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Its For Smart Parking Systems Towards The Creation Of Smart City Services Using Iot And Cloud Approaches

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Abstract: ***The development of technology, smart devices are becoming more common in everyday life. The development of devices that can connect to the Internet and transmit data has been a source of inspiration for smart city designs. The common problem in our cities is the difficulty of finding free parking slots. The parking problem causes traffic to congest and people who go to work are looking for a place. In this fast-growing economy, the number of vehicle users increases exponentially demanding more parking space. Pervasive presence of smart phone encourages users to prefer mobile application based solutions. Growth of IoT has paved way for integration of mobile devices, wireless communication technologies and mobile Applications. This project proposes an IoT based Smart parking system that integrates with mobile Application. It provides a comprehensive parking solution both for the user and owner of the parking space.***

Key words : LoRa, IoT, GSM , safety.

INTRODUCTION

The industrialization of the world, slowdown city development, increase in population and mismanagement of the free parking lots has resulted in parking problems. There is a need for an intelligent and reliable system which can be used for searching the unoccupied parking facility. Smart Parking System is a part of an Intelligent. Transportation Systems (ITS) (Faheem, Mahmud, Khan & Zafar, 2013). Nowadays, the general method of finding a free parking lot is manual where the user usually finds a space in the street depending on luck and experience. This process waste effort, time and may lead to the worst case of parking failure. The aforementioned reasons encourage the user to find a predefined car park with high capacity, but this is not a preferred solution. In the last decades, a lot of researches were made in this point in order to solve the problem of parking management. The design smart parking system was introduced and implemented trying to solve the parking

problem (Shiyao, Ming, Chen & Na, 2014). This system is com-posed of ZigBee network, which sent pressure information to PC through a coordinator and then update database. The application use internet to get the parking information, and use advantages of Web service to gather all the scattered parking information to bring convenience to the user who want to get a parking position. An Intelligent Parking Assistant (IPA) architectural model developed in (Barone, Giur, Siniscalchi, Morgano&Tesoriere, 2014). In this IPA the only authorized users can reserve a parking space. For users to be authorized, they should register on the IPA website. A parking lot is shown as reserved for a period (for ex. 20 mins). If the authorised user did not arrive at the given period, he will be informed that reservation is expired and this parking lot is shown as free parking lot. Parking guidance information systems were provided to minimize parking search traffic by dynamically monitoring avail-able parking and directing drivers to a vacant parking spot. An intelligent parking management system using wireless sensor networks was developed in (Tang, Zheng & Cao, 2006). The wireless sensors were deployed into a car park space to detect and show the occupation of a parking lot. The data collected by the sensors were sent periodically to a database. This database is used for finding vacant parking lots and knowing occupation rate which can generate statistic reports about the parking status. Due to the lake of space, a lot of research tends to a multi-level parking idea. A multi-level parking is introduced as a building with number of floors for the cars to be parked. A multi-level parking can serve a lot of cars in a limited space. In (Reza, Ismail, Rokoni& Sarkar, 2012), authors constructed a prototype of a multi-level parking assistance system based on the facility of image processing techniques. Image processing was used for detecting car plate numbers.

Template matching method was used in order to recognize plate characters. After recognizing plate numbers, it is compared with the list of plate numbers in the system database. The authors in (Bonde, Shende, Gaikwad, Kedari&Bhokre, 2014) aims to minimize the human intervention in parking by automating the process of car parking. They proposed a design of an Automated Parking System commanded by an Android application to organize the number of cars to be parked. There is two sub architectures (Car Control Unit and Parking Control Unit). The Parking Control Unit is commanded by the Android device having the Android application. The Parking unit is responsible for the movement of the car. Multi-level smart parking system architecture was proposed in (Ismail, Reza, Rokoni& Sarkar, 2012; Rokoni, Ismail, Reza & Sarkar, 2011). An image processing techniques also introduced to monitor and identify the vehicles. They used Optical character recognition (OCR) to identify the illegal cars. OCR is the electronic translation of scanned images of typewritten, handwritten or printed text into machine text. OCR is widely used to convert books and documents into electronic les. The OCR technique has several steps like enhancement, segmentation, feature extraction and classification (Lotufo, Morgan & Johnson 1990; Tavsanoglu&Saatci, 2000). The concept of Internet of Things (IoT) begins with things which have identity communication devices. This de-vices could be controlled, or monitored using computers connected through internet (Khanna & Anand, 2016).

