International Journal of Aquatic Science
ISSN: 2008-8019
Vol 12, Issue 02, 2021

An Rfid Based Cloud Integrated Smart System For Vehicle Parking

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Abstract: The vast growing influx of population in the developed, industrially and technologically sound urban cities, an urgent need to make the cities smart is surmounted. The cities are made smart utilizing data sharing, artificial intelligence, machine learning, analytics, and thousands of sensors. One of the significant concerns of today's smart cities is the growing need to manage thevehicles on-road as well as to create sufficient and well-managed parking lots to prevent urban areas from traffic congestion. This leads to a call for a highly automated parking management system self-sufficient in guiding the driver to an available parking space in the nearby area. In this paper, a real-time prototype of the smart parking system (S.P system) based on Internet of Things (IoT) is discussed. The proposed smart parking system works on an electronic device that collects the parking availability status and assists drivers in finding and selecting the desired parking space among the available parking spaces that effectively reduces the traffic problems and mismanagement across the cities to a great extent.

Keywords: IoT, Smart Parking

1. INTRODUCTION

With the change of the global economy and modern life, the Information and Communication Technologies (ICT) has experienced a vital acceleration. Today, people spend most of their timeoutside of their home, they travel daily to work and shopping centers and attractions, without forgetting the displacements to the centre of the city. This certainly caused an imbalance in the daily mobility that led to the development of parking services to avoid unnecessary driving aroundthe city centre to simply search for a parking space. This, on the one hand, causes additional carbon dioxide emissions and damages the environment of the city's ecosystem. On the other hand, it increases drivers' frustration and traffic congestion in the city, which will certainly cause traffic accidents. All of this degrades the experience of the modern city's ecosystem and has become a major challenge in the development of future smart parking systems. This template is designed to help you in preparing your manuscript in expected format. The guidelines include complete descriptions of the fonts, spacing and related information for creating your proceedings manuscripts. Please follow them properly. Smart parking systems are systems that manage the difficulty of parking in the city in public or private areas, using several recent technologies, including WSNs (wireless sensor networks) and RFID (radio frequency identification). These systems obtain information on the available parking spaces in a parking area using real-time data collection by the sensor nodes scattered in the parking area, which allows users to use the

additional services implemented by these systems, such as the automated payment service compatible with mobile phones, so that people can reserve their parking space in advance. It illustrates the general architecture of a smartparking system. The system we propose in this article offers a solution based on an adaptable and hybrid self-organization algorithm for WSN networks, which allows to find a parking space in thetwo types of outdoor parking in a city. The first one is the "linear outdoor parking area"which is a parking area located mainly on the main streets, alleys, and the centre of the city, whereall parking spaces of the parking area form a single line. There are currently three types of linear outdoor parking areas. Slash-type parking is the easiest to park while the horizontal is the most difficult, followed by the vertical one. The second type is "Mass outdoor parking" which has a larger parking space than the linear car parks and are in the peripherals of the city and in larger areas like a technological park, shopping Centre.

IoT (Internet of Things) on a broad and technical basis is a new paradigm of interrelated computing devices, technological innovations, digital as well as mechanical machines, sensors, animals and humans with the capability to transfer data over network without any real time aid of any kind of interaction whether man to man or machine to man. IoT or more precisely IOET i.e. The Internet of Everything has opened different means of evolutionary concepts in every possible sector. Internet of Things is an interconnected network of millions of electronic devices like sensors, RFID tags, and many others connected to communicate with one another.

1.1 INTERNET OF THINGS

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to- computer interaction.

History of IoT:

Kevin Ashton, co-founder of the Auto-ID Center at MIT, first mentioned the internet of things in a presentation he made to Procter & Gamble (P&G) in 1999. Wanting to bring radio frequency ID (RFID) to the attention of P&G's senior management, Ashton called his presentation "Internet of Things" to incorporate the cool new trend of 1999: the internet. MIT professor Neil Gershenfeld's book, When Things Start to Think, also appearing in 1999, didn't use the exact term but provided a clear vision of where IoT was headed.

