**Vellore Institute of Technology**
(Deemed to be University under section 3 of UGC Act, 1956)

# MICROCONTROLLER AND ITS APPLICATIONS (ECE3003)

## RFID BASED CAR PARKING SYSTEM

## PROJECT REPORT

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## AIM:

To create a microcontroller system to support the functioning of a Car parking lot which allows card through via a RFID card and also show the available slots in the parking lot.

Car parking management in residential complexes organisations and malls often consists of many tasks like issuing tokens, noting the check-in and check-out time, calculating fare and finally collecting the amount.

As the number of vehicles are increasing, the problems faced by manual parking management system are also increasing. Such problems can be eliminated to some extent by implementing an intelligent parking system where the entry and exit of cars is monitored and payment is made easy with sensor technology.

With this project we aim to create one such system which can be used to reduce parking times and increase security wherever implemented.

This project uses RFID system and IR sensor circuit to authorise users and notify them of available parking spaces to reduce time spent parking.

RFID Card is specific to the user and the card details are pre-programmed in the microcontroller. When the RFID card is swiped against the RFID Reader, it gets energised from the reader and sends the information to the reader.

The reader then transmits the card's information to the microcontroller via serial communication protocol.

The microcontroller then checks for the received card details with already stored details and checks for authenticity of the card and then authenticates the user.

The IR system is installed near the parking spaces and it acts as a switch to inform the users of occupied and available parking slots.

## BLOCK DIAGARM:
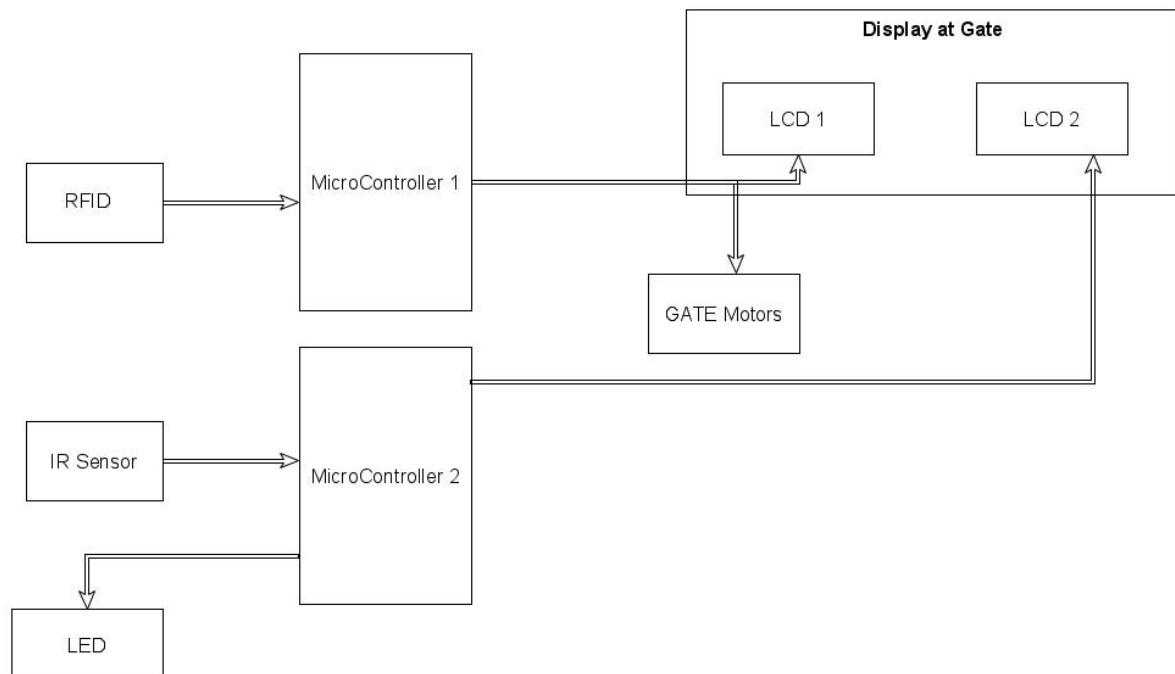
**RFID -** RFID or Radio Frequency Identification is a method in which electromagnetic waves are used for transmitting data for the purpose of identifying tags attached to objects. An RFID system consists of a transmitter (tag) and a reader. The tag is encrypted with a unique code and the reader scans this code for the identification purpose.



