Smart Parking System

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Abstract: Now days in many multiplex systems there is a severe problem for car parking systems? There are many slots for car parking, so to park a car one has to look for the all lanes. Moreover there is a lot of men labor involved for this process for which there is lot of investment. Conventionally, car parking systems does not have any intelligent monitoring system. Parking slots are monitored generally by human beings. All vehicles enter into the parking area and time waste for searching for a vacant parking slot. Sometimes it creates blockage. Conditions become worse when there are multiple parking lanes and each lane have multiple parking slots.So the need is to develop a system which indicates directly which parking slot is vacant in any lane. The project involves a system including infrared transmitter and receiver in every lane and a indicator. The designed system works on the basis of an IOT module connected to a Wi-Fi module and a website that shows vacancy of parking lanes.Use of automated system for car parking monitoring will reduce the efforts.So the man entering parking area can view using IoT module involved and can decide which slot to enter so as to park the car.

Keywords: IR sensors, Smart Parking, Arduino, Wi-Fi module

I. INTRODUCTION

In present day world, Increase in number of vehicles has become a major problem. Due to this, parking a vehicle also has become a pain in the head for everyday users. Thanks to Internet Of Things we could now propose an efficient and working solution for the parking problem. Till now parking never had an efficient system. Even if it had one, it is not an intelligent one. An intelligent approach would be knowing where there is a vacancy in the parking area without even entering the parking lot. This is the main purpose of the proposed body. The current parking system is given in the figure.1

Internet Of Things is a study relating to sensors, actuators,

software and network embedded as a whole. An IOT device works only if all these components go hand in hand with every other individual component. We use IOT in the present case such that it can sense the free space in the parking and give the result through the network to the user driving the vehicle. The ultimate idea of intelligent parking is to help drivers to take minimal time to park their vehicles.

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This may seem like just saving time for them but in reality it also saves the oil consumption by the vehicle. The sensors situated in the parking slot will sense the data and give this data to a website maintained by the owner of the parking area. This website can be accessed by any person from their network enabled devices.

Sometimes the driver might go to higher floors if the parking is full in the lower floor but, there is no guarantee that he might get a vacant spot there. Sometimes the driver might end up moving all around the parking area and find no vacancy. The website allows the driver to see where there is a vacancy even before entering the parking space. If there is no vacancy the driver can directly go to another parking space without even entering the filled parking space.

Fig 1. Existing System

II. LITRATURE SURVEY

Smart parking [1] have proposed a system which used Google map application. Ultrasonic sensor and data collected are stored in cloud. Android application map gives user friendly information regarding vacant place. IOT based Smart Parking Management System 375 Published By: Blue Eyes Intelligence Engineering Retrieval Number: E1996017519 & Sciences Publication Each slot has one LED display which help to find the right parking place. IOT based parking system using Google [1] wasproposed to allow the user to reserve the parking place. Mobile application, finds the current parking place. In this system IR sensor is used to find a vacant place and is displayed at entry and exit gate.

RFID tag issued to authorize a person entry to the parking place. If the person is authorized signal is sent to open the gate [2].

Advanced CAR Parking System [3] using Arduino and Raspberry PI to detect the free slots. This system uses web server for booking, Google Maps using GPS. Results are displayed in the mark graphically. Effective car parking system [4] was proposed which uses IR sensors, authentication is done using RFID tag. ZigBee is used for communication.

Android Based Smart Car Parking System [5] Android based application the obtain information about available empty parking slot. The android application would have customer detail include area, state, vehicles number. Application having user enter and exit time and choosing a parking location.

User details are stored in MYSQL database. LED indicates to display the parking slots are empty or filled. Camera is used to capture the car number plate and convert the image to check whether the car is authorized user car or not [5].

