

Car Parking Complex with Online Booking System

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Abstract

This paper presents Car Parking Complex with online booking system. The idea is to detect the presence of a car, count and display the number of cars at the entry point, exit point and the parking slots at each floor and thus manage the vehicle parking using IR sensors. The purpose of the study is to reduce the time spent over to determine if slots are available. A combination of sensors and gates is used to mechanize the system. The output of IR sensor is used to drive a geared motor which is used to open/close the gate at the entry/ exit points. Another aspect of the project deals with the option of booking online of slots via a site. Raspberry pi 2 model B+ (minicomputer) interfaces the slots with the website. The motor, QR code scanner and website act as the output. The paper ends with the recommendation of integrating the experimental prototype with the human machine interface or (HMI) and to provide a display for the count of vehicle.

Keywords: IR sensors, raspberry pi, ultrasonic sensors, website, QR scanner and reader

I. INTRODUCTION

In most countries where cars are the dominant mode of transportation, parking lots are a feature of every city and suburban area. Shopping malls, sports stadiums, megachurches and similar venues often feature parking lots of immense area.

Car parking is still a growing problem with increase in number of vehicles. We thought of a system which will efficiently manage the parking space and enable the online booking/reservation of the parking slot from a website. The system electronically indicates the booking of available parking slot. Our project implies for a structure with multiple parking slots or multi-store building which will help the traffic management by reducing the haphazard parked vehicles.

The main benefits of the system are time saving, simplicity and higher security.

II. BLOCK DIAGRAM

The website provides an interface to book the slots. There is QR code scanner which generates a qr codes for each of the slots booked, provided to the user upon booking a slot. The website is interfaced with the raspberry pi. The raspberry pi is an interface between hardware and the software aspects of our projects.

Upon the arrival of the user, the car is sensed at the entry of the complex. A QR code reader runs upon the QR code provided to the user. Successful identification of the user would result in activation of the motor driving circuitry. When the slots are occupied it is automatically displayed on the website.