This device scans the RFID tag and streams the data to the microcontroller. By placing the RFID card on these devices, the device is able to read the RFID Tag. This device will be placed near the gate do that the car driver can get his card scanned just by leaning from their car seat.

**Microcontroller 1&2 -** 8051 microcontroller is designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers. It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz.



It takes the value of RFID and checks with the available database for authorization and the other microcontroller detects which slots are filled and

**LCD 1&2 –** 16×2 LCD module is a very common type of LCD module. It consists of 16 rows and 2 columns of 5×7 or 5×8 LCD dot matrices. The module were are talking about here is type number JHD162A which is a very popular one . It is available in a 16 pin package with back light ,contrast adjustment function and each dot matrix has 5×8 dot resolution.

It displays if the RFID is a valid tag and based on which LED is lit up, the vacancies are displayed on the LCD 2 near the gate itself.

**Gate Motors** – Servo motor works on PWM (Pulse width modulation) principal, means its angle of rotation is controlled by the duration of applied pulse to its Control PIN. Basically servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears.



Once RFID tag is authorised, the gate motors run to allow the car inside by opening the gate.

**IR Sensor** – Infrared Obstacle Sensor Module has built-in IR transmitter and IR receiver that sends out IR energy and looks for reflected IR energy to detect presence of any obstacle in front of the sensor module. The module has on board potentiometer that lets user adjust detection range. The sensor has very good and stable response even in ambient light or in complete darkness.



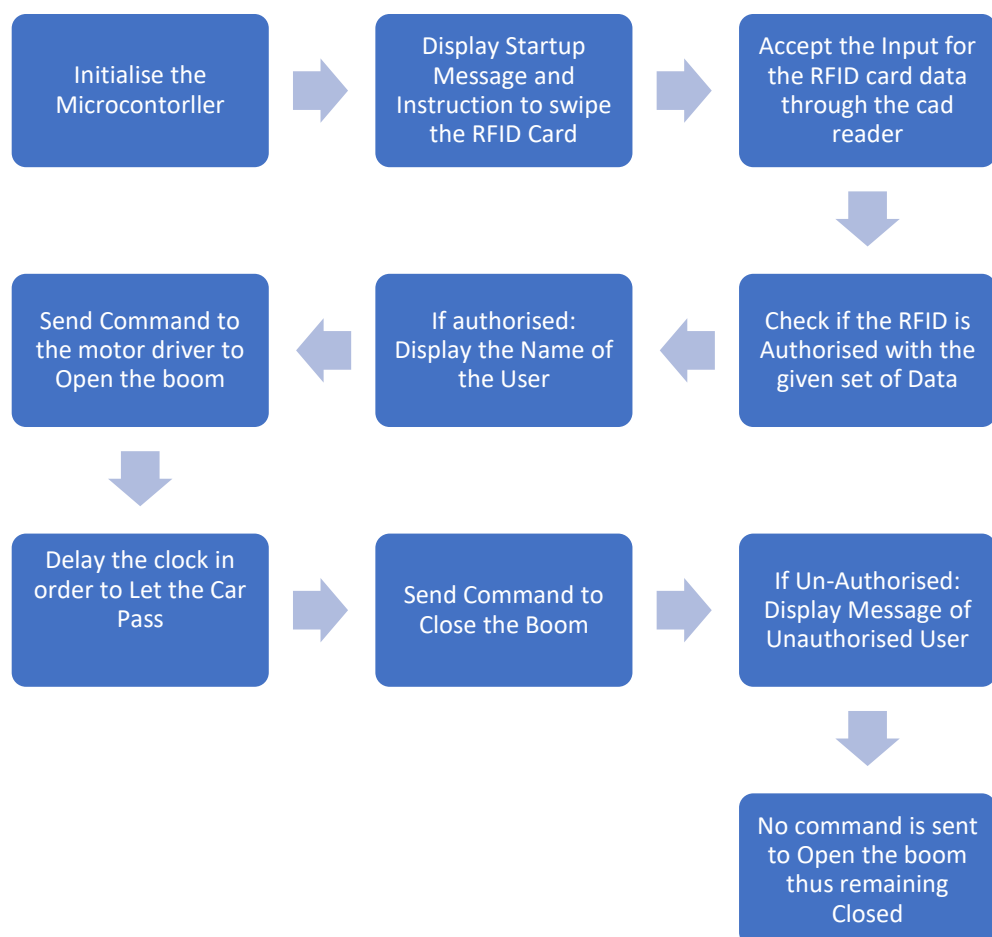This will detect which slot is occupied by a car

