



Automatic Gate Control System.

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DOI: <https://doi.org/10.55248/gengpi.5.0324.0794>

ABSTRACT:

In today's digital era, the demand for efficient and secure access control systems is paramount. This abstract presents a QR code-based automatic gate control system designed to streamline access management processes while ensuring robust security measures. The proposed system harnesses the ubiquitous nature of QR codes and integrates them seamlessly into gate control mechanisms, offering convenience and reliability. The system operates by generating unique QR codes associated with each authorized user or entity. These QR codes contain encrypted access credentials and are dynamically generated and updated, enhancing security by preventing unauthorized replication. Users simply present their QR codes to a scanner installed at the gate entrance. Upon successful verification, the gate is automatically opened, granting access.

Keywords: Arduino uno, Camera, Ultrasonic Sensor, Boom Barrier arm, PC.

Introduction:

Now a days, we have advance technology like fastag, our project Automatic gate control system is related to same but here we are using QR code with number plate identification. The purpose of this paper is to develop an QR code based automatic gate control system. This technology can be used in various industries, colleges, security places. As we know the modern world is going automatic, so we build this project to control and monitored the gate and vehicles respectively. Our automatic gate control system consisting of Arduino uno, Camera, Ultrasonic Sensor, Boom Barrier Arm, PC. After the scanning of the QR code by using camera, the data will be stored to the database and the system will allow only authorized vehicle. First gate introduced was completely manual and humans were required to open such gates. Then came the next system on toll booths that opened the gate after the click of the operator over switch later came the system that only recognized any of moving vehicle and then opened gate using the system, IR detector was used in this type of system.

Block Diagram:

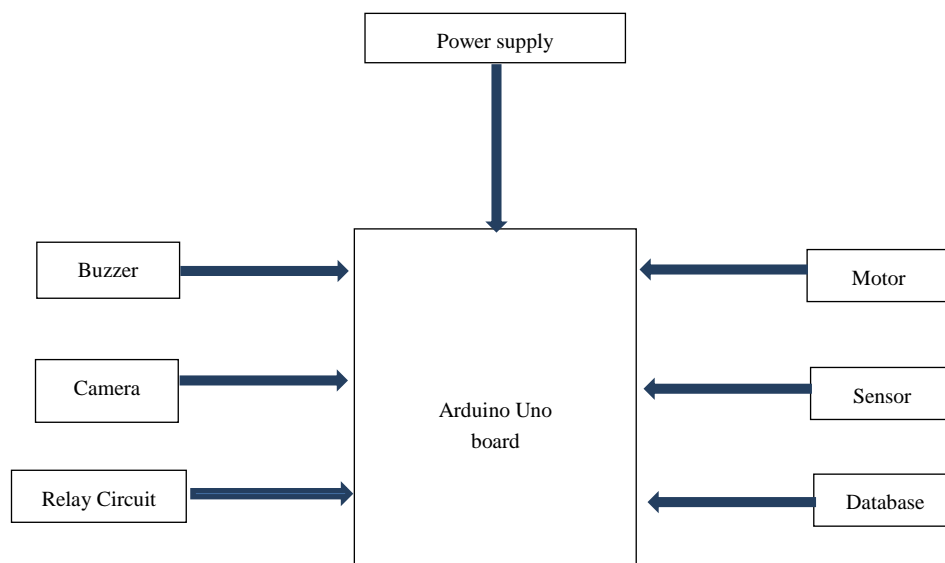


Fig 1. Block Diagram of Automatic Gate Control System

2.1 Arduino Uno

Arduino uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-To-Dc adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a few dollars and start over again. The Arduino UNO is the best board to get started with electronics and coding. If this is your first experiences tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button.

2.2 Camera

Important specs to check out when buying a camera are autofocus speed, frames per second(fps), startup time and overall operational speed ratings. The fps rating is the number of photos, shots, or frames that a camera can capture per second. Higher fps ratings offer smoother and clearer images or video. Specs included the number of megapixels, aperture, focal length, sensor size, zoom type and methods of stabilization and focusing system. Through there are many types of cameras, all include five indispensable components: the camera box, which holds and protects the sensitive film from all light except that entering through the lens; film, on which the image is recorded, a light sensitive strip usually wound on a spool, either manually or automatically.