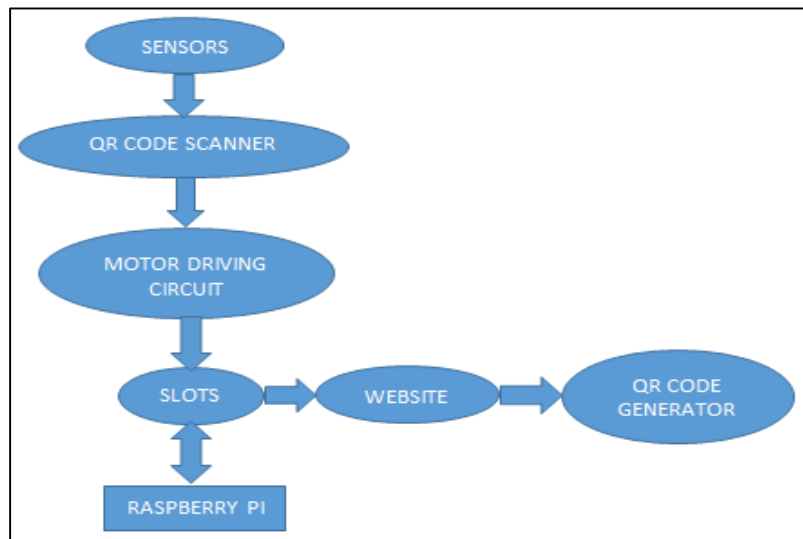


Fig. 1: Block Diagram for working of Car Parking complex

III. FLOWCHART

A. Programmer's point of view

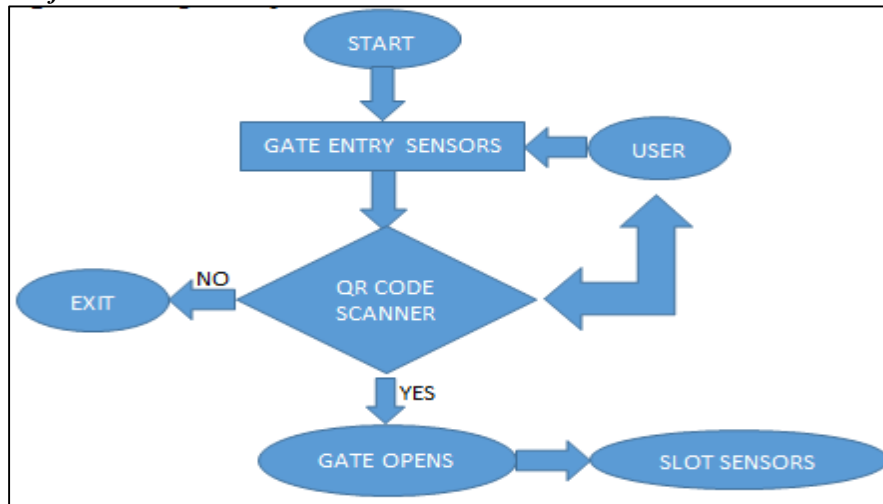


Fig. 2: Programmer's point of view

1) Algorithm:

- 1) START
- 2) Car arrives
- 3) Car is sensed on the inputs taken by IR sensors
- 4) QR code reader='ON'
- a) QR code is scanned
- b) If(QR code is correct)
Gate opens
else
Exit
- 5) Car moves to the Parking slot
- 6) If(IR Sensors detect presence of car at a slot)
Slot='Full'
- 7) END

B. Server point of view

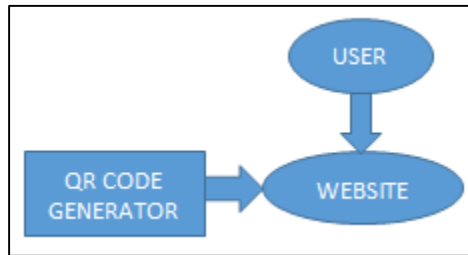


Fig. 3: Server point of view

1) Algorithm:

- 1) START
- 2) User reads the status of the parking slots on the website
- 3) If(slot = 'vacant')
User Books the slot
Else
User waits or exits
- 4) If(User books the slot)
QR Code is allotted
- 5) User saves the QR code
- 6) End

IV. COMPONENTS

A. Infrared Sensors with Operational Amplifier:

An Infrared (IR) sensor is used to detect obstacles in front of the car or to differentiate between colors depending on the configuration of the sensor. In IR sensor circuit, there is basically IR LED (Light Emitting Diode) and IR photodiode, IR LED emits infrared light and detector (photodiode) which is sensitive to IR light of the same wavelength as that emitted by the IR LED.

The principle working of IR sensor is that, when IR light falls on the surface of photodiode the resistance of the photodiode decreases proportionally with the increasing magnitude of the IR light, as the magnitude of the resistance decreases output voltage also decreases with respect to time.

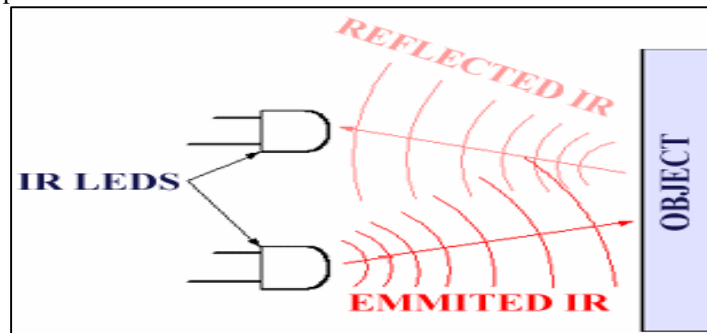


Fig. 4: Infrared sensors with operational amplifier

IR sensor reflects efficiently on white surface, since white surface reflects all types of light whereas black surface absorbs the light and hence IR sensors operation is dispersed.

