AUTOMATIC GATE CONTROL SYSTEM BASEDON VEHICLE NUMBER PLATE

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***ABSTRACT**: An automatic gate control system based on vehicle number plate recognition using deep learning is a system designed to improve the security and efficiency of vehicle access to controlled areas, such as parking lots, gated communities, or restricted-access facilities. The system uses a camera to capture an image of the vehicle's number plate, and then applies deep learning algorithms to recognize the characters on the plate and verify them against a pre-existing database of authorized vehicles. the input system, the image processing system. The input system is responsible for capturing the image of the number plate using a camera. The image processing system uses deep learning algorithms to recognize the characters on the plate, and then matches them against a database of authorized vehicle. If the plate is recognized as authorized, the output data send to serially to microcontroller, then Gate unit activates the gate to allow the vehicle access. . The deep learning algorithms used in the image processing system are trained using a large dataset of number of images to recognize different variations in number plate designs and characters.*

Key word: Gate control, Deep learning and Image processing.

1.INTRODUCTION:

An automatic gate control system based on vehicle number plate using deep learning is an advanced system that enables automatic access control to restricted areas using the number plate of vehicles.

This system is designed to improve the security and efficiency of entry and exit control systems by eliminating the need for manual intervention. In this paper we have conducted a survey of most authentic techniques of license plate detection of a vehicle and an automatic gate control system that will increase convenience and security at entrance of all the important places that require protection and Security. Here the gate will work automatically without the need of human beings and also the system

will be able to recognize license plates from vehicles at the entrance gate and decide whether to let vehicles inside or not. The system uses a deep learning algorithm to recognize and analyze the number plate of the vehicle as it approaches the gate. The algorithm compares the number plate with a database of authorized vehicles, and if the number plate matches, the gate opens automatically. If the number plate is not recognized or does not match the unauthorized vehicles, the gate remains closed, and the system sends an alert to the security personnel using buzzer. Then all datas will be displayed on the LCD display.

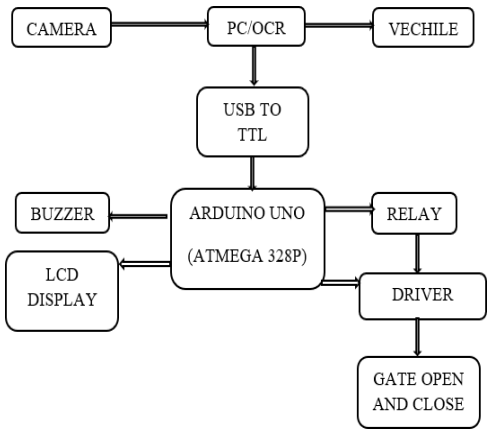
2.RELATED WORK:

1. JizhengLiu, ZhenpoWang "Event-Triggered Vehicle-Following Control for Connected and Automated Vehicles under Non-ideal Vehicle-to-Vehicle Communications". In this paper, an event-triggered vehicle-following control scheme for connected and automated vehicles (CAVs) is proposed considering nonideal Vehicle-to-Vehicle communications such as communication delays and packet dropouts. An output-based event-triggered mechanism is employed for reducing computational burden. An Event-Triggered Model Predictive Control (ETMPC) is proposed by combining with a multi-target controller for the lateral and longitudinal vehicle-following control of CAVs. The simulation results demonstrate that the proposed ETMPC can avoid unnecessary optimization implementation, achieving a computational reduction by 61.5% while maintaining the tracking precision compared with a conventional Model Predictive Controller. The proposed control scheme is also capable of being employed in vehicle platoon control,2021.

2. Zhangjie Meng, Shulian Zhao "The Vehicle Testing Based on Digital Twins Theory for Autonomous Vehicles". Digital twin's theory can provide an effective solution for the complex whole vehicle testing, which includes the dynamics and scenarios. The parallel system is the most advanced method for implementing parallel control theory. In this paper, it introduces the virtual systems established by digital modeling the autonomous driving vehicle and scenario, it introduces a connection between virtual system and the real system. There are two engineering applications based on digital twins and parallel intelligence to test the whole vehicle efficiently, its testing advantages and testing coverage,2022.

3. Behrad Toghi, Divas Grover "A Maneuver-based Urban Driving Dataset and Model for Cooperative Vehicle Applications" Short-term future of automated driving can be imagined as a hybrid scenario in which both automated and human-driven vehicles co-exist in the same environment. In order to address the needs of such road configuration, many technology solutions such as vehicular communication and predictive control for automated vehicles have been introduced in the literature. Both aforementioned solutions rely on driving data of the human driver. In this work, we investigate the currently available driving datasets and introduce a real-world maneuver-based driving dataset that is collected during our urban driving data collection campaign. We also provide a model that embeds the patterns in maneuver-specific samples. Such model can be employed for classification and prediction purpose,2020.