IoT has evolved from the convergence of wireless technologies, microelectromechanical systems (MEMS), microservices and the internet. The convergence has helped tear down the silos between operational technology (OT) and information technology (IT), enabling unstructured machine- generated data to be analyzed for insights to drive improvements. Although Ashton's was the first mention of the internet of things, the idea of connected devices has been around since the 1970s, under the monikers embedded internet and pervasive computing.

The first internet appliance, for example, was a Coke machine at Carnegie Mellon University in the early 1980s. Using the web, programmers could check the status of the machine and determine whether there would be a cold drink awaiting them, should they decide to make the trip to the machine. IoT evolved from machine-to-machine (M2M) communication, i.e., machines connecting to each other via a network without human interaction. M2M refers to

connecting a device to the cloud, managing it and collecting data. Taking M2M to the next level, IoT is a sensor network of billions of smart devices that connect people, systems and other applications to collect and share data. As its foundation, M2M offers the connectivity that enables IoT. The internet of things is also a natural extension of SCADA (supervisory control and data acquisition), a category of software application program for process control, the gathering of data in real time from remote locations to control equipment and conditions. SCADA systems include hardware and software components. The hardware gathers and feeds data into a computer that has SCADA software installed, where it is then processed and presented in a timely manner. The evolution of SCADA is such that late-generation SCADA systems developed into first-generation IoT systems.

Benefits of IoT:
The internet of things offers a number of benefits to organizations, enabling them to:

- Monitor their overall business processes;
- Improve the customer experience;
- Save time and money;
- Enhance employee productivity;
- Integrate and adapt business models;
- Make better business decisions; and
- Generate more revenue

2. LITERATURE SURVEY

(i) A Secure Parking Reservation System Using GSM Technology

Authors: Yusnita Rahayu and Fariza N. Mustapa
Year: July 2018

In this paper, a secure parking reservation system using Global System for Mobile communications (GSM) technology has been performed. It helps the drivers from facing the problem that always occurs at the car park, such as time being wasted in searching for the available parking spaces and keeping on circling the parking area until they find an empty parking spot. This problem usually occurs in urban areas, where the number of vehicles is higher as compared to theavailability of parking spaces. In this proposed system two modules have been developed such asparking lot monitoring and security reservation modules. For the parking lot monitoring module, the layout animation is used to display the parking lot status. In the security reservation module, the users need to send SMS to reserve the parking lot and use the password provided to enter andexit the parking lot. Our main contribution is that the system has more security than other previousresearch with the use of passwords to enter and exit.

(ii) A Survey on Wireless Sensor Network Architecture,Protocols and Applications
Authors: Dr. M. Lilly Florence, D.Swamidoss
Year: July 2017

In this paper, the authors surveyed the current state of the art in wireless sensor networks which has been gaining an interesting platform that changes how we interact with the physical world. Today, researchers and practitioners utilize low power nodes composed of wireless radios, sensors and computing elements for a variety of applications in medicine, military, biology, manufacturing, etc. Most wireless sensor networks use off-the-shelf commodity basedmicrocontrollers, though the energy consumption of these systems can limit the effective lifetimesof the wireless sensor network nodes. They provide a discussion on the definition of wireless sensor network, design architecture, issues in various protocols and various applications of wireless sensor network. A sensor network is a group of specialized transducers with a communications infrastructure intended to monitor and record conditions at diverse locations. Commonly monitored parameters are temperature, humidity, pressure, wind direction and speed, illumination intensity, vibration intensity, sound intensity, power-line voltage, chemical concentrations, pollutant levels and vital body functions. A sensor network consists of multiple detection stations called sensor nodes, each of which is small, lightweight and portable. Every sensor node is equipped with a transducer, microcomputer, transceiver and power source. The transducer generates electrical signals based on sensed physical effects and phenomena. The microcomputer processes and stores the sensor output. The transceiver, which can be hard-wired or wireless, receives commands from a central computer and transmits data to that computer.

