

SMART PARKING SYSTEM FOR INTERNET OF THINGS

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Abstract: Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access those un-internet things from any remote location. It's inevitable for the people to update with the growing technology. And generally people are facing problems on parking vehicles in parking slots in a city. In this study we design a Smart Parking System (SPS) which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area. And it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere.

Keywords: Smart parking ,Zig bee, Magnetic sensor

1.INTRODUCTION

Present day's car parking has become a major issue in urban areas with lack of parking facilities and increased amount of vehicles, due to this drivers who are searching for parking space they have to roam around the city in peak hours. This causes traffic,

waste of time and money. More than half of the world's people are living in the cities. So the cities have reached full of its occupancy. As people uses vehicles for transportation so there is large number of vehicles exists for people convenience. Most of the time people spend their precise time on searching parking lots to park their vehicles. Thus congestion occurs in the traffic it leads to a hectic job to

find the parking space to park their vehicle. The most traffic occurs only because of vehicle congestion in the urban areas thus people are wasting their time in searching the parking area abnormally to park their vehicles. Moving towards smart city application, smart parking is a good example for a common citizen of how the Internet-of-Things (IoT) will be effectively and efficiently used in our daily living environments to provide different services to different users [1-3]. Any citizen may use his mobile

In this paper, we propose a smart parking system detecting and finding the parked location of a consumer's vehicle and reservation of slots by using IOT and smart phone. Using ultrasonic and magnetic sensor, the proposed system detects vehicles in indoor accurately. Communication of user and slot ID is by using Zigbee module system. It supported the identification of entering and leaving vehicles in parking slot and memorized the vehicle parking location. Since the smartphone is used, the customer has the convenient service for vehicle parking location. In our experiments, the proposed system had shown the accurate parking location service in parking slots. This system helps user to find parking space availability with the help of Internet of Things (IoT) technology by providing parking free space information. The IoT maintains the database of the parked vehicles through a shared server. So drivers can book the slots in advance and the parking information updated in server. Security of parked vehicles is also a considered aspect in the proposed system.

Internet of things was first introduced in 1999 at auto ID center and first used by Kevin Ashton. As evolving this latest burning technology, it promises to connect all our surrounding things to a network and communicating with

each other with less human involvement. It is defined as the things present in the physical world or in an environment are attached with sensors or with any embedded systems and made connected to network via wired or wireless connections. These connected devices are called as smart devices or smart objects. And it consists of smart machines which communicating interacting with other machines, environment, objects etc. And also it incorporates to connect any two machines, machine to human and vice versa etc. In the last few years, a stimulating idea is fast emerging in the wireless scenario: the

pervasive presence around us of a variety of “things” or “objects” such as devices, sensors, actuators, and mobile phones, which, through unique addressing schemes, are able to interact with each other and cooperate with their neighboring “smart” components to reach common goals. This novel paradigm, named the “Internet of Things” (IoT), continues on the path set by the concept of the smart environment and paves the way to the deployment of numerous applications with a significant impact on many fields of future everyday life.

In the proposed system we are dealing with the indoor parking concepts but the parking system can be designed in such a way that it is applicable for covered parks, open parks and street side parking. The cloud based IOT architecture for smart parking system which contains cloud service provider which provides cloud storage to store information about status of parking slots in a parking area. The centralized server which manages to store entire smart parking systems information such as number of slots, availability of vehicles etc. And these information will be accessed through some secured gateways through network.

Through the smartphone application, users can see on a map the locations where spots are currently available and carry out a reservation for a currently vacant spot. Upon arrival at a parking spot, a user can choose from a number of verification methods: a) a simple text message through a pre-registered phone that contains the spot number b) an exact (GPS-based) location confirmation via the smartphone application and c) a special device that will communicate directly with the rest of the infrastructure and

convey the user's details. It is important to note, that user verification must take place irrespective of whether or not a reservation was carried out for the spot.

