffic signs, even when faced with challenging scenarios such as different lighting conditions, occlusions, and varying angles. However, further research is necessary to

Improve the robustness of the CNN algorithm for traffic sign recognition.

This includes investigating the performance of CNNs on new datasets and

Exploring the potential of incorporating other image processing techniques, such as data augmentation, to improve the accuracy of the model.

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