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BIONIC ENGINEERS

Bilekahalli,Bengaluru, Karnataka, India

BIONIC ENGINEERS

AN INTERSHIP REPORT ON

"Smart Car Parking"

Bachelor of Engineering

IN

Electronics and Communication Engineering

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DON BOSCO INSTITUTE OF TECHNOLOGY

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1 INTRODUCTION

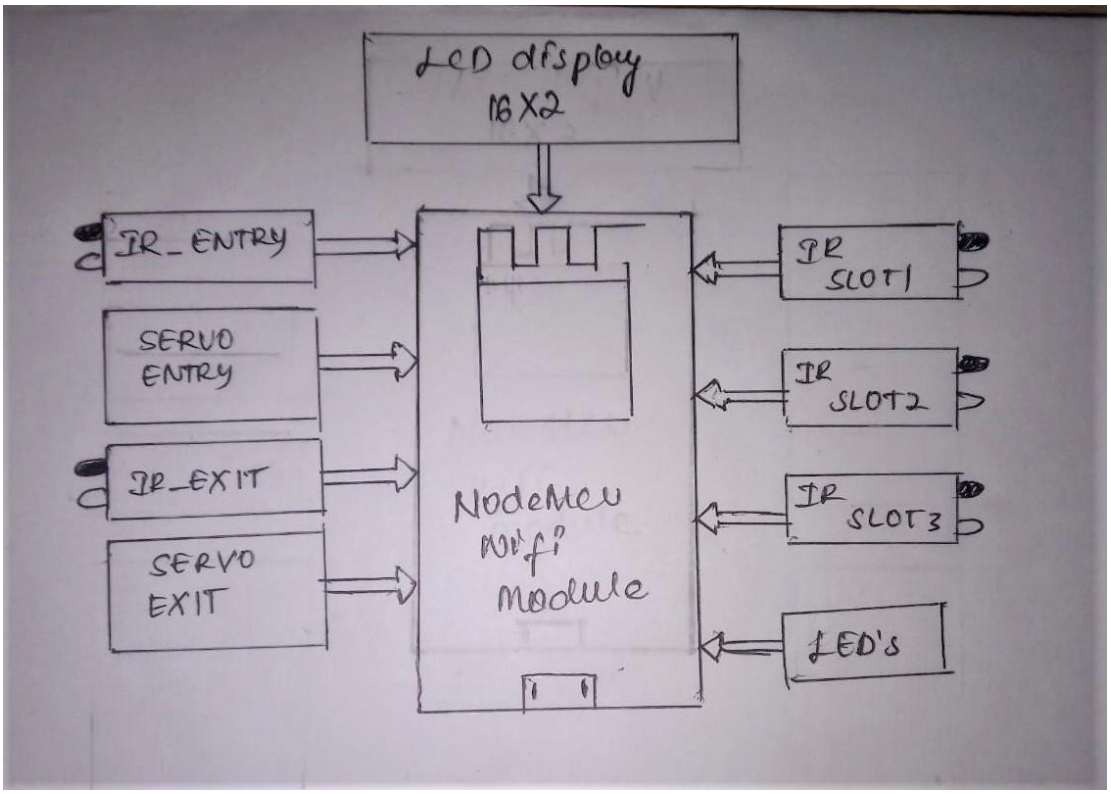
In developing countries like India there in increase in population along with this there is also increase in the number of vehicles coming to the road, now days finding parking in busy areas is very hard and one has to keep searching for the parking area, every parking slot is operated manually and there can be lot of human error, there is no system that gets the details of parking availability online. Imagine getting the parking slot availability information on one's phone and one doesn't have roaming around to check the availability of parking slots. This problem can be solved by the IoT based smart parking system. Using the IoT based parking system one can easily access the parking slot availability over the internet. This system can completely automate the car parking system. From your entry to exit all can be done automatically.