(iii) A Study of Self-Organization Mechanisms in Ad Hoc and Sensor Networks
Authors: Falko Dressler
Year: October 2017
Self-organization is a great concept for building scalable systems consisting of a huge number of subsystems. The primary objectives are improved scalability and dynamic adaptation to changing environmental conditions. Until now, many self-organization methods have been developed for communication networks in general and ad hoc networks in particular. Nevertheless, the term self-organization is still often misunderstood or misused. This paper contributes to the networking community by providing a better understanding of self-organization mechanisms focusing especially on the applicability in ad hoc and sensor networks. The main contributions of this paper are a clarification of the term self-organization and a categorization of self-organization methods. Additionally, well-known protocols in ad hoc and sensor networks are classified and selected case studies are provided. Primarily, solutions for the medium access control and the network layer are analyzed and discussed. Finally, open research issues with practical relevance are discussed.

(iv) Monitoring Parking Space Availability via Zigbee Technology
Authors: Hee Chien Yee and Yusnita Rahayu
Year: October 2017
With the rapid growth of vehicle availability and usage on the road in recent years, findinga vacant car parking space is becoming more and more difficult which resulting in a number of conflicts such as traffic problems. In this paper, a prototype of Monitoring Parking Space Vacancy System is introduced using wireless technologies to alleviate the traffic problems. The system includes two modules, parking lot vacancy monitoring module, and master

module. Parking lot vacancy monitoring module consists of digital infrared sensor, liquid crystal display (LCD), and Zigbee module which are interfaced with PIC microcontroller. Master modules include laptop GUIdisplay, and Zigbee modules. The user can get the status of parking lot vacancy through the LCDof monitoring parking vacancy module. The Zigbee transceiver on monitoring parking vacancy module which interfaced with microcontroller is to transmit the infrared sensor data when the digital infrared sensor detects the presence of vehicle in the parking areas and thus provide the status of the parking lot to be displayed in master module with Graphical User interface (GUI).

(v) Car Park Management with Networked Wireless Sensors and Active RFID
Authors: AlMoatazbellah Karbab , Djamel Djenouri Sahar Boulkaboul , AntoineBagula
Year: 2016
This paper considers automatic car park management, which becomes an inevitable optionto rationalize traffic management in modern cities. Integration of networked sensor/ actuator and radio frequency identification (RFID) technologies is explored to enable sophisticated services via the Internet in the emerging internet of things (IoT) context. Based on this integration, we proposea scalable and low-cost car parking framework (CPF). A preliminary prototype implementation and experimentation of some modules of the proposed CFP has been performed. The clustering of sensors (sensing boards) into a single mote using the standard $I2C$ protocol has been explored in the prototype, and experimental results demonstrate considerable reduction in cost and energy consumption. With the constant increase of vehicles in agglomerations worldwide, finding a car park with available spots becomes a worry for the citizens in modern societies. A driver may spend a large amount of time looking for a car park with available spots. Once such a car park is found, he may still waste time there looking for a free park spot. This results in high fuel consumption, increased traffic congestion, and dramatic impacts on the environment, drivers' health and well- being. New devices emerging from sensor/actuator [1], and Radio Frequency Identification (RFID) [2] technologies may play a pivotal role to modernize and improve car park management, and to provide modernized services via a new first mile of the Internet called the "Internet-of-Things (IoT)". This promises access to a broad range of services, not only anytime and anywhere, but also using anything. These devices can be endowed with an IP address and outfitted to the objects of the smart parking and/or its infrastructure to become smart objects, which may be interconnected into a smart IoT platform with sensor devices used for empty park spot localization, while the RFID devices are used for parking spot authorization, car localization, and theft prevention. Integration of these two technologies yields a heterogeneous environment with many challenges in terms of deployment, communication and protocol engineering.

