

# AUTOMATIC PAY AND PARK SYSTEM

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**ABSTRACT-** This paper is about creating a reliable system that takes over the task of identifying free slots in a parking area and keeping the record of vehicles parked very accurately. This project lessens the human effort at the parking area to great extent such as in case of searching of free slot by the driver and calculating payment for each vehicle using the parking area. This system employs ATmega 644 as its heart which comes under AVR family of microcontrollers. The various steps involved in this operation are vehicle identification, free slot detection and payment calculation. Vehicle identification is carried out using RFID and here it is suggested that each vehicle to have unique identity. Free slot detection is carried out using display. Payment calculation is done on the basis of period of parking and this is done with the help of real time clock (RTC). For the system to be more reliable, RTC is powered from a separate dc source.

**INDEX TERMS-** RFID, GSM, Atmega644, Automation.

## I. INTRODUCTION

RFID today is the popular wireless induction system. Each RFID tag in RFID system is given a unique ID (UID). When an independent RFID tag approaches the RFID reader, the induction between tag and reader happens. The information and content recorded in the tag is transmitted to the RFID reader and translated into the computational data. Following up the data translation, the tag recognition can be completed and related applications are provided. The RFID card is used to identify that a user is legal or not. According to the short- distance wireless signal, the RFID tag users can be monitored within the specific area. However, most of these applications are based on the indoor environments or be a tiny area service. In opposition to creating new execution or service environment, there were many existing systems or applications deployed. This project aims at implementing an Automatic Pay and Parking System using RFID.

The second stage is reading the data from the RFID tag to the RFID reader. In the third stage, the data is updated from RFID reader to the Database. The final stage is to keep a track of vacancies of the parking spaces. In this paper, a realistic application Automatic Pay and Parking System is proposed. Via using the proposed system, the main contributions are:

The project is implemented in four stages:

Step 1: Writing into the tag:

By making use of the write capability of the RFID reader, RFID tag is embedded with unique identification code and is assigned to a car. This is similar to embedding information on a magnetic strip and the process is called writing. The tag contains distinct information about the car, like employee ID number or name or any other distinct data. This step accomplishes the data feed to the tag.

Step 2: Reading from the tag:

The information from the tag needs to be read during the car parking. In this step, the data is read from the tag with the help of an RFID reader.

Step 3: Data feed to the System:

The data from the RFID reader has to be transferred to the system for the actual comparison of data and further processes. During this phase the data from the RFID reader is fed to the system using RS232.

Step 4: Tracking the count:

To properly utilize the parking lot, the number of the cars presented in the parking lot needs to be tracked. In this the number of cars in the parking lot is incremented for every car entering the lot and is decremented for every car leaving the lot.

## 2. RFID SYSTEM

The RFID System consists of a reader, and RFID tags. Each RFID tag records a unique ID and finite information. The tag is triggered when it approaches the RFID reader. The information recorded in the tag is transmitted to the RFID reader.

A RFID reader will pass the signal into the digital and computing content. In the proposed *RFID* Parking system the RFID reader is deployed at the gate. In addition, the RFID tags are placed in the car. Considering the practicability, the *RFID System* should overcome the accuracy affection of weather and sunshade-paster of car, and the RFID tag type. When an Automatic Pay and Parking System user's car approaches the gate, the induction and communication between RFID tag inside the car and antenna of RFID System is automatically established. Then the reader of RFID System translates the signal information to the digital content. Fig.1 presents the work flowchart of the RFID System. The same procedure will be followed whenever the vehicle leaves from a parking slot. The

user again has to swipe the card while coming out of the parking lot [4].

Figure 2: Vehicle Detection Flow Chart.

## 2.2. Parking Lot Reservation Module

The flow diagram of parking lot reservation module is shown in the figure 3. When the user wants to reserve a parking lot in advance, user has to send a reservation SMS. When the coordinator system receives the SMS from the user, it will start to check whether there is any vacancy in the parking lot. If lot is available means the control unit will send an acknowledgement message to the respective user who has requested for parking lot reservation. A timer will be started for that reservation. Before the timer expires the user has to reach, if not means the reservation will get expired and the expiration message will be sent to the user. If lot is not available means lot not available SMS will be sent to the user. If user reaches on time means, he has to access the parking lot. The barrier gate will get open and allow the user to enter the parking level. Once the user parked the vehicle in the respective parking lot allotted, the user has to press a key, which is available in the parking lot which enables the security monitoring of the vehicle.