So here we are building an IOT based Car Parking System using NodeMCU, IR sensors, and servo motors. IR sensors are used at entry and exit gate to detect the car and also few are used to detect the parking slot availability. Servo motors are used to open and close the gates according to the sensor value. Here we are using the Cayenne IOT platform to show publish the data on cloud which can be monitored from anywhere in the world.

2 METHODOLOGY

2.1 HARDWARE DESIGN

The hardware design consists of an Nodemcu as a microcontroller, and inbuilt ESP-8266 WiFi Module to upload the information of the available parking space to the cloud, the infra red sensor to sense the parking slot whether it is available or not and the LEDs are used to indicate the parking slot been occupied or not. All the hardware is connected to the nodemcu as shown in below figure.



Block Diagram

2.2 SYSTEM DESIGN

ThingSpeak open IoT platform is used to store all the data related to the parking space availability and the driver will have access to the system with a mobile phone through an application developed using BLYNK mobile app.The server and send a request message for an available parking spot. If any parking spot is available, the user will be allowed to enter the car parking area and guided to park the vehicle . The cloud will also be updated with the current parking space information.

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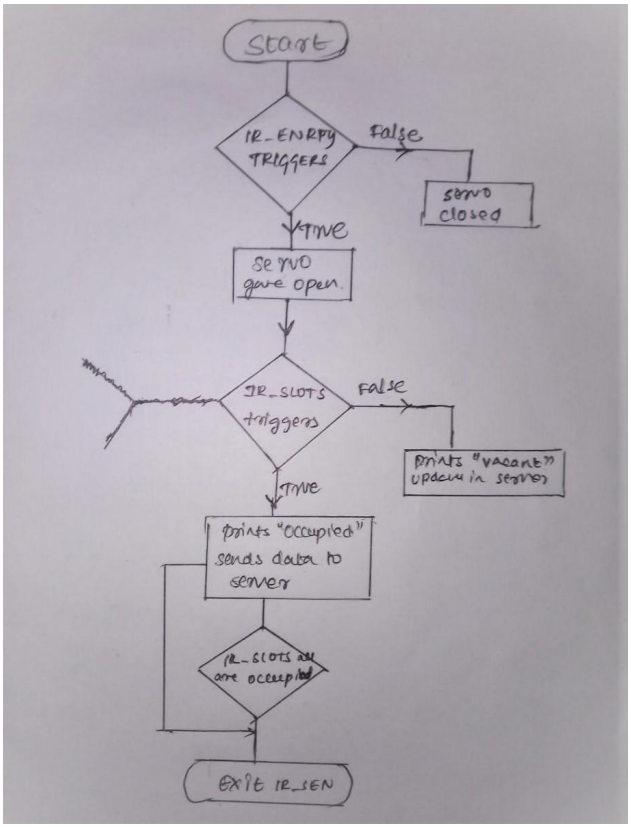
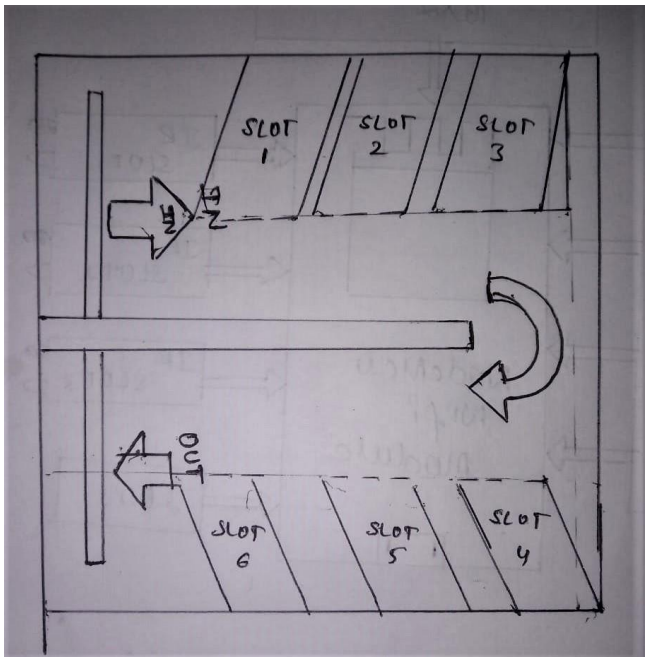