In our proposed system the verification of identical spot is by message to server storage. The smartphone communicates with the server for the details of available parking space. So one can ask slot to the server by sending a slot requesting message to the server. This designed automatic smart parking system which is simple, economic and provides effective solution to reduce carbon footprints in the atmosphere. It is well managed to access and map the status of parking slots from any remote location through web browser. Thus it reduces the risk of finding the parking slots in any parking area and also it eliminates unnecessary travelling of vehicles across the filled parking slots in a city. So it reduces time and it is cost effective also.

II. LITERATURE REVIEW

In old parking management systems, only the administrator has information about the parking spaces occupied by vehicles. Since the existing parking system cannot use the active information exchanging, it did not provide useful parking information for drivers. To solve this problem, smart sensors and the middleware for handling them are needed. The vehicle parking location service has been proposed on the using of RFID devices [4]. In this service, the drivers have to receive an RFID tag on the entrance of parking lot.

The RFID tag provides the vehicle location service for drivers through the RFID reader of parking space. However, this approach is inconvenient because the driver must receive the RFID tag in the entrance. In addition, the cost for RFID tag is needed. smart parking system to solve the problem of the exiting parking systems based on the wireless sensor network and Bluetooth of smartphone. The proposed system uses ultrasonic sensors for indoor parking lots and a magnetic sensor for outdoor parking lots. For the location service of parking vehicles, the Bluetooth and USIM ID are exploited.

For the indoor parking system, a sensor mote with an ultrasonic sensor and Bluetooth communication module is installed on the ceiling of each parking slot. The sensor mote collects the data from ultrasonic sensor and communicates with the consumer smartphone as using BLE (Bluetooth Low Energy). It also sends mode ID and USIM (Universal Subscriber Identity Module) ID to server.

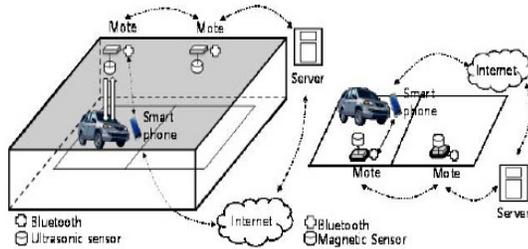


Figure 1: Indoor and outdoor parking systems

As shown in the Figure 1, all motes collect the data about the state of parking slots. They receive the USIM ID of customer smartphone through Bluetooth communication.

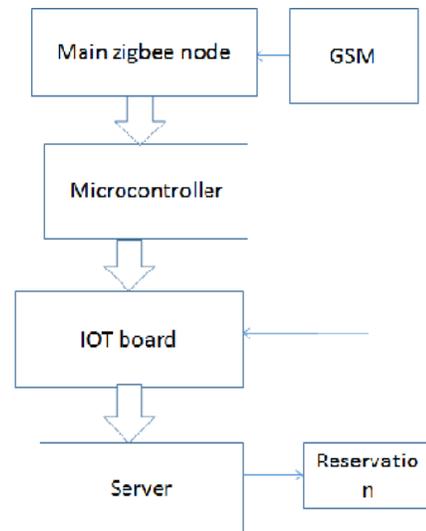
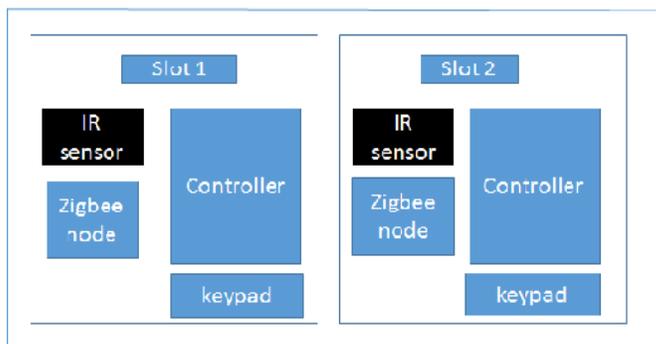


Figure 2: Architecture of proposed indoor parking system

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These data are used for the location service for parking vehicles. The server provides the Web service based on the received data. To get the parking service, the consumers exploit the Web browser or Apps software in their smartphone.