**LED** – The main principle of this circuit is to interface LEDs to the 8051 family micro controller. Commonly, used LEDs will have voltage drop of 1.7v and current of 10mA to glow at full intensity. This is applied through the output pin of the micro controller.
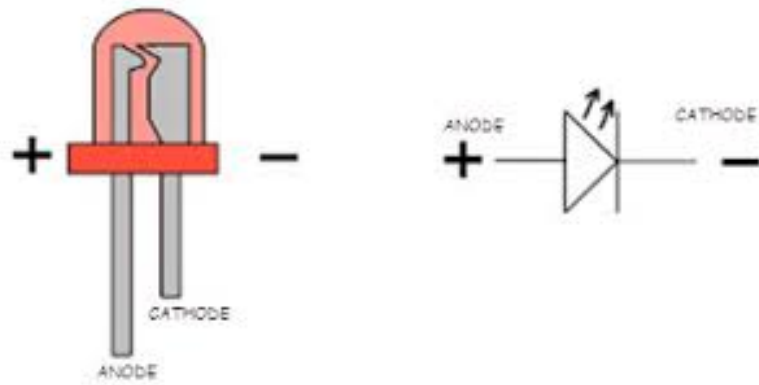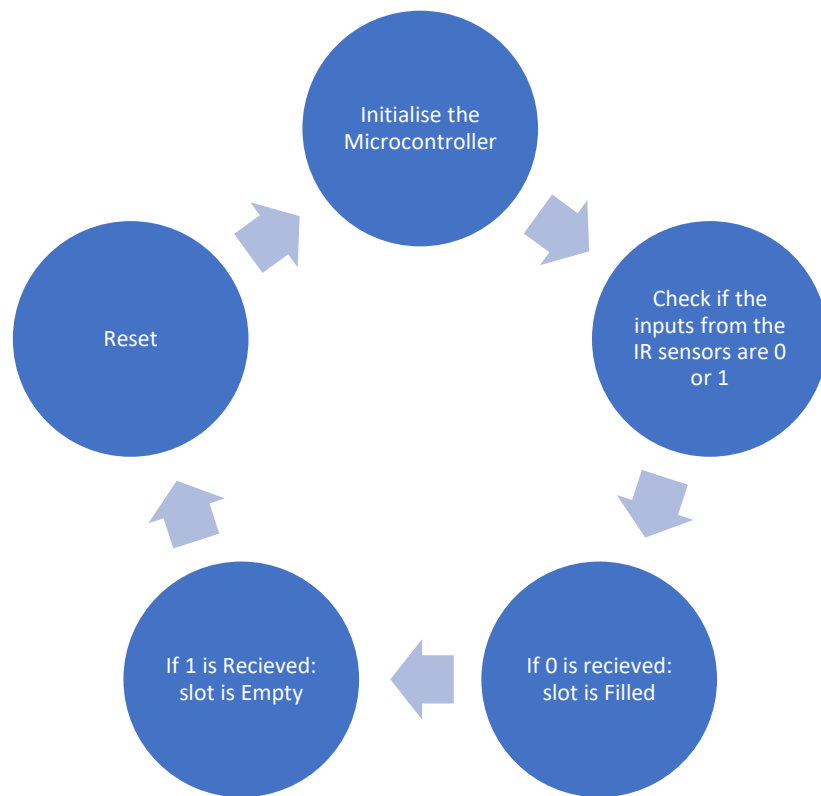
This LED is used by the microcontroller 2 to show the vacancies in the parking lot.
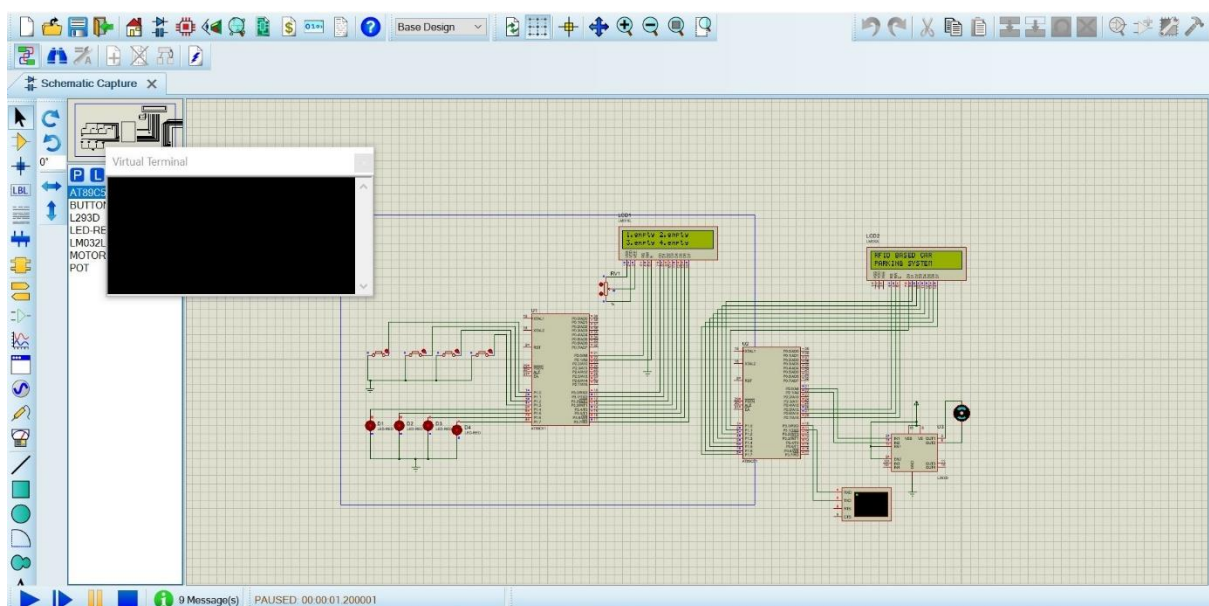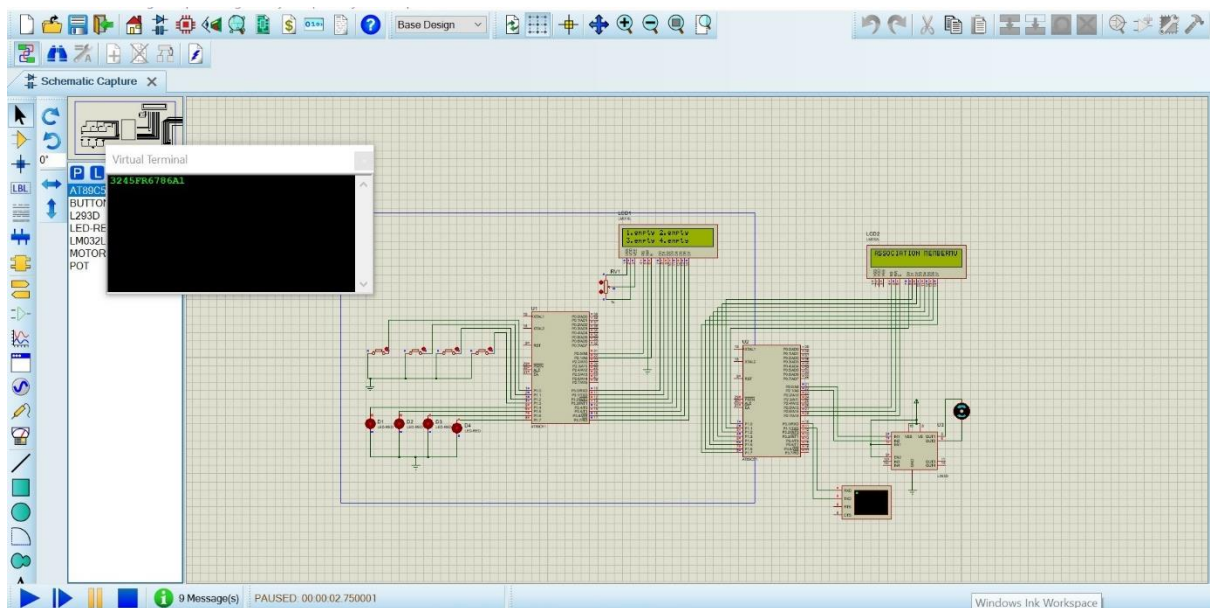
## ALGORITHM / FLOWCHART:

### For RFID



Initialise the Microcontorller → Display Startup Message and Instruction to swipe the RFID Card → Accept the Input for the RFID card data through the cad reader

Send Command to the motor driver to Open the boom ← If authorised: Display the Name of the User ← Check if the RFID is Authorised with the given set of Data

Delay the clock in order to Let the Car Pass → Send Command to Close the Boom → If Un-Authorised: Display Message of Unauthorised User

No command is sent to Open the boom thus remaining Closed
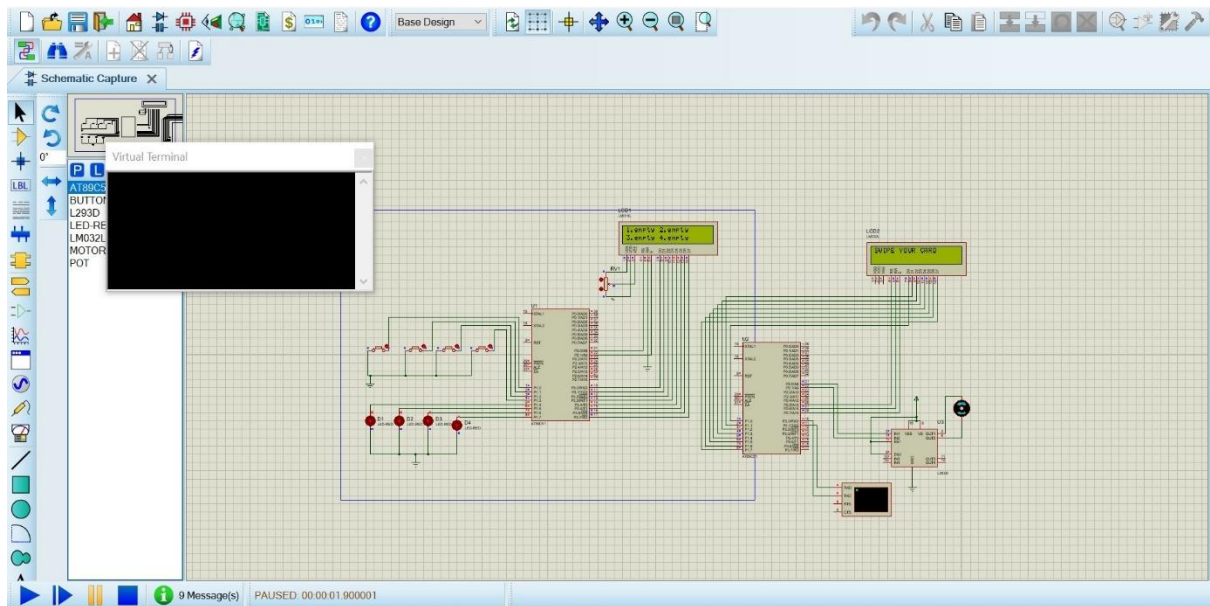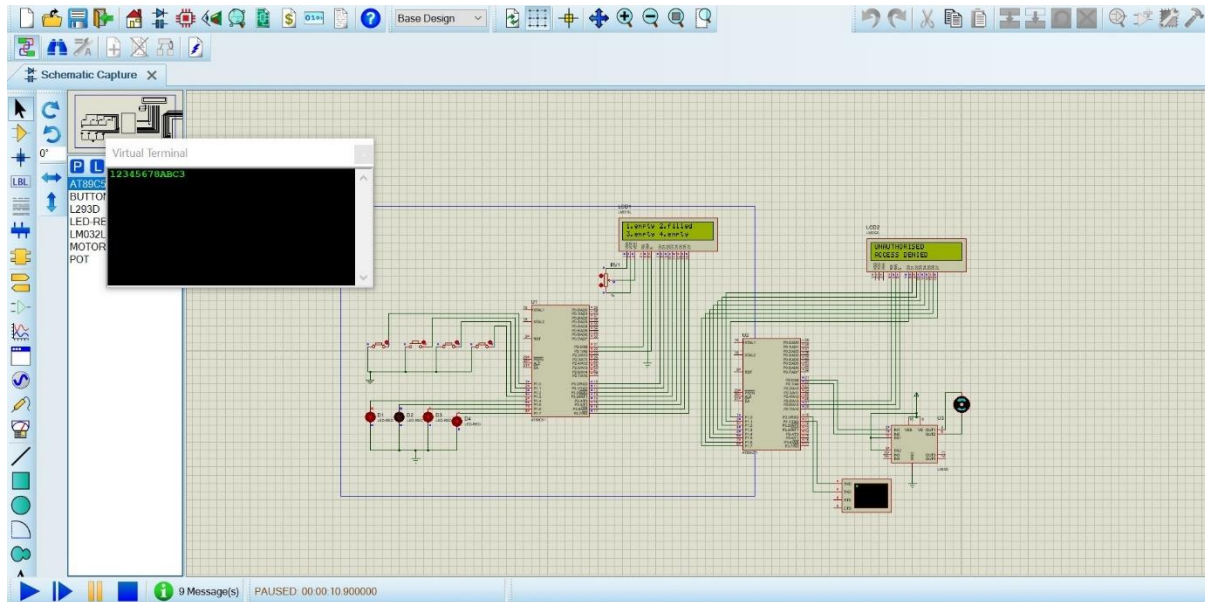
**For Empty Slot Detection**



**PROTEUS SIMULATION SCREENSHOTS:**

## PROS AND CONS:

### Pros of the project:

- Provides platform to have a systematic parking system
- This system only allows authorized person to enter the factory area
- Improve traffic flow during peak period
- Allow the admin to monitor the staff and workers attendance by referring to the database
- Replaces the need of a security guard.

**Cons of the project:**

- We have used 2 microcontrollers here because of the need of more number of pins.
- The circuit gives some amount of delay which can make the process of parking slow and cause traffic at peak times
- We might get synchronization problem due to lack to sync between both microcontrollers.
- Any change of data must key in by the admin.
- Staff or workers cannot update their details by themselves.