System Design



Sample car parking mapping

2.3 PROPOSED SYSTEM / STAGES

STAGE-1

When car enters the parking area IR sensor that is present before entry gate will detect the passing vehicle and checks if there is any free slot available so that the user can access it and if there is any parking slot available then then the gate will be opened automatically making way for the car to enter into the parking area and park the vehicle.

STAGE-2

Once the car enters the parking area the person doesn't know which slot is empty, so to overcome this problem there is an indication of LED for every slot, when the LED does notglows it means the slot is empty when the LED glows it means the slot is occupied, by this the person can easily know which slot is empty and park his vehicle in an empty slot that is easily accessible to the user.

STAGE-3

The operation of exit side gate will be similar to that of the entrance. When the car is leaving the parking area, the led in slot will turn red automatically when the car leaves the slot, adnear the exit gate the IR sensor that is present and it gets triggered when the car is present in front of it and the servomotor is powered and the gate opens there by making way for the vehicle to exit the parking area.

STAGE- 4

In front of the parking area, there will be an LCD display that displays the data like the number of slots empty or no of slots occupied and if all the slots are filled it shows a message saying that the slots are completely filled.

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STAGE- 5

The main advantage of the current system is the user will get to know the slots occupied in parking area is updated in Thingspeak website and blynk application/website. From this application/website the user can also see the status of parking area, It shows the information of parking slots individually.

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3 HARDWARE AND SOFTWARE

3.1 HARDWARE USED

- NodeMCU ESP8266
- IR Sensor
- Servo Motor
- LCD display
- Led's

NODEMCU

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability,produced by Espressif Systems in Shanghai, China.

The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from existing micro controller to WiFi and is also capable of running self-contained applications.This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.

FEATURES

• Voltage:3.3V.
• Wi-Fi Direct (P2P), soft-AP.
• Current consumption: 10uA~170mA.
• Flash memory attachable: 16MB max (512K normal).
• Integrated TCP/IP protocol stack.
• Processor: Tensilica L106 32-bit.
• Processor speed: 80~160MHz.

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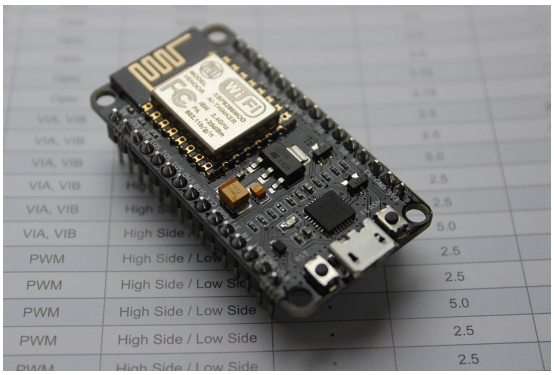
• RAM: 32K + 80K.
• GPIOs: 17 (multiplexed with other functions).
• Analog to Digital: 1 input with 1024 step resolution.
• +19.5dBm output power in 802.11b mode
• 802.11 support: b/g/n.
• Maximum concurrent TCP connections: 5.



Nodemcu

IR SENSOR

IR sensor is a device that emits light so as to sense some object of the environment. An IR sensor can measure the warmth of an object and also detect the motion. Usually, within the spectrum, all the objects radiate some sort of thermal radiation. These types of radiation are invisible to our eyes, but infrared sensors can detect these radiations. IR LEDs (Light Emitting Diodes) serve as the emitter, and IR photodiodes serve as the detector. Photodiodes are sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and therefore the output voltages will change in proportion to the magnitude of the IR light received. A typical infrared detection system consists of five elements: infrared sources, transmission media, optical components, infrared detectors, or receivers, and signal processing. Infrared lasers and infrared LEDs with certain wavelengths act as an infrared source. The three main sorts of media used for infrared transmission are vacuum, atmosphere and optical fibres. Optical components are wont to focus the infrared or to limit the spectral response.

