



Smart Car Parking Management System Using Internet of Things – A Review

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ABSTRACT: This project is used to Smart Parking system consists of an on-site deployment of an IOT module that is used to monitor and signalize the state of availability of each single parking space. The two prominent words in IoT are “internet” and “things”. Internet means a vast global network of connected servers, computers, tablets and mobiles using the internationally used protocols and connecting systems. Internet enables sending, receiving, or communicating of information. Thing in English has number of uses and meanings. Dictionary meaning of ‘Thing’ is a term used to reference to a physical object, an action or idea, situation or activity, in case when we do not wish to be precise. IoT, in general consists of inter-network of the devices and physical objects, number of objects can gather the data at remote locations and communicate to units managing, acquiring, organizing and analyzing the data in the processes and services. It provides a vision where things (wearable, watch, alarm clock, home devices, surrounding objects with) become smart and behave alive through sensing, computing and communicating by embedded small devices which interact with remote objects or persons through connectivity.

I. INTRODUCTION

The parking problem in big cities, especially the mega-cities, has become one of the key causes of the city traffic congestion, driver frustration and air pollution. In the future, it is expected to have an increase in the demand for the intelligent parking service because of the rapid growth in world population as well as the automotive industries. An effective solution to this service can be provided by many new technologies. According to [8], people waste away liters of gas just trying to parking, on average 30% of traffic is looking for an available parking spot. Smart parking solutions can help to accomplish parking problems. This study concentrates on placement algorithms which are used in smart parking applications. Another important factor to take into account is the cases where the location of alternative parking spots are evaluated, for example, a case where the distance to the free spot is not the best one available. As discussed in [7], an effective parking placement strategy makes the better use of parking spot resources possible. In this paper, we present a hierarchical placement approach based on nearest location. First, the nearest parking area will be found. After finding nearest car park, we can directly search only nearest car park for an empty spot. By doing this, we directly skip the car parks which are not close enough to driver. This hierarchical method makes the search easier, faster and more efficient. Time is the most valuable metric in our project. By using hierarchy in placement algorithm, we consume less time while finding nearest empty spot in car park. Saving time while parking a car means that we save energy, fuel, even less CO₂ emission. As a summary, main objective of this project is saving time using hierarchical approach in placement algorithm, in other words, presenting time efficient placement approach for smart parking systems.

The rest of this paper is organized as follows. Related works in the literature are discussed in Section II. Section III presents and explains the proposed approach. In Section IV, simulation results are discussed and a comparison between the new approach and the non-hierarchical approach is performed. Section V concludes the study and gives recommendations about future directions.

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 11, November 2019

II. SYSTEM ARCHITECTURE

Fig. 1 describes the architecture of the proposed system Smart Irrigation System. In this system real-time monitoring parameters for temperature, humidity in the atmosphere and content of moisture level in the soil are the important factors for obtaining high-quality for system operation [3].

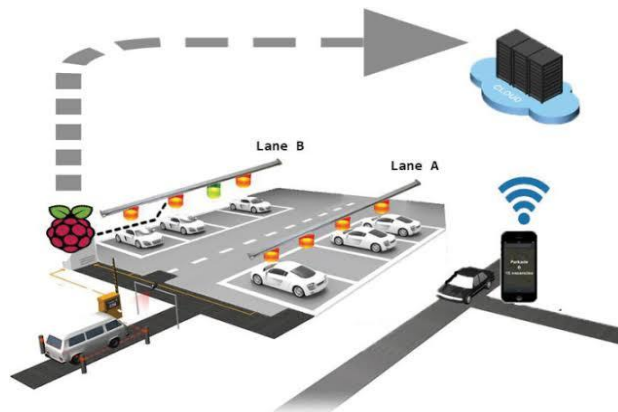


Figure 1: Smart Parking System

At the beginning of a measurement interval, the Arduino Uno microcontroller supplies power to the circuit and sensors. A soil moisture reading is taken by measuring the frequency of the alternating signal from the binary counter. The temperature sensor [LM 35] and humidity sensor [DH 11] is also interfaced in the microcontroller to monitor the environmental conditions [3]. Checking the environmental conditions helps the farmer to choose appropriate crop at the particular season and improves the production.

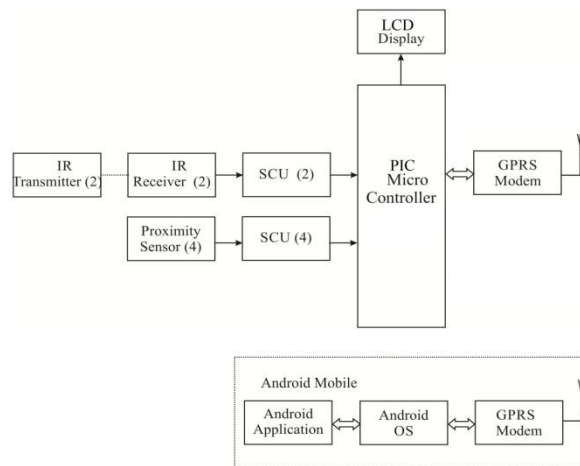


Fig. 2 Architecture Diagram

In the smart irrigation system, the motor can be automatically turned on whenever the moisture level of the soil is low. It can be achieved by comparing the sensor value with the predefined threshold values. Whenever the sensor value is less than the threshold, motor is switched ON and the Microcontroller sends message to the farmer in the form of SMS through GSM [10]. The temperature, Humidity and moisture data is also displayed in the LCD display connected to the controller.

