Smart Parking Management System and Traffic Reduction in Parking Slots using IoT

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***Abstract*:- In this fast-growing cities, the vehicle users increases exponentially and demanding more parking space. In present smart phone encourages users to prefer mobile application to get solve their problems. Growth of IOT has put a path for integration of mobile devices, wireless communication technologies and mobile Applications. This paper proposes an IOT based Smart parking system and traffic reduction in parking slots that integrates with mobile Application. It provides a parking solution for both the user and owner of the parking slots. Features are provided for reserving a parking slots, authenticating a reserved user, identifying nearest parking slots depending on the size of the vehicle, navigating to the parking slots and computes accounts information on day, week and month basis. IR sensors are used to identify if there is a parking spot is free. Availability of a free parking slot with its location information and petrol bunks, Shopping malls is transmitted using GPS module technology, microcontroller and wireless communication technology to the server and is retrieved though a mobile application. RFID tag is used to get authenticate by fixed in the vehicle's end user who reserves the parking slot for an hour, day, week or monthly basis.**

Keywords: IoT, RFID, SPMS, GPS, IR Sensor, Wireless Communication Technologies.

2. INTRODUCTION

An increasing number of smart cities increase the usage of IOT .The smart parking management system (SPMS) in certain areas like hospitals, Malls, airports will reduce the traffic jam that occur in parking slots. The smart parking can easily be designed using Internet of Things (IOT) by hardware like Arduino, raspberry. Any city can be reduce the traffic and save their time in innovative way by introducing smart parking system by using a mobile app to navigate the drivers to locate free parking slots near them, smart traffic management to track and find the parking slots and show the free slots in the mobile application .In this application the cost and display of the certain parking slots will display to choose the driver to their comfort. This helps to reduce the air pollution in parking slots. The smart parking management system uses RFID tag technology to identify and authenticate the user to use and access user information. Thus, each time the user logs in, name, address, date and time, and parking history is recorded and can be searched on the central database, preventing duplicate and/or unauthorized entries in others parking slots. Smart parking [1] has 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. Each slot has one LED display which help to find the right parking place. IOT based parking system using Google [1] was proposed 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, 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 Management System (SPMS) 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].

3. EXISTING SYSTEM

In existing system, a mobile application is used to find the free parking slots to park their vehicles to save their time and energy. In this app it will display the near parking slots after login the app, the user will get a user id to use the allocated parking slots.

- Free space identification.
- Classify parking slots.
- Visualization in sever for owner to analyze .