3. SYSTEM DESIGN

3.1 Existing System

One of the significant concerns of today's smart cities is the growing need to manage the vehicles on-road as well as to create sufficient and well-managed parking lots to prevent urban areas from traffic congestion. Most of the traffic jams are occurring and the main reason is an improper parking system. The users do not get timely data about the parking details. These are the main reasons traffic congestion also didn't get the Proper and organized use of parking spaces. These are the main drawbacks in this existing system so our proposed method is used to overcome these drawbacks

3.2 Disadvantages

(i) Time Consumption is more
(ii) Increasing the amount of fuel consumption
(iii) Its not provide Proper and organized use of parking spaces
(iv) This system provide an air pollutions

3.3 Proposed System

IoT's application in parking is mainly based on an automated system capable of providing a real-time database for the proper management of traffic congestion. The huge increment in the number of vehicles in urban areas along with mismanagement and congestion has become a significant cause for the tremendous increase in parking-related problems and its after-effects like road rages and conflicts between drivers and government officials or parking lot security. All these problems urge for the need of an automated parking system that provides a platform to the drivers for selecting among available parking spaces in the nearby slots. The IR sensor is used to monitor the slot status in parking.

3.4 Advantages

(i) Reduction of fuel consumption

(ii) Saving time

(iii) Improving drivers' experience

(iv) Proper and organized use of parking spaces

(v) Reduction in air pollutions

4. MODULE DESCRIPTION

4.1 System Architecture

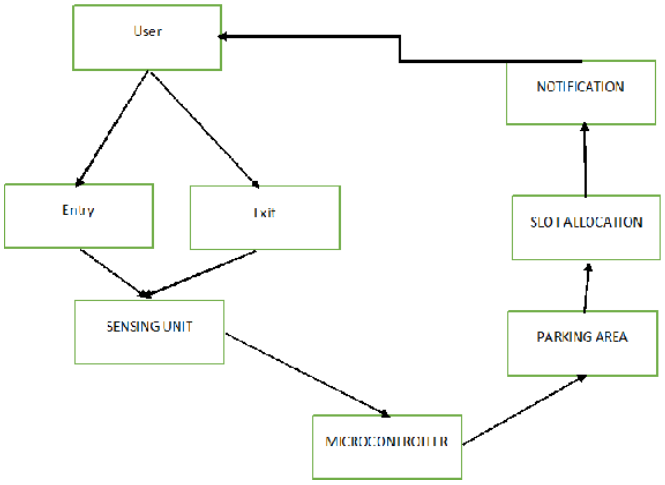


Fig.1. System Architecture

An IoT ecosystem consists of web-enabled smart devices that use embedded processors, sensorsand communication hardware to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the informationthey get from one another

4.2 Interface Diagram

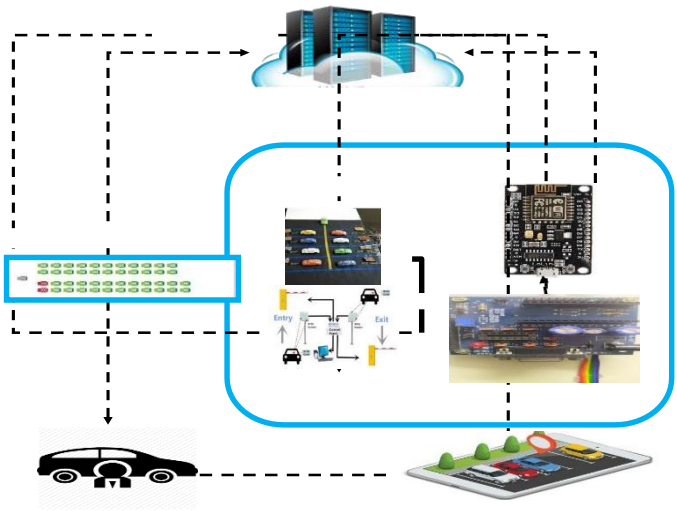


Fig.2 System Interface

Modules:

1. Web Page Creation
2. Cloud Service
3. Vehicle Detection
4. Slot status
5. Notification

1. **Web Page Creation:**
The IoT web page is created. Then the web page is used to access all the authorized persons. Also the Notifications and alert intimations are passed through the web pages.The IoT web page is used to access the processes.