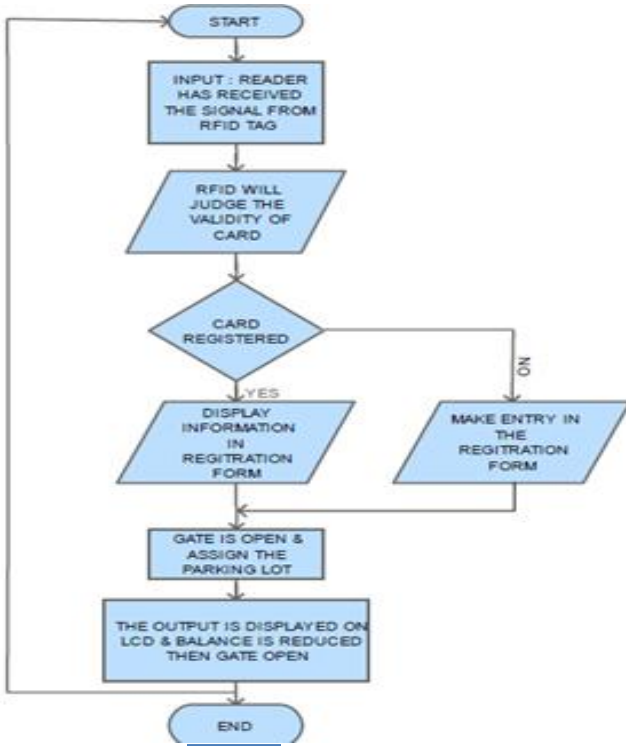


Fig. 1: The work flowchart of RFID System

## 2. WORKFLOW

### 2.1 Parking Lot Monitoring Module

The flow diagram of vehicle detection module is shown in the figure 2. The parking lot is provided with infrared sensors and is allowed to sense the parking area continuously 24x7. If it detects any vehicle in the parking lot, it will indicate the presence of vehicle to the microcontroller to which it is interfaced.

The microcontroller will in turn send the status information to database system. Continuous update will take place as the system works continuously for 24x7. A display device is provided at the entrance of the parking bay which helps the users to identify whether the parking lot is available or not. This scenario suits well for single level parking system.

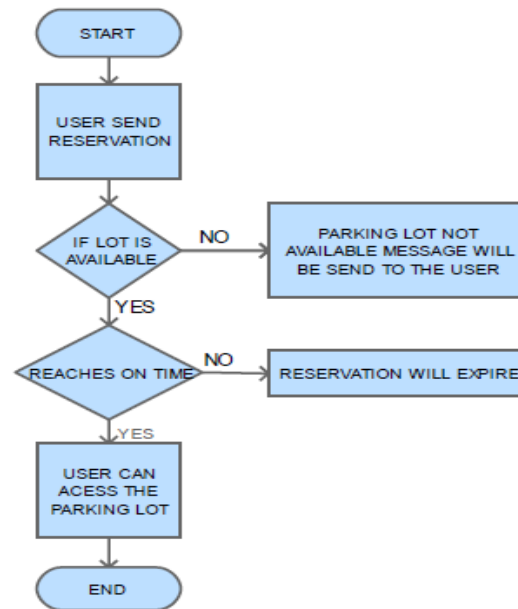
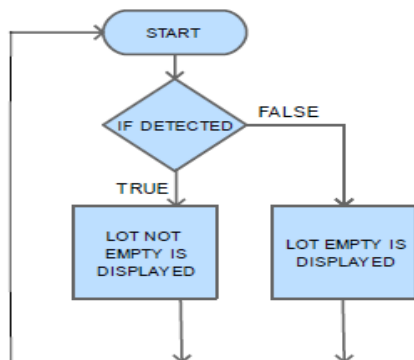


Figure 3: Reservation Flow Chart.

## 3. DESIGN OVERVIEW

The Automatic Pay and Park system includes access control unit (normally a PC), Atmega 644 series microcontroller, Rf module, keypad, barrier gate, and display unit. As mentioned earlier this system has three modules; parking lot monitoring module, lot reservation module, and security module. Each parking lot will be provided with infrared sensor, whose function is to monitor the parking field 24x7.

The infrared sensors are interfaced with the Atmega644 microcontroller. The lot status is continuously transmitted to the coordinator system where the database is maintained. A barrier gate is provided to each level of parking bay. Each level may have number of parking lots. UART communication is carried

out between GSM and the microcontroller. Dot Net framework is used to construct the access system.

### 3.1. RFID

The EM18 RFID Module. Using the board with controller to read a card's data is very simple and requires just a serial connection. The board has on board poser indication LED, this indicate the presence of a RFID card. All the io pins are brought out labeled header pins.

### 3.2. ATMEGA644 Microcontroller

The ATmega644 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. The On chip ISP Flash allows the program memory to be reprogrammed in-system through an SPI serial interface. The Atmel ATmega644 is powerful microcontroller that provides a highly-flexible and cost-effective solution to many embedded control applications.

### 3.3. GSM

GSM (Global System for Mobile communication) is a wireless communication device used to receive the user's request for reserving the parking lot and also for sending the entry and exit password to the user for accessing the parking lot. SIM300 V7.3 version modem is used in this system. AT command sets were used to access the GSM modem [3]. GSM modem is interfaced with the coordinator system using RS-232 COM connection.