FLOW CHART

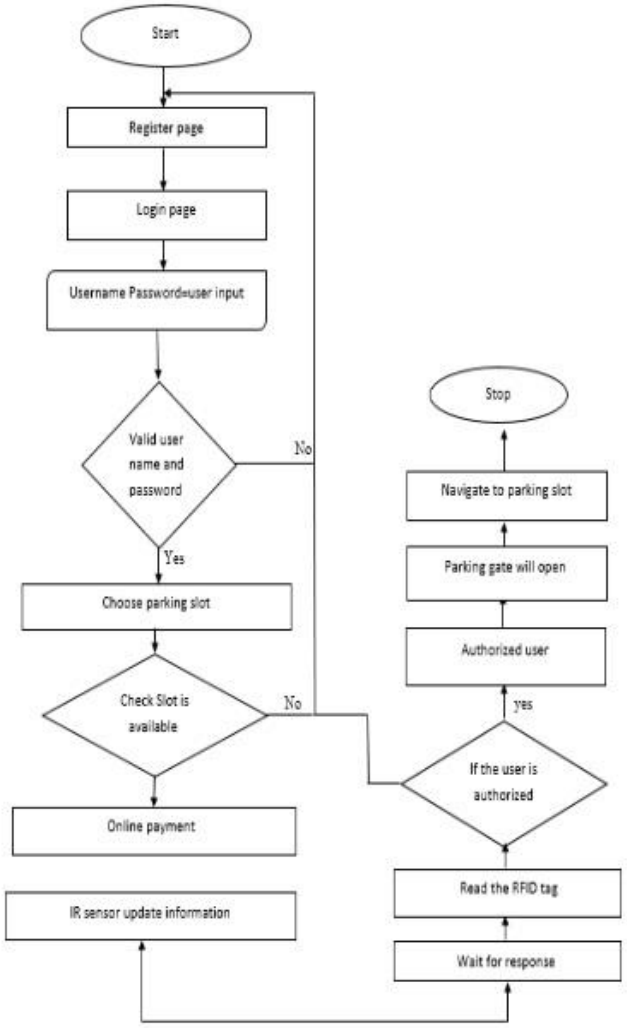


Fig.1 Flowchart of SPMS

4. PROPOSED SYSTEM

The proposed system is explained below:

i. Development of parking app
ii. Traffic reduction in parking slots
iii. Cost and quality will display
iv. Timing over alert
v. Security purpose by using RFID
vi. Identification of petrol bunk and shopping mall near to parking slots

In this proposed system, the mobile application consists the register and login page for the security purpose and to provide a particular slot to the user. It also displays the petrol bunks and the shopping malls that are available in the parking areas. In this traffic also reduce in the parking slots by using IR sensors to allocate the slots for the users who are register in the application.

ADVANTAGE

- To check the parking slot availability.
- The user to locate and reserve a parking slot in online, navigation from entrance gate to available parking slot.
- The system reduces the driver's effort and time to search parking space.

5. PROCESS OF USING APP

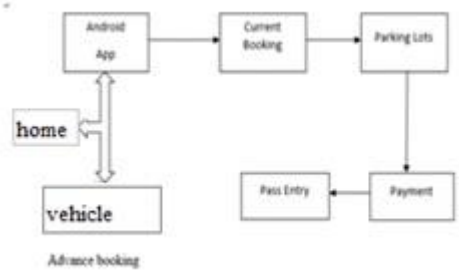


Fig.2 Architecture of online booking for parking slots

The above architecture is the explanation of the parking slots to book their parking slots before enter into the parking area to save the time and energy of the user. RFID tag is used to allot the slots for the user and the check the slots is free are already booked.

BLOCK DIAGRAM

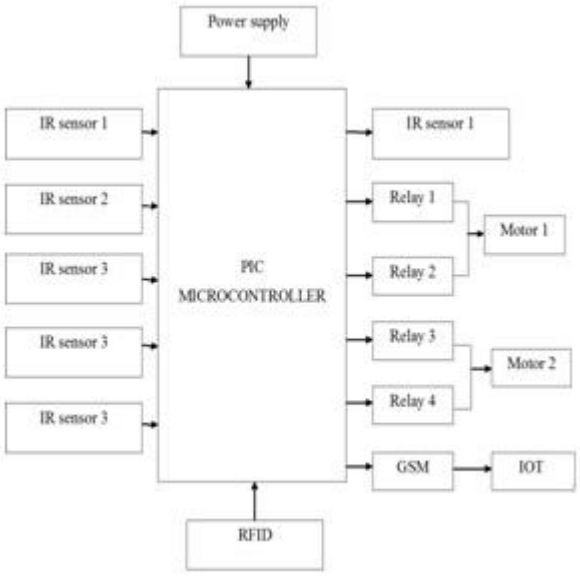


Fig.3 Schematic Block Diagram of SPMS

➢ ***LCD***

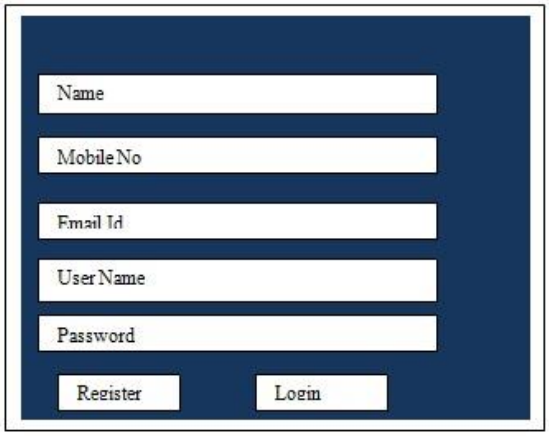
LCD stands for liquid crystal display. They come in many sizes 8x1, 8x2, 10x2, 16x1, 16x2, 16x4, 20x2, 20x4, 24x2, 30x2, 32x2, 40x2 etc . Many multinational companies like Philips Hitachi Panasonic make their own special kind of LCD'S to be use their products. This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply.