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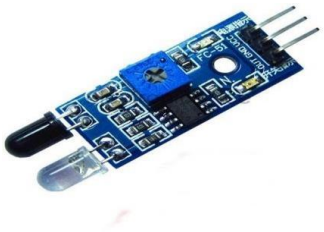

IR Sensor

SERVO MOTOR

A **servomotor** is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor, although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system.

Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of position encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

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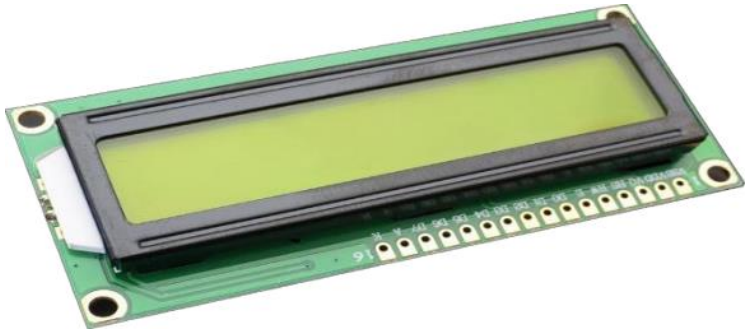
Servo Motor

LCD DISPLAY (16X2)

A **liquid-crystal display** (**LCD**) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly,[1] instead using a backlight or reflector to produce images in color or monochrome.[2] LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden. For instance: preset words, digits, and seven-segment displays, as in a digital clock, are all good examples of devices with these displays. They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements. LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement. For example, a character positive LCD with a backlight will have black lettering on a background that is the color of the backlight, and a character negative LCD will have a black background with the letters being of the same color as the backlight. Optical filters are added to white on blue LCDs to give them their characteristic appearance.



LCD Display (16x2)

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LED's

A **light-emitting diode** (**LED**) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.[5] White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device

3.2 SOFTWARE USED

- Arduino ide
- Blynk IoT
- Thingspeak IoT

ARDUINO IDE

The **Arduino Integrated Development Environment (IDE)** is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution.The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware. By default, avrdude is used as the uploading tool to flash the user code onto official Arduino boards.

Arduino IDE is a derivative of the Processing IDE, however as of version 2.0, the Processing IDE will be replaced with the Visual Studio Code-based Eclipse Theia IDE framework.

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With the rising popularity of Arduino as a software platform, other vendors started to implement custom open source compilers and tools (cores) that can build and upload sketches to other microcontrollers that are not supported by Arduino's official line of microcontrollers.

Arduino IDE

BLYNK

Blynk is an Internet of things (IoT) company which provides a platform for building mobile (IOS and Android) applications that can connect electronic devices to the Internet and remotely monitor and control these devices.

Blynk was founded by Pavel Bayborodin, a user experience (UX) expert in mobile and automotive space. The IoT platform was launched in 2014.Blynk platform is used by engineers to connect MCUs and prototyping development boards like Arduino, ESP8266 or SBCs like Raspberry Pi over Wi-Fi, Ethernet or the cellular to the Internet and build custom mobile applications to remotely monitor and control electronic equipment.Blynk Cloud is open-source