2. **Cloud Service**
The Cloud framework is created in this stage, then this framework has to maintain all the details of the sensor sensed data. The authenticated persons get the notification from the cloud framework.

3. **Vehicle Detection**
The detection of a vehicle is done by using the RFID. All the vehicles have the RFID tag that contains the vehicle number, vehicle model, Owner number etc.

4. **Slot status**
The detection of a car is done by using the IR sensor. We use two IR sensor for detection.The IR sensor is used to detect the parking slot status .IR sensor pass the details of parking slot is

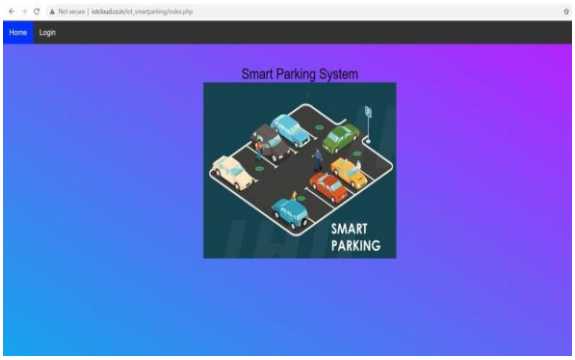
empty or the parking slot has busy.

5. **Notification**
This module is used to initiate notifications and are forwarded to consent users that his slots are free so you can access this parking slot.

5. RESULTS AND DISCUSSION

The web interface is created in PHP and the data is stored in the google cloud service. The home page contains the login option.

Fig.3. Home Page



User account creation:
The user account need to be created with the information like name, address, mobile number, email, bank information, username and password.

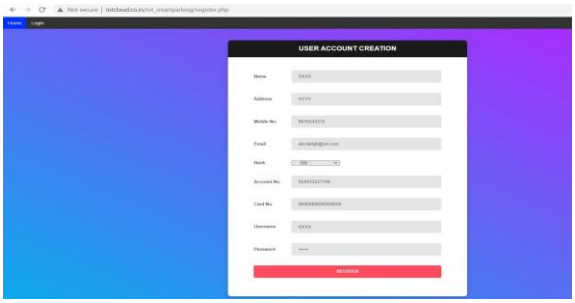


Fig.4. User Registration

Login:
The user can login the web interface using the username and password.

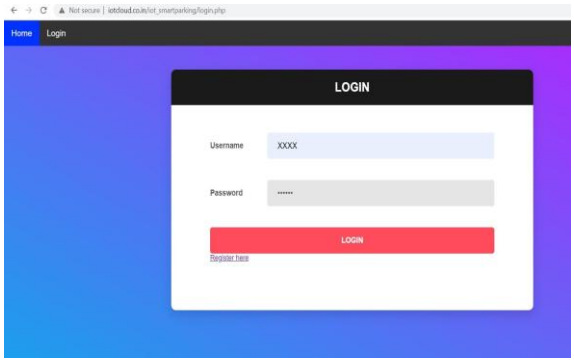


Fig.5. User Login

Free slot allocation:
The available free slots are displayed to the users and the user can select any slot of their choice. Once the free slot is selected, the payment should be completed. When the user wish to move out of the slot, he should enable "out" option

