Microcontroller Based Bi-directional Vehicle Counter and Automatic Gate Controlling System

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Abstract. The objective of this paper is to make a controller based model to count number of vehicle in and out of corporate company and data will send to concern person through GSM. In this paper used RFID Reader to detect the presence of a vehicle. According to this, if we place RFID card it worked as in count. Automatically gate will open and close depends on the vehicle presence and if we scan again it counted as down This count value is send SMS through GSM; Depends on the no of count inside the room according to that lights will turn on, when the count in room decreases automatically lights in the room turn off. When the data corresponds to the data on the microcontroller, the load is switched, which is controlled by the relay from the output of the microcontroller. If the correct tag is disabled, the system will display the message “AUTHORIZED”, “UNAUTHORIZED” elsewhere and will not allow access. In addition to LCD screens, bulbs are used as lamps. The project can be further improved by integrating it with GSM technology. Any unauthorized entry can be reported to the security staff via SMS.

Keywords: Microcontroller, Arduino Uno, RFID, Tag, GSM.

1. Introduction
Technological advances Leads to the emergence of wireless communications many engineering projects that help people requirements. The importance of today on the one hand protected access is growing in many areas and beyond another aspect of improving RFID technology Cards and readers are cheaper. Both aspects are the main reason for rapid growth RFID-based authentication system [1]. A few days Wireless technology is used to create wireless connections Network. Among them is the 2.4 GHz wireless network. Widely used and applied. Extensive application wireless communication 2.4 GHz means this Infrastructure can respond on time and make it suitable for major industrial systems. The global mobile system [2] is an international standard. If you travel around the world, GSM is the only form of telephone communication. Introduction of health checks on the basis of telephone communication via SMS.

However, the function of these devices to prevent car theft is very simple. In addition, their anti-theft approach [3] is not a single function. Every day, millions of drivers pass by toll booths. The traditional way to get paid by a car owner or driver is to stop at a toll booth where the car is paid to a seated (or seated!) collector. Next to the receiver cabin, then the gate opens mechanically or electronically. To eliminate these problems and inconveniences, we will introduce automatic payment methods and traffic management methods. These are called electronic ports that use RFID technology.
2. Related Works
There are currently two ways to collect taxes. First, the traditional method of holding hands, in which one collects money and gives bills. The second is the smart card method, in which one has to show the smart card to the system installed in the tax department to open the door [4].

Disadvantages of the current system the above-mentioned method of tax collection is a time consuming method. There is a possibility of tax evasion. This leads to the next line of cars [5].

History of Automated Taxation: Design and development of "RFID-based automated payment Plaza" that allows to save time and work without cash on microcontrollers, RFID technology and payment platforms [6].

The name stands for "RFID-Based Automated Payment Plaza". The main theme of this paper is automation. So here we will not understand what automation is. Simply put, automation is one that does not work with machines. Before we move on, we will not focus on payment history. Thus, until the 1990s, the payment plaza was fully controlled. Four people have to use the paid port, two of them are responsible for opening and closing the door and the other is for collecting money and collecting information etc.

The semi-automated plaza was established in 1995 after the introduction of the expressway, where data was stored on a computer and the gateway was automated, requiring only two people for a single stand. But here we see a plaza for those who pay.

Active wave Inc [7] currently uses an active signal monitoring system. The vehicle's active wavelength is 30 meters and operates at 916-927 MHz for transmission operations and 433 MHz for reception communications. Currently active wave products are equipped with 256 Kbps fixed memory. The signal is powered by a replaceable 3V battery and weighs 14 grams. The element signal is indicated by an LED flash and an audible signal.

Smart key access control systems [8] server SQL server based model management system and several vehicles. They create the user interface using the Microsoft .NET Framework. The smart switch also operates in the 900 MHz band, but up to 30 meters.

RFID-based load collection system [9] uses free RFID. Implementation is divided into the structure of two modules - the transport module (active tag) and the base module. The two modules communicate with each other through an electronic module connected to each module. These RF modules communicate in the 902 - 928 MHz frequency range.

3. Methodology
The proposed system which is shown in figure 1 consists of an Atmega-328 microcontroller as the central processing unit and all other modules used in the system are linked to the microcontroller. Figure 1 shows the block analysis system.

![Figure 1. Block Diagram of proposed System](image)

The executed system consists of a microcontroller (Atmega-328), which is the main processing unit of the whole system, and all sensors and devices can be connected to the microcontroller. Automatic receipt of payment with RFID devices attached to automotive equipment and exchange of information...
on IR sensor threads fixed in the receiving terminal strip. It has a central database, vehicles, and tollgate stations. The RFID tag sends a 100-200 meter signal to the payment station, and then identifies the IR sensor signal and the Central database if the information matches the Tollgate. The station is its size. The gate opens automatically.