Blynk IoT

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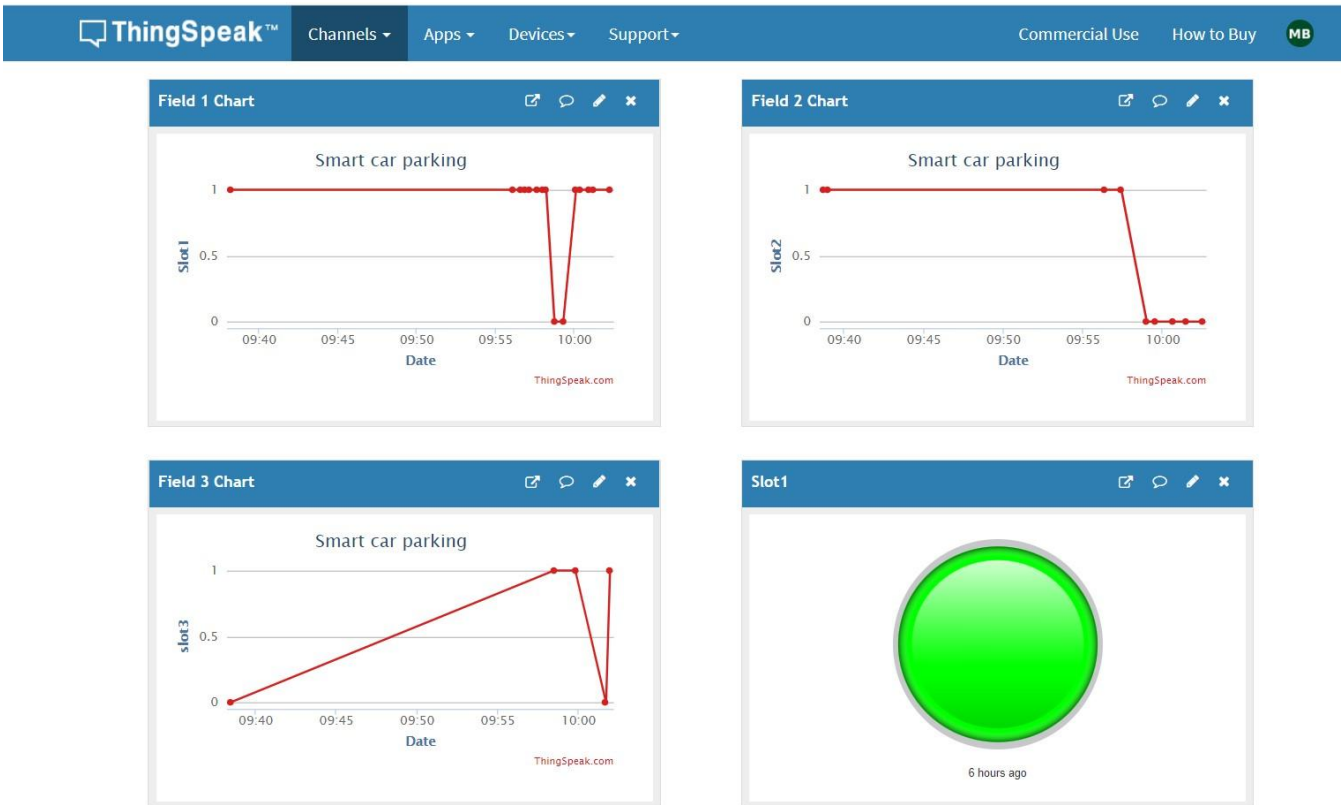
THINGSPEAK

ThingSpeak is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval and logging of data by providing an API to both the devices and social network websites. ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak users to analyze and visualize uploaded data using MATLAB without requiring the purchase of a MATLAB license from MathWorks.

ThingSpeak has been the subject of articles in specialized "Maker" websites like Instructables, Codeproject,and Channel 9.



ThingSpeak Website

4 CONCLUSION AND FUTURE WORK

CONCLUSION

- The proposed system was able to accurately identify the empty slot and was updating in the website/ mobile application.
- The operation of gate was done correctly without any error (letting in the vehicles only if the slots are empty).

FUTURE WORK

o To build a system that would be capable of searching nearby parking slots and able to navigate to the nearest slots based on the distance and number of empty slots available.

o To build a system that would be capable of accepting the payments and booking an empty slot for the user who can access it later.

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