WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Systematic Smart Parking System Using Arduino and IR Sensors

Srinivas R

Department of Computer Technology, Sri Krishna Adithya Collage of Arts and Science

ABSTRACT

This project defines the methodology of systematic smart parking system design consists of Arduino, IR detectors, one servo motor, and one 16*2 i2c Display. The Arduino is the main micro regulator that controls the whole system. Two IR detectors are used at the entry and exit gates to monitor vehicle entry and exit in the parking area. Other four IR detectors are used to detect the parking slots availability. The servo motor is placed at the entry and exit gate that is used to open and close the gates. Also, an i2c display is placed at the entrance, which is used to show the available parking slots in the parking area. The benefits of this project are real time slots, parking procedures, information and improves users' ability to save time on proper parking.

KEYWORDS: *Smart parking system, IR sensors, LCD screen, servo motor.*

1. INTRODUCTION

There are various types of parking systems that have been developed using the IoT technology. And it has a wide spectrum of applications. Infrared (IR) sensor is also a part of the WSNs technology and it is commonly used in developing a smart parking system. IR sensor is used to detect obstacles by emitting radiation. It is also known as the general-purpose proximity sensor. IR sensor can sense or measure the heat and the motion of an object. Hence, IR sensor is the suitable sensor to detect the movement or the motion of a vehicle when it is occupying the parking spaces. The selection of the IR sensor to be implemented in the car parking system is to highlight the potential solution that can help to improve the process of finding a vacant parking space which becomes troublesome for most of the car users. Besides, most of the car parking available today, especially in the shopping malls or tourist places or any other commercial areas have a major drawback of the parking system which the system helps the user to find the available spaces for parking but not the exact location of the parking slot.

Therefore, the existing of IoT technology is one of the popular elements to use when it comes to the parking system. The difficulty to find a vacant parking space is on the rise and if the IoT technology is adapted to the parking management system, it is expected to ease and help the citizen, especially for whom finding an available parking space is their daily routine in life. With the existence of this technology, it is possible to improve the quality of life.

2. LITERATURE REVIEW

In [1] author says the system is developed to display the vacant or available parking slots. It integrates a nodemcu microcontroller with IR Sensors and LCD screen is used to display vacant to screen.

In [2] author says smart parking system designed for vehicle parking and the main aim of this paper to atomize to allow vehicle to park. And use of Arduino and IR Sensors to identify the vehicle.

In [3] author explains the architecture and design of IOT based smart parking system. The system design is used to eliminate time conception to find empty parking spaces.

In [4] author explains the parking guidance and information system based on wireless sensor network. It deals with effective way of finding empty spaces and managing number of vehicle to modify multi parking.

3. HARDWARE SPECIFICATION

- Arduino Mega

- IR sensors

- I2C Lcd Screen

- Servo Motor

4. MODULE DESCRIPTION

CAR DETECTION MODULE

The most fundamental and widely used sensor in electronics is the infrared (IR) sensor or IR Sensor Module. It is utilized in wireless technology for features like remote controlling and obstacle detection. IR sensors typically comprise an Infrared (IR) LED and a Photodiode; collectively, these components are referred to as a "IR pair." A special purpose LED called an IR LED can emit infrared light with wavelengths between 700 nm and 1 mm. Our eyes cannot see these kinds of radiation. In contrast, an IR Receiver LED or photodiode detects infrared rays. It is also used to detect vehicles.

DISPLAY MODULE

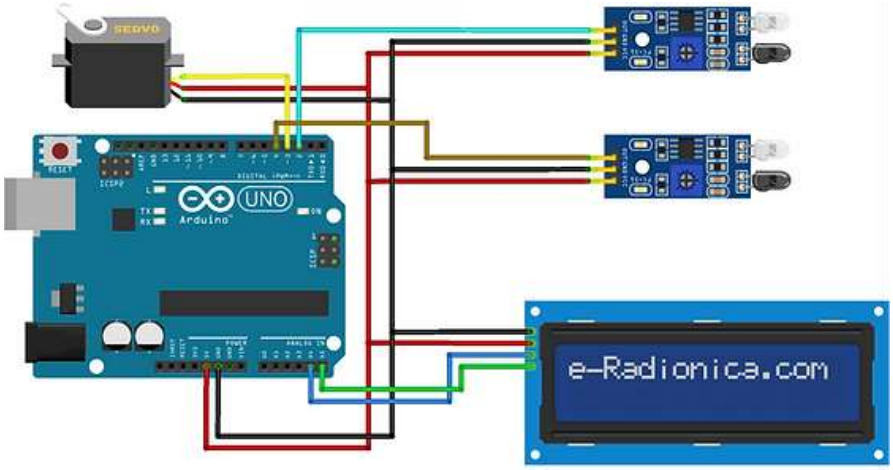
An LCD (Liquid Crystal Display) screen is a type of electronic display module with numerous applications. A 16x2 LCD display is a very basic module that is widely used in a variety of devices and circuits. A 16x2 LCD can display 16 characters per line and has two such lines. Each character is displayed in a 5x7 pixel matrix on this LCD. The intelligent alphanumeric dot matrix display has a resolution of 16 x 2 and can display 224 different characters and symbols. This LCD contains two registers.