Smart Parking System based on Embedded System [6] uses smart parking system using embedded and sensor network which uses android and windows application. In this system, Raspberry PI is used, IR sensor is used to finding a vacant parking slot.V2I(Vehicle To Infrastructure) communication to driver sending the parking request providing, user information status of conform reservation. Infrastructure to Vehicle (I2V) communication is used for reserve parking place application and shows direction. JSON format used to inter changing the data. QR code is used for the security purpose, webcam used to scan the code and authorized to show the parking lot direction [6].

A Privacy-Preserving Pay-by-Phone parking system [7] was proposed. The parking system can be reserved by pay by phone method. Mobile application using credit card payment method is implemented. New user can register and the new user contacts the system server and to purchase new e-coins. Each e-coin having a parking duration time of slot. Parking officer queries of on-board devices by performing RFID query [7].

Smart parking guidance system [8] proposed the parking guidance and information. System provide driver information and availability of parking slot through the VMS on internet. This system can be classified two different type off-road and on-road. Off-road used Pneumatic tube, loop deducted, Pneumatic tube to deduct presence of vehicle, Acoustic sensor-noise level to presence of vehicle, piezoelectric sensor-vibration to identify presence of vehicle security purpose used RFID. On-roadway ultrasonic sensortransmit wave to identify, IR sensor-emitting reflected wave to identify vehicle is present or not.

American countries uses park me app or google map API to find a vacant place[22].

India‟s capital New Delhi from 2015 start planning to collect all relevant data about parking lot and parking areas current infra-structure of parking place ownership. Web page or mobile app is used to booking parking place [23]. Real time tracking of cars can be localized using range based or range free algorithms. Review of various range based /range free algorithms were discussed in [25]. Based on its location, parking areas may be reserved.

III. REQUIREMENTS

For the given model, the gadgets required are Hardware sensor, sensor output converter, hardware- thingspeak interface, thingspeak application.

A. Hardware Requirements

1. IR Sensor: In parking slot will use this sensor to detect any vehicle is placed in that slot or not, all detected values are given to the Arduino.

2.Arduino: Parking slot will use this microcontroller board to convert sensor output into string format. Arduino will be coded to read data from the sensors and output to Wi-Fi module in string format.

B. Hardware - Thing Speak Interface

Wi-Fi module: The data from the controller is send to server using Wi-Fi module. This is set up to the Arduino board. WI-FI module enables the connection between the hardware i.e Arduino and the website in which the vacancies are shown.

C. Software Requirements

The software required are embedded C and Arduino IDE for writing the code for sensing the data and giving the slots for the wifi module and the IR sensors.

IV. CONTROL FLOW

1. First, the IR sensor is to detect any vehicle is placed in the slot or not.
2. Arduino takes all sesnors values and gives to the Wi-Fi module.
3. Wi-Fi module gets the string data, this data values is post in the server.
4. The website database get's the data from the system and plot the values in a website.

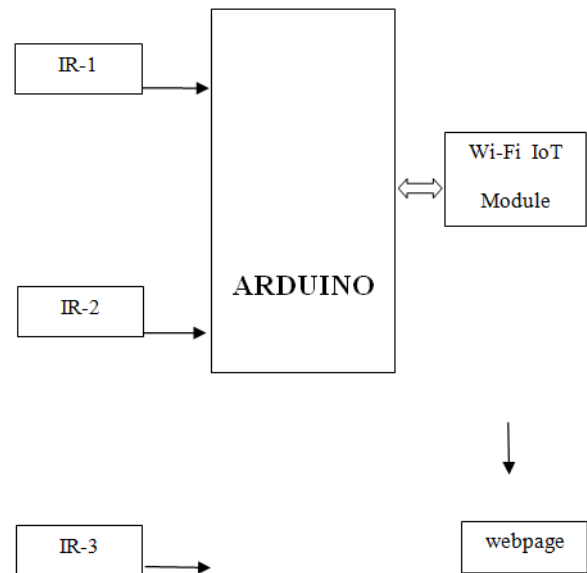Figure2 shows all the above mentioned steps in a block diagram.