3.**BLOCK DIAGRAM**:



4.COMPONENTS

4.1 Arduino uno:

The Arduino Uno is a popular microcontroller board based on the ATmega328P microcontroller, which is capable of controlling a variety of electronic projects. It was first introduced in 2010 and has since become one of the most widely used Arduino boards.

The Arduino Uno board comes with a variety of features, including 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. The digital input/output pins can be used to connect the board to other devices, such as sensors, displays, motors, and other electronic components. The analog inputs can be used to measure voltages between 0 and 5 volts.

The board can be programmed using the Arduino Integrated Development Environment (IDE), which is a free software tool that allows users to write, compile, and upload code to the board. The IDE includes a library of pre-written code, called "sketches," that can be used to quickly and easily build a variety of electronic projects.

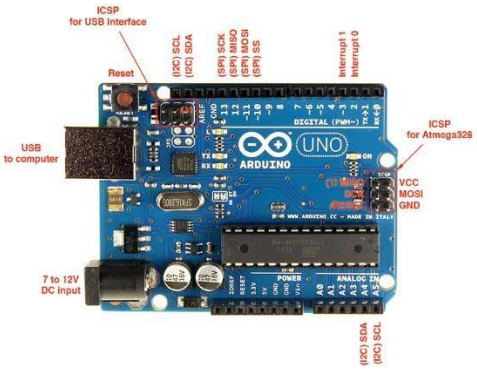


Fig.1 Arduino uno

4.3.

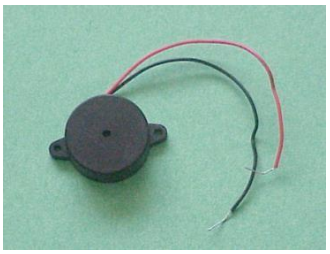


Fig.2 Buzzer

4.2. BUZZER:

A buzzer is an electronic component that produces an audible sound or tone when an electrical signal is applied to it. Buzzers are commonly used in electronic devices to provide audible feedback, alerts, or alarms.

There are different types of buzzers available, including piezoelectric and magnetic buzzers. Piezoelectric buzzers work by converting electrical energy into mechanical vibrations, which then create sound waves in the air. Magnetic buzzers work by using an electromagnet to create a magnetic field that causes a diaphragm to vibrate, creating sound waves.

Buzzers can be found in a variety of applications, including in household appliances, alarm clocks, doorbells, electronic games, and in industrial machinery as warning signals. They are also commonly used in electronic circuits for testing and debugging purposes.

LCD stands for "Liquid Crystal Display," and it is a type of display technology commonly used in electronic devices such as calculators, watches, digital clocks, and televisions. LCD technology is also used in many types of electronic projects, including those based on Arduino and other microcontrollers.

An LCD display consists of a layer of liquid crystals sandwiched between two polarizing filters. The liquid crystals are aligned in such a way that they can either allow or block the passage of light depending on the voltage applied to them.

By applying the appropriate voltage to the liquid crystals, different segments of the display can be turned on or off, creating the appearance of text or graphics.

Fig.3 LCD Display

4.4. USB:

USB TTL is a type of USB-to-serial adapter that allows a computer to communicate with and control devices that use serial communication protocols. TTL stands for Transistor-Transistor Logic, which is a type of digital logic that uses transistor switching to represent binary values.

USB TTL adapters typically consist of a USB connector on one end and a set of pins or a header on the other end that can be connected to a device's serial port. They often use a chip such as the FTDI FT232RL or the Silicon Labs CP2102 to handle the USB-to-serial conversion.

These adapters are commonly used in embedded systems development, robotics, and other projects where a computer needs to communicate with a device using serial communication. They are also useful for debugging and troubleshooting purposes, as they allow developers to monitor and interact with the device's serial communication in real-time.

Fig.4 USB

4.5. RELAY:

A relay is an electronic switch that is used to control the flow of electricity in a circuit. It consists of a coil and one or more contacts, which are typically made of metal. When an electrical current is passed through the coil, it creates a magnetic field that causes the contacts to close or open, depending on the design of the relay.

Relays are commonly used in electronic circuits for a variety of purposes, such as controlling lights, motors, and other high-power devices. They are also used in industrial control systems, automation systems, and other applications where remote control of electrical equipment is needed.