### 3.4. LCD

LCD is a display device interfaced with the microcontroller which is placed at the parking level. The LCD is used to display the value entered by the user.

## 4. RESULTS AND EXPERIMENTS

Experiments were conducted and it proves to be very successful. The screenshots of the front end access system and the prototype of the parking lot management system are shown in the figure below.

**Parking System**

Name:

Id:

Card number:

Zip Code:

In Time :

Out Time:

Figure 5: Access Form.

The figure 5 shows the front end access form with number of fields. The front end access system is constructed using VB.Net. It consists of number of user friendly fields which can be easily accessed by the users. Figure 6 shows the reception of the users request for lot reservation.

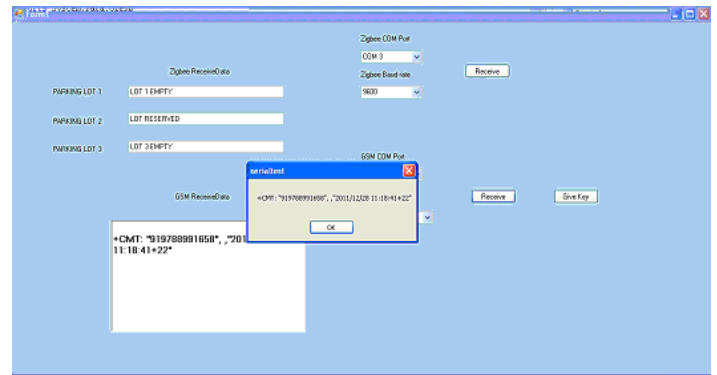


Figure 6: Access Form of User's Message Validation.

Figure 7 shows the prototype of the lot monitoring and management system for single level vehicle parking system.

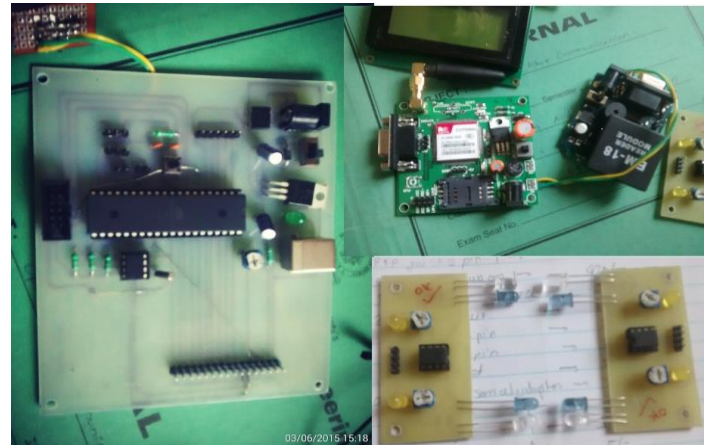


Figure 7: Prototype of Parking Lot Monitoring System.

The coordinator setup which consist of front end system to which controller end node and GSM modem are interfaced.

SIM 900 type modem is used in this system. AT commands for sms will vary according to the manufacturers. The controller circuit diagram of the lot monitoring module. It includes LCD, MAX232, ATMEGA 644 controller, four infrared sensor modules and a D type 9-pin connector.

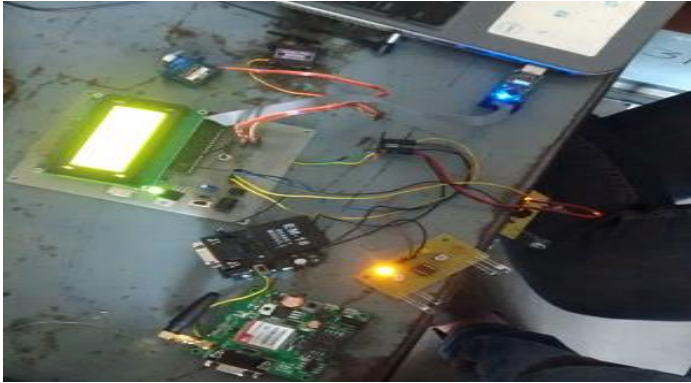


Figure 8: whole System

On the whole, this system provides security to the parked vehicle, reduces the unnecessary time taken for finding the empty space in parking area, and also reduces the traffic and unnecessary mess inside the parking area.

## 5. CONCLUSION

This system holds good for Automatic parking system, as it provides higher level of security for the vehicles parked in the respective parking spots. This system also reduces the traffic and congestion in finding the available parking spots. The security of the vehicle and the experimentation result proves that the system provides higher level security for the parked vehicles and is easily implementable in real time. This system holds a working rate of 9.5 out of 10. On the whole this system proves to be cost effective and highly secure.

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