Fig2. Block Diagram

V. PROPOSED SYSTEM

A. Identifying Free Parking Slot Free slot identification is verified using Infra-Red (IR) sensors. The IR sensor used for each parking slot. The infra-red sensor detect the vehicle in infra-red waves reflected and covers short distance. A pulse of IR light is generated by the IR sensor and emitted by emitter.This signal is carried over.

B. Detected the information will be send via Wi-Fi module to transfer the information to Arduino board and results are displayin the website designed. Authenticating User Vehicle It is assumed that each vehicle has built in RFID tag and vehicle is authenticated by RFID reader. First time users need to register to avail the facility. Authenticated vehicle would get a pass for entry and slot number would be allocated.

C. Classifying Parking Slot, The parking slots may accommodate only a single car. The website provides the sufficient data of free spaces in the parking area. This helps in classifying the slot to accommodate the vehicle in the vacant space. The website is written consisting of 3 slots for the 3 IR sensors connected to the arduino. Images of 3 cars are imported such that a car will be shown in the parking space if there is no vacancy in that corresponding parking space.

The figure3 shows the website and all the slots are empty.

And the figure4 shows that slots 1 and 3 are filled and only slot empty is 2 in the website. These results can also be viewed from drivers phone. Figure5 is the implemented project fitted and attached with glue on a board.
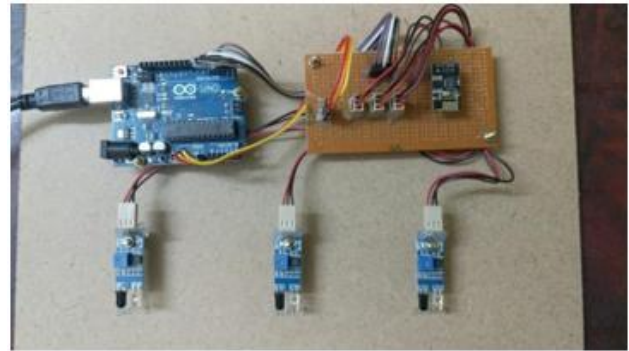

Fig3. Website showing 3 empty slots.

Fig4. Website showing 2 filled and 1 empty slot.

Fig5. Connections through Sensors, Arduino and Wi-Fi module.
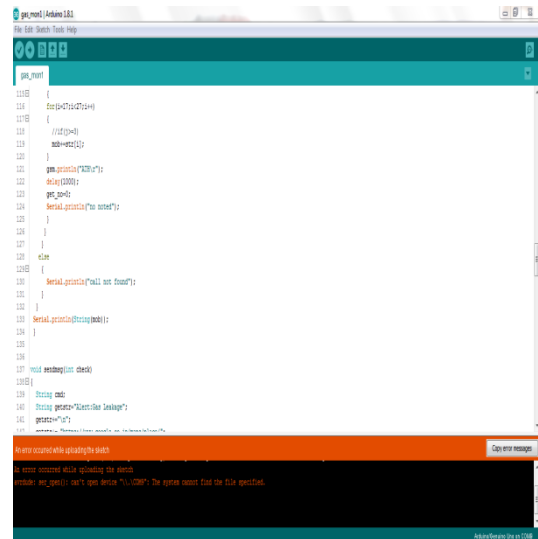
Fig6. Screenshot of Integration Testing In Arduino IDE.

VI. CONCLUSION

In this work, IOT based smart parking system has been proposed which integrates several physical devices to check the parking slot availability.Website allows the user to locate and reserve a parking slot in online, position of the vacant slot from entrance gate to available parking slot also helps the driver. The proposed system reduces the driver‟s effort and time to search parking space. Prototype is built for single storage parking slot, but this model can be extended for multi storage parking space. The final conclusion is that with the help of internet of things, Arduino, IR sensors, Wi-Fi module and a website, the complexity of the parking problem in day to day life is reduced saving time and work for the common man.

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