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III. SYSTEM DESCRIPTION

A proposed system gives water to the plants where water is needed with the required amount with the help of soil moisture sensor. When compared with the conventional irrigation system that works on the principle of timer based irrigation, gives water to the plants where plants are irrigated even when there is no need for water. This system also makes use of temperature and humidity values of the environmental conditions.

A GSM is a short message based interface which is used to send SMS to the farmer whenever the soil condition is abnormal and is also displayed in the LCD. In this system, the moisture value obtained from the sensor is compared with the threshold value and the plant gets irrigated whenever the soil level goes beyond the threshold level. Monitoring the environmental conditions will be useful for the farmers to know the types of crops to be cultivated at the particular season.

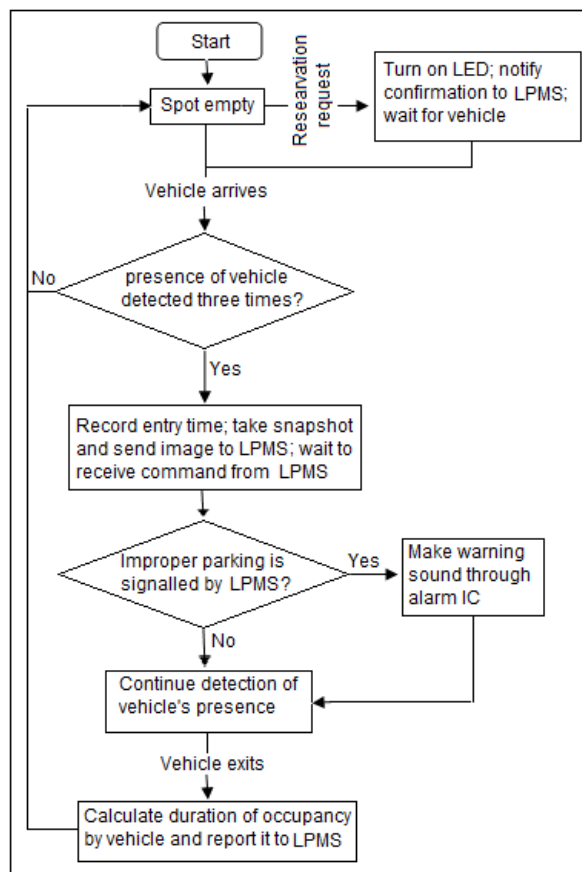


Fig. 3 Flowchart of the proposed system

IV. DISCUSSIONS

In order to determine the different moisture level of the car it is tested with different types of car and environmental conditions. When the parking sensor tested in different cars, it will have different reading, as there is change in resistance, hence the sensor needed to be calibrated to suit with different kind of cars.



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V. LITERATURE SERVEY

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. 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 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 sensor transmit 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].

To enable a user to use the smart parking system, user need to register with user ID with vehicle number. User can set up the default payment option in his account settings. The android app is built for booking parking slot and payments. The application is used to find the free slot and user need to specify the estimated time of arrival and parking slot usage start and end time. The IR sensors used to identify the parking slot is free or occupied. Parking slot is empty LED shows slot number N (empty), D (occupied). After booking for free parking slot, if the vehicle enters the entrance gate, it is assumed that each car has built in RFID card and RFID reader verifies the vehicle and is authenticated. The parking slot may be allotted for small vehicle and large vehicle.

VI. CONCLUSION AND FUTURE WORK

The concept of IoT is rapidly becoming more and more popular with variety of application areas. IoT concept is going to become an important part of our daily life, and work life. It can be employed efficiently to create more comfortable environment and living spaces. On the other hand, our planet needs some green solutions because energy efficiency is a very important concept nowadays as we are running out of energy resources. This paper introduces an energy and time efficient approach which can be used in car parking applications. Introduced hierarchical approach is simulated and compared with non-hierarchical one. Same search algorithms are used with hierarchical and without hierarchical approaches. The results of simulation are discussed and showed that hierarchical approach makes search process more



ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 11, November 2019

energy and time efficient. In addition, by considering energy and time efficiency with IoT concept, it leads us have more convenient, comfortable also more environment friendly intelligent systems. As future work, prototype of proposed approach can be created. Instead of simulation results, real life experience and results can be investigated in terms of efficiency in time and energy. By using prototype of approach, CO₂ emission values, fuel consumption, and other metrics can be considered and discussed as well.

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