Fig.4 Prototype of LCD

FEATURES

- Input voltage: 5v
- E-blocks compatible
- Low cost
- Compatible with most I/O ports in the E-Block range
- Ease to develop programming code using Flow code

SIGN IN PAGE



BOOKING PAGE

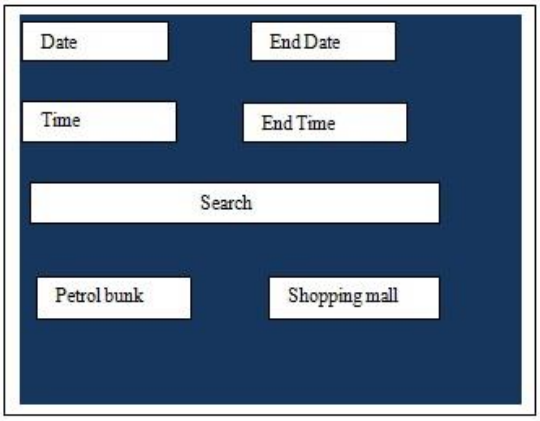


Fig.5 Arduino based Raspberry PI Software

➢ ***IR SENSOR***

IR LED emits infrared radiation. This radiation illuminates the surface in front of LED. Depending on reflective of the surface, the amount of light reflection varies. This reflected light is made incident on reverse biased IR sensor. The amount of electron-hole pairs generated depends on intensity of incident IR radiation. Thus as intensity of incident ray varies, voltage across resistor will vary accordingly. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

FEATURES

- Operating voltage:5VDC
- Output voltage: 0 or 5VDC
- Easy to assemble and use
- Onboard detection indication

Effective distance range of 2cm

Fig.6 Prototype of IRLED

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED, when IR light falls on the photodiode.

➢ ***RFID READER-EM 18***

A Radio Frequency Identification Reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio Frequency waves are used to transfer data from the tag to a reader. The RFID tag it must be within the range of an RFID reader, in order to be read. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items. . The antenna uses radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna. Radio frequency identification (RFID) is one method for Automatic Identification and Data Capture (AIDC). RFID tags are used in many industries. An RFID system consists of three components: an antenna and transceiver and a transponder.

FEATURES

- Supply voltage: 12v DC
- Output: UART and TTL
- In-built buzzer indicator
- Signal LED is placed

Fig.7 RFID Reader Module

➢ ***GSM Module***

SIMCom Wireless Solutions is a subsidiary of SIM Technology Group Ltd (stock code: 2000. H.K). It is a fast-growing wireless M2M company, designing and offering a variety of wireless modules based on GSM/GPRS/EDGE, WCDMA/HSDPA and TD-SCDMA technical platforms By partnering with third parties, SIMCom Wireless provides customized design solutions in M2M, WLL, Mobile Computing, GPS and other applications. SIMCom Wireless also provides ODM services for customers. According to ABI Insight report, SIMCom Cellular Module was number two provider of wireless modules worldwide in 2008 with 20% acquisition of global market share.

This GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module featuring an industry-standard interface; the SIM800 delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM800 can fit almost all the space requirements in your applications, especially for slim and compact demand of design.

Fig.8 GSM Module

FEATURES

- High Quality Product
- RS232 interface @ RMC Connector for direct communication with computer or MCU kit
- Configurable baud rate
- SMA connector with GSM Antenna.
- SIM Card holder.
- Built in Network Status LED
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Audio interface Connector
- Normal operation temperature: -20 °C to +55 °C
- Input Voltage: 4.5V-12V DC

6. CONCLUSION

In this paper, IOT based smart parking system has been proposed which integrates several physical devices to check the parking slot availability. Mobile app allows the user to locate and reserve a parking slot in online, navigation from entrance gate to available parking slot is also 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.

7. REFERENCE

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