Operational amplifier (Op-amp) is a high gain voltage controlled amplifier with differential inputs and single stable output. Op-amp produces an output potential (relative to circuit ground) that is typically hundreds of thousands of times larger than the potential difference between its input terminals. The amplifier's differential inputs consist of a non-inverting input (+) with voltage V_+ and an inverting input (-) with voltage V_- ; ideally the op-amp amplifies only the difference in voltage between the two, which is called the differential input voltage. The output voltage of the op-amp V_{out} is given by the equation:

$$V_{out} = A_{OL} (V_+ - V_-)$$

Where A_{OL} is the open-loop gain of the amplifier (the term "open-loop" refers to the absence of a feedback loop from the output to the input).

Op-amp is classified into 2 configurations; open loop and closed loop. In this case the circuit is closed loop with positive feedback. Along with Op-amp AND gate is used to differentiate the input of 2 IR sensors. AND gate basically plays a role of multiplier, where in when 2 inputs are high the output is given to the Op-amp which indicates the presence of object. The truth table of AND gate is displayed below which gives clear picture of working of AND gate.

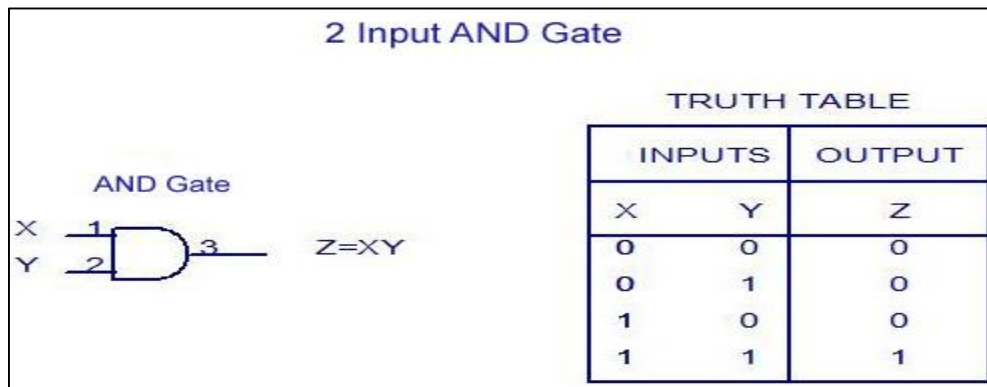


Fig. 5: Input AND Gate

B. Geared Motors:

An electric motor is an electrical machine that converts electrical energy into mechanical energy. In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force within the motor. The principle working of the motor is dependent on the Faraday's law of electromagnetic induction that is when current carrying conductor is placed in magnetic field it experiences a force due to which it moves. Motors are classified on the nature of supply as DC motors and AC motors. Geared DC motors can be defined as an extension of DC motor. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM. The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction.

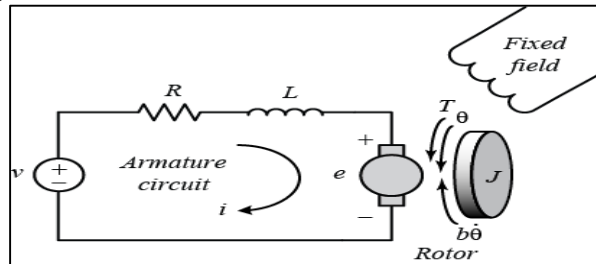


Fig. 6: Geared motors

C. Light Emitting Diode Circuit Board Display:

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p-n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