A smart parking system using IoT to reduce parking hazards and helps to minimize emitting greenhouse gases, increase the security of these smart parking (Ramaswamy, 2016; Juliadotter, 2016). IoT enables smart parking system using the system of interconnected Distance Sensor, Pi Camera devices together. This hardware were used in collecting data and transmit it to cloud storage, to enable commuters to get a parking lot in less time to save fuel and ultimately producing excessive CO2 emission. In (Mainetti, Palano, Patrono, Stefanizzi&Vergallo, 2014), authors present a heterogeneous network of the integration of Ultra-High Frequency (UHF) Radio, Frequency Identification (RFID) and IEEE 802.15.4 Wireless Sensor Network (WSN) devices which can be deployed in any outdoor parking. This System could collect information from the parking like occupancy of the parking lots and guide the driver to the nearest vacant space. Also, the application has an NFC-based e-wallet system enabling users to pay for the parking fee.

2. LITERATURE REVIEW

There are several methods employed for the vehicle parking. The concept of new smart parking solves the parking problem by using mixed integer linear problem. The disabled person can park the vehicle at specially designed locations. Automatic parking and UN parking with the help of android applications.

1. Optimal resource allocation and reservation

Yanfeng Geng and Christos G. Cassandras proposed [1] the concept of "A new smart parking system based on optimal resource allocation and reservations". Drivers access the system via cellular phone or internet. a new concept for a "smart parking" system. This system explicitly allocates and reserves optimal parking spaces to drivers. It uses the concept of mixed integer linear problem. Drivers who are looking for parking spots send requests to the DPRC. Driver Processing Request Centre gathers driver parking requests Cars location keeps track of driver allocation status and sends back the assignment result to drivers. A request is based on parking costs and walking distance between a parking spot and the drivers actual destination. It also contains the driver's basic information such as license number, current location and car size. An assigned parking space is send back to each driver via the DPRC. If the driver is satisfied with the assignment he has the choice to reserve that spot. Once reservation is made the driver still has opportunities to obtain a better spot. The PMRC [Parking Resource Management Center] then updates the corresponding parking spot from vacant to reserve and ensures that other drivers have no permission to take that spot. Parking Resource Management Centre collects and updates all real time information and disseminates it via internet. If a driver is not satisfied with the assignment or he fails to accept it for any other reason he has to wait until the next decision point. The mixed integer linear problem solves problems at each decision point. The requirements of the system are: first, the allocation centre has to know the status of all parking spots, the location of all vehicles, issuing requests and traffic situations. Current sensing technologies make monitoring implememtable. Second is effective wireless communication between vehicle and an allocation centre. Third is the centre must be able to implement a reservation that guarantees a specific parking spot to a driver. This is achievable through existing wireless technology interfacing a vehicle with hardware that makes a spot accessible only to the driver who has reserved it. A softer scheme is use a red/green light system placed at each parking spot, where red indicates that the spot is reserved and only the vehicle assigned to it may switch it back to green. If any "folding barriers and obstacles that emerge from and retract to the ground under a parking spot are wirelessly activated by the device on-board vehicles similar to mechanisms for electronic toll systems.