Fig.5 Relay

4.6. CAMERA:

A camera is an electronic device used to capture and record images or videos. Cameras come in a variety of types and styles, ranging from compact digital cameras to professional DSLR cameras and high-end cinema cameras.

The basic components of a camera include a lens, an image sensor, and an image processor. The lens is responsible for focusing light onto the image sensor, which converts the light into an electrical signal. The image processor then processes the signal to create a digital image or video.

Fig.6 Camera

4.7. CONNECTORS:

In electronics and particularly computing, a jumper is a short length of conductor used to close, open or bypass part of an electronic circuit. They are typically used to set up or configure printed circuit boards, such as the motherboards of computers. The process of setting a jumper is often called strapping.

A pin header (or simply header) is a form of electrical connector. A male pin header consists of one or more rows of metal pins molded into a plastic base, often 2.54 mm (0.1 in) apart, though available in many spacings. Male pin headers are cost-effective due to their simplicity. The female counterparts are sometimes known as female socket headers, though there are numerous naming variations of male and female connectors. Historically, headers have sometimes been called "Berg connectors", but headers are manufactured by many companies.

Fig.7 Connectors

4.8. POWER SUPPLY:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy

supplies, less often to mechanical ones, and rarely to others.

Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.

Fig.8 Power Supply Adapter

4.9. TRANSFORMER:

A transformer is an electrical device that is used to transfer electrical energy from one circuit to another through the process of electromagnetic induction. Transformers are commonly used to step up or step down the voltage of an AC power supply, and are used in many electronic devices, including power supplies, audio amplifiers, and electronic equipment.

A transformer consists of two coils of wire wound around a magnetic core. The primary coil is connected to the input voltage, while the secondary coil is connected to the output. When an AC voltage is applied to the primary coil, it creates a changing magnetic field around the core, which in turn induces a voltage in the secondary coil. The voltage induced in the secondary coil is proportional to the number of turns in the coil and the rate of change of the magnetic field.

Transformers can be used to step up or step down the voltage of an AC power supply. A step-up transformer increases the voltage of the input signal, while a step-down transformer decreases the voltage of the input signal. This makes transformers an important component in power distribution systems,

where high-voltage AC power is generated at power plants and then stepped down to lower voltages for distribution to homes and businesses.

Fig.9 Transformer 12v

4.10. DC MOTOR DRIVER:

The L298 is an integrated monolithic circuit in a 15-lead Multi watt and PowerSO20 package. It is a high voltage, a 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. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage.

Fig.10 DC Motor

5. WORKING:

This proposed system will need to collect data on the vehicles entering and exiting the premises. This data can be collected using a camera mounted at the gate or entrance. The camera will capture the image of the vehicle and its number plate. will need to process the captured image to extract the number plate. This can be done using image processing and ocr techniques its number plate recognition. The system can use a deep learning model such as a Convolutional Neural Network (CNN) to recognize the characters on the number plate. The CNN can be trained using a large dataset of number plate images. The algorithm compares the number plate with a database of authorized vehicles, and if the number plate matches, the output data is send to the controller of arduino , then the gate opens automatically using relay. If the number plate is not recognized or does not match the unauthorized vehicles, the gate remains closed, and the buzzer will be ON for alert to the security. LCD is used to display the collected data and buzzer is used to alert the people.

6. ADVANTAGE:

a. A gateway control system can provide a centralized point of control for network security measures such as firewalls, intrusion detection, and prevention systems.
b. Control system can help simplify network management by providing a single point of control for network traffic, routing, and other functions.
c. Control systems can often integrate with other network management

systems, such as network monitoring or performance analysis tools.

7. DISADVANTAGE:

a. Poor image quality, poor lighting, or a poorly maintained database can lead to false positives or false negatives, inconveniencing users**.**

b. The system's dependence on electricity and software makes it vulnerable to power outages and technical failures. This can result in the gate not opening or closing as expected, leading to inconvenience and frustration for users.

8. CONCLUSION:

The gateway control system that utilizes a CNN algorithm for vehicle detection can provide an effective means of identifying and differentiating between authorized and unauthorized vehicles. By analyzing real-time and using image data feeds from cameras placed at the gateway entry and exit points, the CNN algorithm can detect and classify vehicles based on their make, model, and number plate recognition. This can enable the system to compare the detected vehicle information against a pre-defined list of authorized vehicles, it can allow the gateway controlled system and unauthorized vehicles or not allowed and gate are closed to system.

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