### 3.1. Hardware Tools
#### 3.1.1. Arduino Uno
The Arduino is an open-source consumer community, manufacturing single-board microcontrollers that are used to build digital devices and interactive modules capable of detecting and controlling things in real world. Most of the Arduino hardware boards consist of an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models include 6 analog and 14 digital Input / Output pins that allow the user to connect different modules, and a Universal Serial Bus (USB) interface pin to transfer data.

![Arduino Uno board](image)

**Figure 2.** Arduino Uno board

Arduino Uno is an ATmega328 based microcontroller and is shown in figure 2. It has 14 digital input / output contacts, six of which can be used as output PWM, 16-megapixel ceramic, ISO, USB connector, 6 analog inputs, power outlet and reset button. This provides all the support for a microwave. To get started, connect them to computer with either a USB cable or a USB adapter or battery. The Arduino Uno board differs from the other boards, and they do not use a chip for drivers from the FATIU USB. It is programmed as Atmega16U2 USB converter (up to Atmega8U2 R2).

#### 3.1.2. LCD Interfacing to Microcontroller
The LCD is a flat screen used to display electronic data in form text or integers. LCD is a Liquid Crystal Display is shown in figure 3. The lightweight structure and portability are its main characteristics.

![LCD connection to ATMega-328](image)

**Figure 3.** LCD connection to ATmega-328

As the sensor data is stored in Electrically Erasable Programmable read-only memory (EEPROM), dates and time are continuously displayed on the LCD. In addition to the voltage supply connections, the 8-bit data bus, Read/Write (RW), Register Select (RS) and Enable (EN) pins are important from
the programming perspective. If the Register Select (RS) pin is set to 0 and the Enable Pin is made high to low, the command is sent to the LCD. And the data is sent to LCD if the Register Select (RS) pin is set to 1 and the Enable Pin is made high to low.

3.1.3. Infrared sensor
Infrared devices are electronic devices that reflect specific aspects of the environment. Infrared sensors can measure the temperature of an object as well as slow down movement. These sensors measure infrared radiation instead of radiation, which is called passive sensor. Normally, all substances in infrared radiate heat. These rays are invisible to the naked eye and can be detected by infrared sensors. The emitters are only MIS bulbs and the detectors are IR beams that are equally sensitive to X-rays. These costs and voltages vary in proportion to the amount of IR radiation received

3.1.4. RFID Reader & RFID Tag
RFID stands for “Radio Frequency Identification”. And as their name suggests, they use the Radio Frequency Technology. The RFID tags are a kind of tracking system using barcode strips made of magnetic material. The metal pin series or barcodes have a digital representation and are exclusive to a specific tag. Once the tag is decoded, the sequence of the barcode is shown in digital form. The Radio Frequency Technology is used to decode the information. The Radio waves then transfer the data from the RFID Tag to a RFID Reader which then transmits the data to a system. Every RFID tag has its own Electronic Code Number. The tag ID requires less storage and has a supplementary EEPROM memory. The RFID tag data can be updated to an RFID computer program.

The Radio Frequency Identification (RFID) reader generates the radio waves to decode and transfer the data from the RFID tag. When the radio frequency wave interacts with an RFID tag, it energizes the metal pins or the barcode strips to produce a magnetic field generating a specific pattern. This pattern will be decoded to a unique number for the corresponding RFID tag when the RFID reader reads. This allows the RFID reader to obtain the RFID tag address that is unique to that particular tag. This identified tag will be the reference to the bus when connected.

4. Implementation and Results
Screenshot of messages sent to authorized number through GSM module [10] is in figure 4 and outputs displayed on LCD shown in figure5.

![Figure 4. Screenshot of SMSs received](image)
Figure 5. LCD outputs

The RFID Reader was used to detect the presence of a car. According to this, if we place an RFID card, it functions as if it were counted. Automatically gate will open and close depending on the presence of the vehicle and if we scan again it will count as down. This count value will send SMS via GSM; depends on no count inside the room according to which lights will turn on when the count in the room automatically decreases the lights in the room.

The load that is handled by the relay from the output of the microcontroller is shifted, as the input corresponds to the input on the microcontroller. When the correct tag is disabled, the device will display AUTHORISED and UNAUTHORIZED notifications elsewhere and will not allow access. Bulbs are used as lamps in addition to LCD screens. By integrating it with GSM technology, the project can be further enhanced. Any unauthorised entry can be recorded via SMS to the security staff.

5. Conclusion
The project helps to count the vehicles entering and exiting parking area. The circuit counts the vehicles and sends the count along with data as a SMS to a particular number through GSM. The count is also displayed on LCD.

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