Research Paper

IoT Based Vehicle Parking Place Detection

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Abstract:
In this highly populated world with heavy traffic, finding vehicle parking is an important issue in highly smart and congested cities. There are too many vehicles on the road but not enough spaces for parking them. One of the main problems is that when we arrive a parking area then we realize that there are no empty parking slots to park our vehicles. Another biggest problem is after entering in a big parking area we are confused to find the empty parking slot to park our car. Sometimes we may face both these problems that waste our valuable time. That's why we need efficient parking management systems in all parking areas that will provide easy parking and our time is saved.
In this project, we are designing an efficient Parking System using IoT to overcome this problem. This method helps the vehicles driver to park their vehicles with less wastage of time.
Keywords: *IoT , Arduino UNO, Parking system ,LCD Display, IR sensors, Servomotor.*

I. Introduction:

Nowadays people in densely populated areas are facing a severe problem for car parking systems. People are choosing normal parking methods and searching for a vacant place in a parking slot without knowing if the slot is full or not. Due to this there is a wastage of time, wastage of fuel and sometimes cars may get damaged due to lack of space for parking. So, to overcome these problems we came with the idea of IOT BASED VEHICLE PARKING PLACE DETECTION. This project involves a system including Arduino UNO that provides solution to the problems in the allocation of car in the parking slot and IR sensors are provided at the parking place to detect the presence of vehicle parked. Also, a gate has been provided with servomotor whose main function is to allow and restrict vehicles inside and outside the parking slots by opening and closing the gate with respect to the information which is provided by the IR sensors in the entrance.

This system detects whether the parking slot is empty or not. If the slot is empty in the automated car parking ,it gives space to new vehicles else the entrance is blocked by the servo barrier in case the parking is full. The drivers can see the status for the availability of the free space on 16*2 LCD display. We can also see on the LCD how many parking slots are left.

Manual Car parking systems does not have any intelligent monitoring systems. The parking slots are monitored by human beings. All vehicles enter into the parking which may leads to the damage of cars and waste of time for searching whether the parking slot is available or not. Sometimes it may create blockage. Use of this system for Car parking monitoring will reduce the human efforts.

II. Existing Systems:

At present some countries have portals which users can gain some information about parking areas via the internet. This system can give user the information regarding parking space, but it won't be able to give which parking slot is vacant and occupied.Hence such system cannot smartly handle the issue. Car lifts along with automated robotic system which automatically takes car in a particular parking space as soon as car enters on a platform.This system cannot be installed by medium scale shopping malls , movie theatres as it can cost them a huge amount.

III.   Proposed system:

we are going to make an automatic vehicle parking system project using Arduino UNO. For the detection of vehicles, we are taking IR sensors and to display the parking spaces we are using a 16×2 LCD Display.
There are four parking slots in our project. If we want to increase the number of paring slots, then we add a few more IR sensors and change the code accordingly.
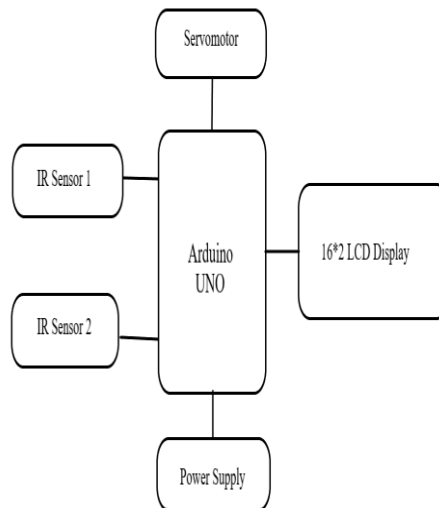

Fig : Block diagram

This system detects whether the parking slot is full or not. If the slot is empty in the automated car parking the new vehicles are allowed to enter else the entrance is blocked by the servomotor in case the parking is full.

The drivers can see the parking space availability outside the parking on a 16×2 LCD. We can also see on the LCD how many parking slots are free. The data is updated as the vehicles move in and out of the parking.

IV.   Hardware Description:

Arduino UNO: Arduino Uno is a microcontroller board which is based on the ATmega328P (datasheets).This board has 14 digital input/output pins (out of which 6 are PWM outputs), it has 6 analog inputs, and a quartz crystal of 16 MHz, a USB connection or power jack, an ICSP header and a reset button.

Fig 1: Arduino UNO

Using Arduino boards, we don't require extra peripherals and components to run the board. Arduino is the complete board that comes with GPIO pins, analog pins, and microcontroller as a heart of board.
Servomotor: By using pulse width modulation (PWM) we can control the servomotor through a control wire. There is a minimum pulse and maximum pulse, as well as the repetition rate. Normally a servo motor can only turn 90° in either direction for a total of 180° movement.