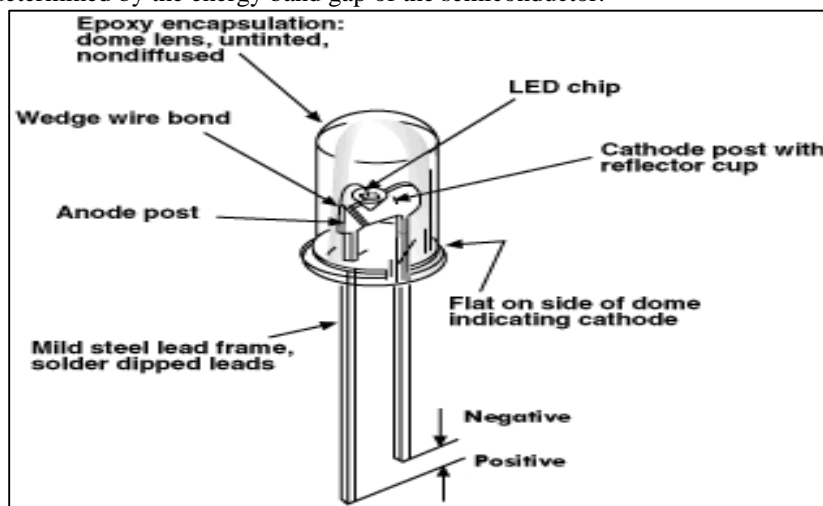


Fig. 7: Basic symbol of LED is displayed below

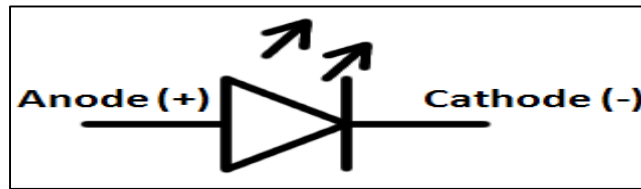


Fig. 8:

LED is a solid state device that converts electrical energy into single color light. It is basically a specialized type of PN junction diode that emits either visible light, infrared or laser light at different wavelengths, made from a thin layer of heavily doped semiconductor material.

The principle operation of LED is that it emits light when a current flows from anode to cathode across the PN junction of the device. Hence, an LED requires a direct current supply to forward bias the junction with a positive voltage for normal operation. The voltage to current relationship of LED is non-linear as shown in Figure below, so the LED turns on at a lower voltage and will rapidly draw much higher current as the voltage increases.

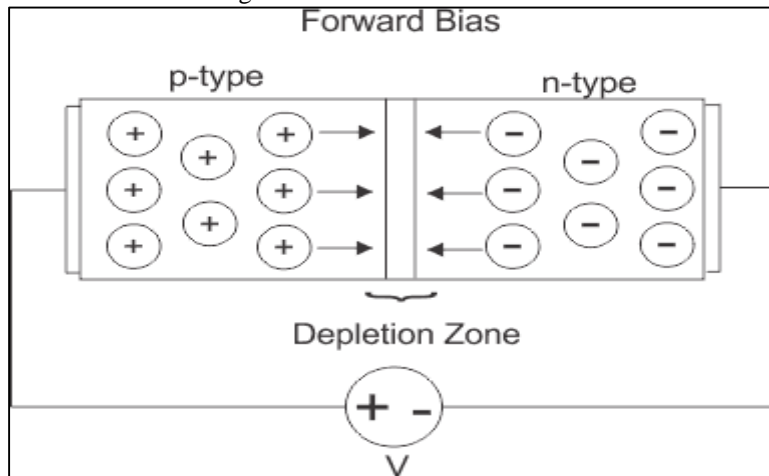


Fig. 9: Below figure shows the basic operational features of LED

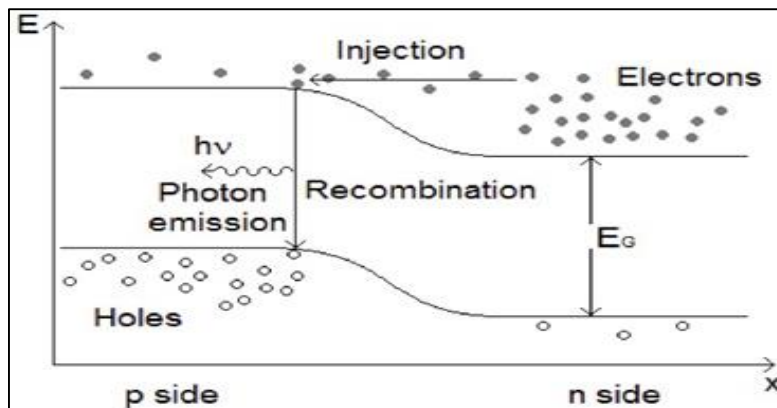


Fig. 10:

The light output intensity of LED is directly proportional to the forward current flowing through it. However, doubling of current does not provide twice the light output. A better solution is to use multiple LEDs to achieve desired light output. Since LED is connected across a power supply in a forward bias condition, it should be protected from excessive current flow using a series resistor.