2.3 Ultrasonic Sensor

The Ultrasonic sensor is non-contact type of sensor used to measure an object's distance and velocity. This sensor operates on sound wave property to measure the velocity and distance of the object. However, the frequency of the sound wave used in the ultrasonic sensor exceeds the human audible sound wave frequency range. With ultrasonic sensors, all physical properties of the system can be measured, that modify ultrasonic wave propagation across the material. Therefore, especially two critical stages during the cross-linking process can be detected by ultrasound. Although ultrasonic sensors have great potential for the industrial monitoring of resin cure, one major limitation of earlier implementation of the technology mentioned in the literature was the requirement of direct contact of sensor with the resin to be analyzed.

2.4 Motor

An AC motor is an electric machine that converts alternating current into mechanical rotation. AC motor application range from industrial bulk power conversion from electrical to mechanical to household small power conversion. With only a few moving parts, AC motors have the potential to last for years. The durability of AC motors makes them a preferred solution for field application such as agricultural equipment and commercial applications such as boom barrier gate. The speed to torque characteristics of AC motor allow them to provide excellent performance in many applications without overheating, degeneration of braking. This is an AC motor is chosen for high-demand application such as pumps and packaging equipment.

2.5 Relay Circuit

Relay is an electromechanical device that uses electric current to open or close the contacts of switch. The relay module is much more than just a plane relay, it comprises of components that make switching and connection is easier and act as indicators to show if the module is powered and if the relay is active or not. The relay module contains switching relays and the associated drive circuitry to make it easy to integrate relays into a project powered by a microcontroller. On the left are two terminal blocks, which are used to connect mains wires to the module without soldering. Relay are used where it is necessary to control a circuit by an independent low power signal, or where several circuit must be controlled by one signal. Relays were first used in long distance telegraph circuits as signal repeaters.

2.6 Database

MySQL is an open-source relational database management system (RDBMS). A relational database organizes data into one or more data tables in which data may be related to each other; these relations help structure the data. SQL is a language that programmers used to create, modify and extract data from the relational database, as well as control user access to the database. In addition to databases and SQL, and RDBMS like MySQL works with an operating system to implement a relational database in a computer's storage system, manages users, allows for network access and facilitates testing database integrity and creation of backups.

Working:

We are using an ultrasonic sensor here to detect the incoming vehicles. Once the vehicle will be distance from sensor, it will detect the vehicle and corresponding signals to Arduino. It will calculate the distance between vehicle and sensor. Then the camera will scan the QR code and the save data in database, but if QR code already attendance of vehicles is monitored and gate will open, and when the vehicle will pass from gate will close automatically. This process is repeated for known vehicles, if this system is installed in industrial or in company then known vehicles of employees will get direct permission at entry gate. If unknown vehicle or any guest vehicle arrives in front of gate then, the image of number plate is saved to database as guest. And as the security guard for the permission. Once the security guard give confirmation then the gate will open else the gate will be remained.

Methodology:

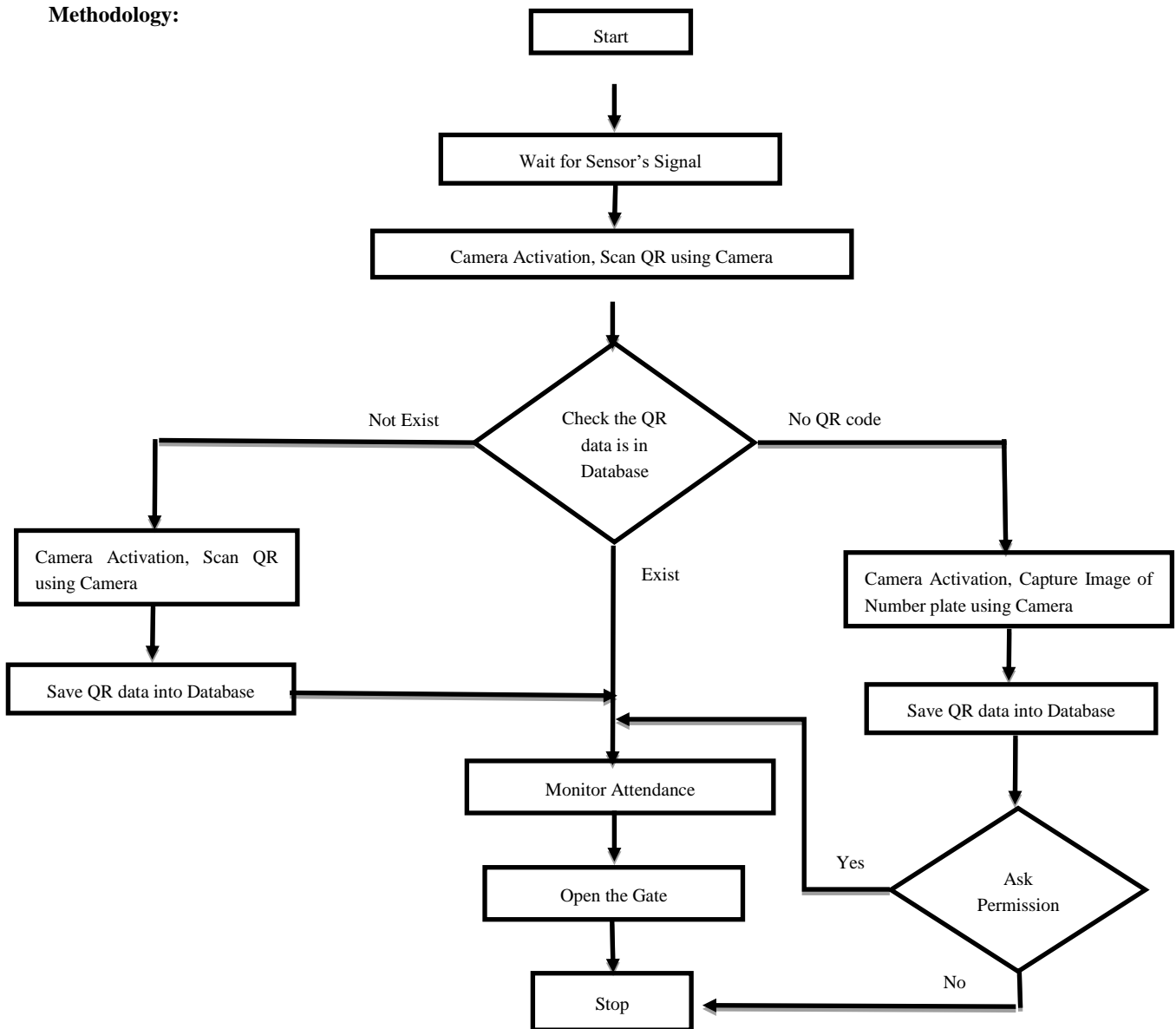


Fig 2. (Flowchart of Automatic Gate control System.)

System Requirement Analysis

Understand the specific requirements of the gate control system, including the types of users, access levels, and security features needed.

QR Code Generation

Develop a method to generate unique QR codes for authorized users. This could involve encoding user's information such as ID, Access level, and validity period into the QR code.

Gate Hardware Setup

Install hardware components such as QR code scanners, gates, and control systems. Ensure compatibility and proper integration between these components.

QR Code Scanning

Implement a mechanism for the gate system to scan QR codes presented by users. This could be done using dedicated QR code scanners or integrated into smartphones or other devices

Authentication

Develop software to authenticate scanned QR codes against a database of authorized users. Verify the user's identity, access level and validity of the QR code.

Gate Control

Integrate the authentication process with the gate control mechanism. Depending on the user's authorization, either grant or deny access to the gate.

Monitoring

Implement monitoring functionalities to track access events, including timestamps, user IDs, and gate actions. This helps in auditing and troubleshooting.

User Interface

Design a user-friendly interface for users to generate, manage, and present QR codes. This could be a web port, mobile app, or physical card issuance system

Security Measures

Implement security measures to prevent unauthorized access such as encryption of QR codes, secure communication protocols, and regular system updates.

Maintenance and Support

Provide ongoing maintenance and support to address any issues, update system software, and accommodate changes in user requirements or technology advancements.

Conclusion:

The use of QR codes enhances security by providing a unique, encrypted digital identifier for each user. This mitigates the risk of unauthorized access and ensures that only authorized individuals can enter the premises. Additionally, the integration of QR code technology enables seamless integration with mobile devices, allowing users to access gates remotely and receive notifications regarding gate activity. The versatility of QR codes allows for easy scalability and integration with existing gate control systems. Whether used in standalone gate access or as part of a larger access control infrastructure, QR code technology offers flexibility and adaptability to suit various requirements.

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