Fig 2: Servomotor

The PWM sent to the servomotor will determine the position of the shaft and based on the duration of the pulse sent by the control wire; the rotor will turn to the specified position.

IR Sensor: IR Infrared Sensor Module has the great adaptive capability of the ambient light, having a pair of an infrared transmitter and the receiver tube, the infrared emitting tube to emit a certain frequency,
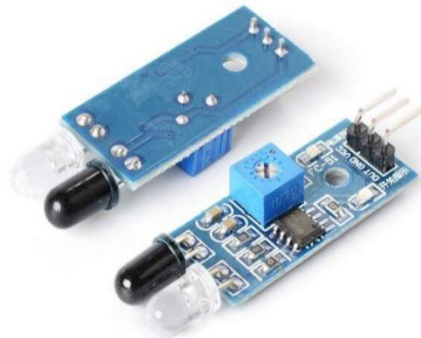

Fig 3: IR Sensor

encounters an obstacle detection direction (reflecting surface), infrared reflected to the receiver tube receiving, after a comparator circuit processing, the green LED lights up, while the signal output will output digital signal (a low-level signal), through the potentiometer knob to adjust the detection distance, the effective distance range 2 to 10cm working voltage of up to 5v.

LCD Display:

The I2C 16×2 Arduino LCD Screen is using an I2C communication interface. It can display 16×2 characters on 2 lines, white characters will display on blue background.

Fig 4: 16×2 LCD Display

The I2C is one of type of serial bus developed by Philips, which make use of two bidirectional lines, called SDA (Serial Data Line) and SCL (Serial Clock Line). Both must be connected via pulled-up resistors. The standard voltages are 5V and 3.3V.

V.   Advantages:

1.Optimised parking : Drivers can get the information regarding parking slots and which reduce time wastage and fuel.

2.Lesser Traffic: With this automated vehicle parking system ,the traffic at parking places is reduced.

3.Lesser Pollution and Increased Safety: By this project vehicle traffic is reduced which leads to less pollution and gives a better world with increased safety.
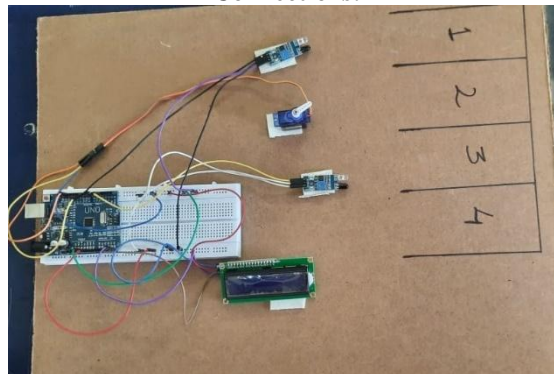
VI.   Applications:

1. This can be used in any shopping mall, multiplex.

2.It can also be used in educational institutes, offices.

3.This can be improved in the sense of security.

VII.   Conclusion and Future Scope:

After doing study on this project, it is found that that the has many benefits like time and fuel saving. It provides security to the parking ground. The system provides a real time process and information of the parking slots. It helps to resolve the issue of traffic congestion. In future work, the public users can reserve a parking area from any location . GPS, reservation facilities can be included in the future.

Connections:

Result:
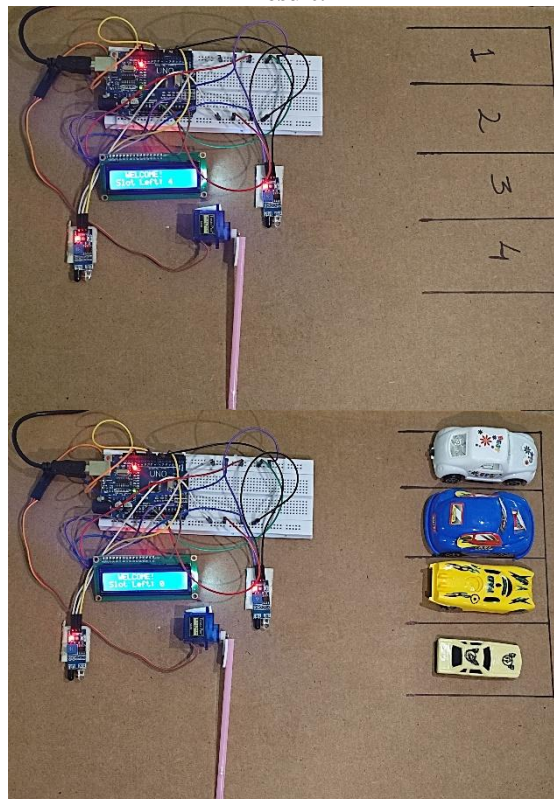
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