Thus, using Ohm's law we can express:

$$I_F = \frac{V_{DC} - V_F}{R}$$

Where,

I_F = forward current

V_{DC} = supply voltage

V_F = forward voltage

R = series resistor

By series connection such many LED's we can design a circuit board of LED as shown below,

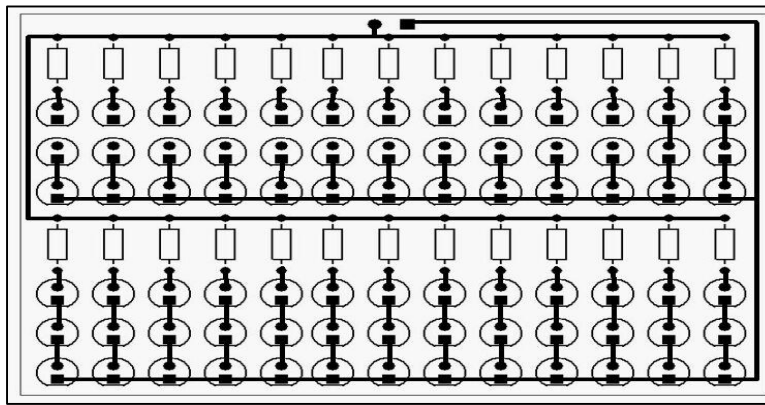


Fig. 11:

D. Raspberry Pi:

1) Common features of Raspberry Pi is as follows:

- Dual step-down (buck) power supply for 3.3V and 1.8V
- 5V supply has polarity protection, 2A fuse and hot-swap protection
- New USB/Ethernet controller chip
- 4 USB ports instead of 2 ports
- 40 GPIO pins instead of 26. The top/first 26 pins match the original layout, 9 additional GPIO
- 2 EEPROM Plate identification pins
- Composite (NTSC/PAL) video now integrated into 4-pole 3.5mm 'headphone' jack
- Micro SD card socket instead of full size SD
- Four mounting holes in rectangular layout
- Many connectors moved around
- The power supply is what takes the MicroUSB port voltage and creates the 5V USB, 3.3V, 2.5V And 1.8V core voltages. It has Ethernet base10 port. Mostly it is choose over Arduino because of following reasons;
- Pi uses arm 7 Quad core cortex with 1 Ghz processor and 512mb ram which makes it ideally faster than other devices to react to situation faster than other electronic boards like Arduino which uses various microcontroller based upon its configuration like Arduino mini and mini pro etc.
- Pi can be directly interfaced with the desktop or display what so ever whereas for Arduino it requires additional circuitry like lcd connector rs232 cable etc. to make it compatible and work on it.
- Pi has Ethernet port 4 USB port and HDMI display which Arduino don't have and cost 2X to provide such circuitry which adds to the final cost.
- Raspberry pi uses processor and Arduino uses microcontroller.
- Pi has low power consumption of 0.5 W to 2 W. whereas for Arduino it is 5 W which increases with later models.
- Pi has high speed processor which ideally give advantage of faster operation for projects whereas for Arduino has low speed which is efficient for projects where accuracy is not of importance.
- Pi has inbuilt noise cancelation features which helps to suppress the noise and make it more effective.
- Pi has less no. of GPIO pins which makes it disadvantages where high no. of inputs are given.

V. CONCLUSION

In this paper, the car parking system, we have designed is more efficient than the normal car parking which could be time consuming. Booking of the slot can be done online. Slot booking mechanism is advantageous in case wherein a person is far away from the parking complex. QR code reader/scanner provides authentication to the user availing the system.

REFERENCES

- [1] https://en.wikipedia.org/wiki/Main_Page
- [2] <http://electronicsforu.com/newelectronics/default.asp>
- [3] <http://www.thinkgeek.com/electronics-gadgets/>