Fig.6. Free slot availability

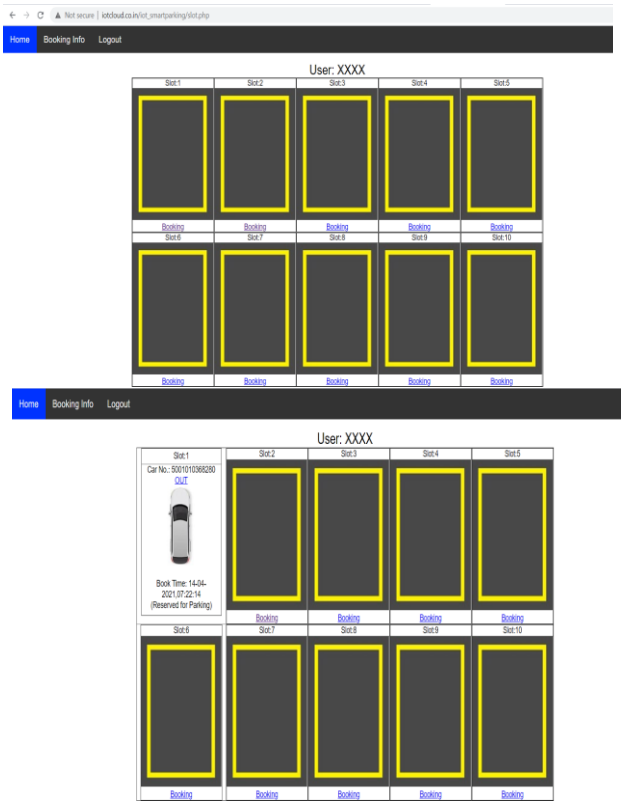


Fig.7 Slot allocation

Payment and User Information:
The payment is optional and can be initiated once when a user selects a free slot. The admin can view the information about the user like in time, out time, payment information etc. This information is essential for the admin to know the usage of free slots by the user. The

payment information is updated for each transaction done by the user.

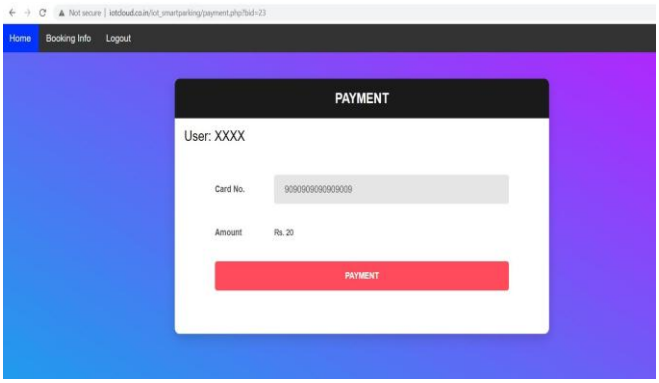


Fig.8 Payment Information

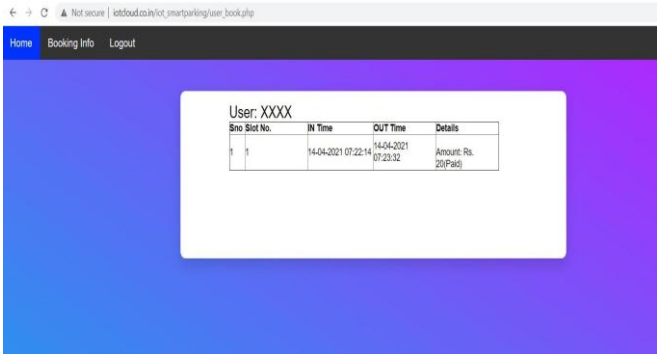


Fig.9. User Information

6. CONCLUSION

The proposed system presents a prototype of a fully equipped IR sensor-based Parking System that provides solutions to various parking problems. Here the IR Sensor tag referred is assumed to have a modified version than present-day IR sensor on parking because it stores all the information required for this module to work. This module will enable the drivers to pre-book the parking spaces to prevent them from traffic congestion and irritation. Further, it will also reduce air pollution and provide an efficient system with no wastage of time and fuel in searching for vacant parking lots.

ACKNOWLEDGMENTS
The authors would like to thank the management of Bishop Heber College for providing the BHC Minor research grant vide FR NO.1036/2020 to carry out the research work.

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