These displays are mainly based on multi-segment light-emitting diodes. There are a lot of combinations of display available in the market, but the 16×2 LCD is widely used. The command registers store various commands that are sent to the display. The data register stores data that will be displayed. The process of controlling the display entails entering the data that will form the desired image. The main advantages of this LCD device are its low power consumption and low cost. The main disadvantages of this LCD device are that it takes up a lot of space, it is slow, and its lifespan is reduced due to direct current. This lcd screen is used to display the availability of parking slots according to the instruction in the code

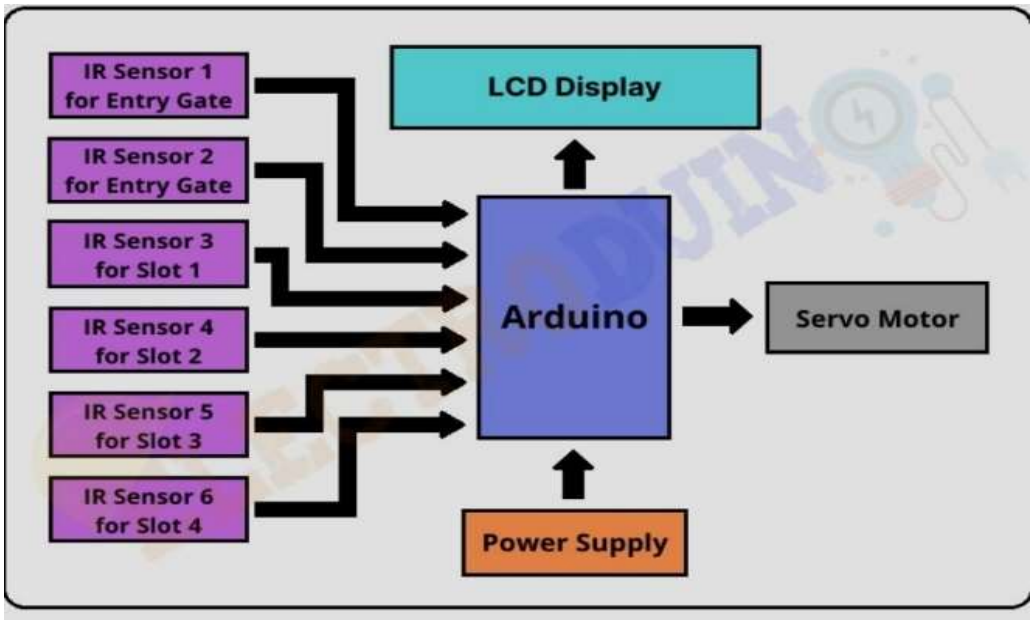
SERVO MODULE

A servo motor is a type of motor that can rotate very precisely. This type of motor typically includes a control circuit that provides feedback on the current position of the motor shaft; this feedback allows servo motors to rotate with great precision. A servo motor is used when you want to rotate an object at a specific angle or distance. It is simply a motor that is controlled by a servo mechanism. If the motor is powered by a DC power supply, it is referred to as a DC servo motor; if it is powered by an AC power supply, it is referred to as an AC servo motor. This tutorial will only cover the operation of a DC servo motor. It will act as a barrier gate to my project. It will help to open the entry and exit gate.

5 CIRCUIT DIAGRAM



6. BLOCK DIAGRAM



7. CONCLUSION

This paper showcases the potential of integrating modern technology for creating efficient and sustainable parking management system. And it will help to reduce the amount of time a driver has to spend looking for a parking spot, the amount of traffic around the parking, and the amount of bad parking around the parking space.

8. FUTURE SCOPE

- Integration with self-driving cars: As self-driving cars become more common, smart parking systems will need to adapt to accommodate them. This could include designing special parking spaces for self-driving cars or integrating the smart parking system with the vehicle's navigation system so that the car can park itself.
- Predictive analytics: Data analytics can be used by smart parking systems to forecast parking demand and adjust pricing accordingly. This can help optimize parking spots and reduce congestion in congested areas.
- Payment systems: To make it easier for drivers to pay for parking, smart parking systems can integrate with payment systems. This includes cashless payment options like mobile payment apps or automatic payment systems that charge the driver's account as soon as they leave the parking spot.
- Integration with public transportation: drivers can park their automobiles and continue their journey on a bus or train by integrating smart parking systems with public transportation networks. This can ease traffic congestion by lowering the number of vehicles on the road.

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