III. THEORETICAL BACKGROUND

A. Smart Parking System Architecture

Figure 2 shows the architecture of proposed indoor parking system. For the indoor parking system, a sensor mote with an ultrasonic sensor and Zigbee communication module is installed on the ceiling of each parking slot [5]. The sensor mote collects the data from ultrasonic sensor and communicates with the consumer with a keypad interfacing system. It also sends mode ID and USIM (Universal Subscriber Identity Module) ID to server through Zigbee with gateway. These data are used for the location service for parking vehicles.

B. Hardware Architecture

The hardware of smart parking system is composed of the wireless sensor motes, gateway, and server. The sensor motes are deployed on the parking lot, which are monitoring

the vehicle existence on each parking slot and are sharing with customer smartphone. The gateway is in charge for the data transmission to server. The sensor motes are constructed with MicaZ product involved in Atmega 32A MCU.

III. OPERATIONS OF SMART PARKING SYSTEM

A. Vehicle Identification and Location Recognition

To inform the vehicle parking location for users, firstly the available states of each slot in parking space are identified. The ultrasonic sensor emits the ultrasonic to the objectives and can measure the distance to them as using the echo waves. We installed an ultrasonic sensor on the ceiling of a parking slot and measure the distance until the bottom. The distance between the ceiling and bottom is regarded as the basic distance value. If a vehicle occupies a parking slot, the new distance is measured between the ultrasonic sensors on ceiling and the vehicle hood. The difference of distances let us identify the existence of vehicle on the parking slot. Since an ultrasonic sensor is very sensitive to the rain, snow, and dust, some problems are occurred in outdoor environment. Usually, vehicles are made up the parts over 100 involved in magnetic materials. Due to magnetic property in vehicles, the magnetic sensor can detect the movement of vehicles. The magnetic sensor in our sensor mote can measure the three axis of magnetic wave, so it can detect the vehicle entering into the parking slot with reliability

To identify the vehicle of customer in the parking lot, we need the unique value to each customer. In this research, as the unique ID, the USIM ID of customer keypad interfacing system can be exploited. As the ID of USIM chip and the ID of sensor mote transmit to the server, the vehicle of each customer is identified.

B. Consumer Service Procedure

As the consumer parks the vehicle in the parking slot, the sensor mote detects the vehicle entering in its sensing area. Next, the consumer interfacing with keypad, and sends the USIM ID. If the consumer requests the

location of vehicle using the smartphone, the smartphone sends its USIM ID to the server. The server can find the vehicle location in parking slot using USIM ID. Also user can reserve there location of parking slot by using internet with criteria of limited time. Server sends the reserved slot ID to IOT board and it control the particular slot mode as reserved. Also system gives a password to user's smartphone to attain the credibility of reservation.

C. IOT

The term "Internet of Things" (IoT) was first used in 1999 by British technology pioneer Kevin Ashton to describe a system in which objects in the physical world could be connected to the Internet by sensors. Ashton coined the term to illustrate the power of connecting Radio-Frequency Identification (RFID) tags that used in corporate supply chains to the Internet in order to count and track goods without the need for human intervention. Today, the Internet of Things has become a popular term for describing scenarios in which Internet connectivity and computing capability extend to a variety of objects, devices, sensors, and everyday items.

IV. FUTURE WORK

For the future work, the more accurate RSSI measurement method will be studied, and the additional applications for smart parking space are developed, such as accident alarm, reservation for parking slot, and so on. The concept of Smart Cities have always been a dream for humanity. Since the past couple of years large advancements have been made in making smart cities a reality. The growth of Internet of Things and Cloud technologies have give rise to new possibilities in terms of smart cities. Smart parking facilities and traffic management systems have always been at the core of constructing smart cities.

V. CONCLUSION

This designed automatic smart parking system which is simple, economic and provides effective solution to reduce carbon footprints in the atmosphere. It is well managed to access the exact location of free space or free slot to park the car. status of available slots which are already available at server will be distributed to the customer who is accessing the server using his smartphone. Thus it reduces the risk of finding the parking slots in any parking area and also it eliminates unnecessary travelling of vehicles across the filled parking slots inside the indoor parking area. So it reduces time and risk of accident

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