3. Disassist: Parking for disabled person

”Disassist: An internet of things and mobile communications platform for disabled parking space management” proposed by Lambros Lambrinos and Aristotle’s Dosis. It is a system designed and developed based on the principles brought forward by IOT and smart cities initiatives. It integrates sensors and Smartphone’s along with wireless and mobile communications to provide for better utilization and management of parking spaces allocated for use by people with disabilities. When we go through a city during rush hours when traffic is at its peak, all parking spaces are already occupied. A person with disability is trying to access city centre but he did not find any disabled parking slot. There are drivers who occupy disabled parking slots without having the right to do so. Even in some cases there are violators who have fake documents displayed on their window screen. The aim of the disassist is to enhance the parking experience from the perspective of people with disabilities. In this system the parking management organized as parking bays. The parking bays can be on street and off street. In on street, the Parking bays are found on the roadside. In off street, different categories of parking loads are ranging from single areas to large multi-storey car parks. Monitoring parking spaces are not only for checking fee payments but also for calculating availability and reporting such information to drivers for searching vacant spaces. Parking reservation can be implemented relatively easily in controlled areas that can theoretically enforce reservations and hence guarantee the availability of the reserved space. In open spaces actions such as user verification and reservations are more difficult to accomplish. When a reservation remains valid and charging must start when vehicle actually arrives at the parking location. The parking space locations are displayed on a map allowing drivers to navigate to these locations. The level of information is related to its vehicle capacity and hourly fees. A real advantage is provided by those that report current availability and reservations. A significant number of people suffer from temporary or permanent disabilities. A special permit called a disabled badge is to be issued to these people. They can park at specially designed locations. These special parking spaces are near to shops amenities and public administration offices. In these the designed badge must be displayed on their window screen. This enables the visual verification of the vehicles entitlement to be parked at the designated places. The interaction between the user and the system are described as follows: first is a mobile phone application through which an SMS message to indicate the parking slot the user has parked at. Second is an application running on a smart phone that is used to obtain parking location information as well as real time availability information. The application will allow users to verify the parking slot they have parked at and obtain reservation for a slot. Third is a dedicated device that follows IOT and communicate automatically with the rest of the infrastructure in order to authenticate the user and verify the parking slot occupied. Various improvements to the system concentrating on reservation enforcement will ensure for reservations for future time period.

3. EXISTING SYSTEM:

- In the existing system, there is no autonomous system to know the free space through online
- A smart car parking system that will assist users to solve the issue of finding a parking space and to minimize the time spent in searching for the nearest available car park

DRAWBACKS OF EXISTING

- Does not have auto Booking System
- No online monitoring system
- Less efficiency

4.PROPOSED SYSTEM

Features are provided for reserving a parking space, authenticating a reserved user, auto navigating to the parking slot and computes accounts information on daily, weekly and monthly basis. IR sensors are used to identify if a parking spot is free. Availability of a free slot with its location information is transmitted using IoT module technology, microcontroller and wireless communication technology to the server and is retrieved though a mobile application. RFID tag attached to a vehicle is used to authenticate a user who reserves the parking slot on a hourly, daily, weekly or monthly basis.

Our proposal is to develop an IoT-Cloud platform, which will be focused on the deployment of relevant information that allows

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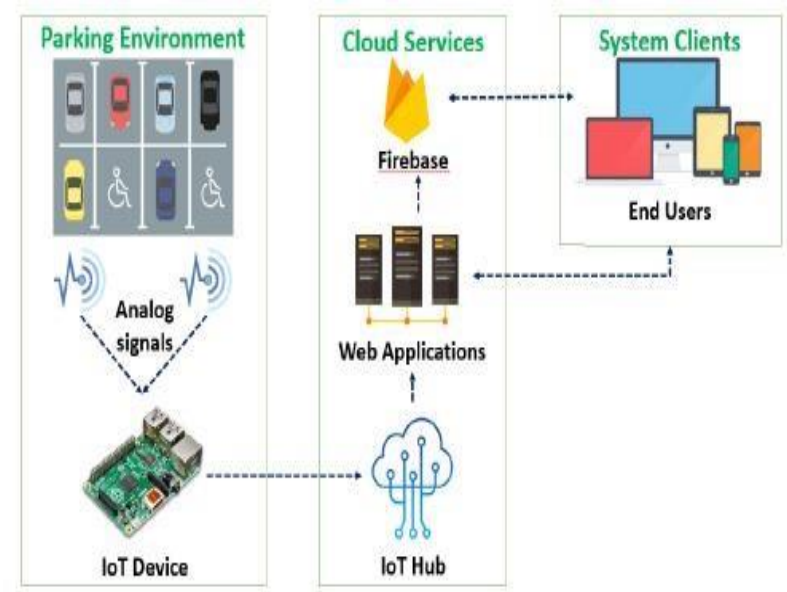
to find, in an efficient way, parking sites in the corresponded place. This information is obtained through sensors previously deployed in parking lots, located around the city, then it will go through a processing system that was designed and implemented with a novelty architecture, and finally the information will be consumed by different users (drivers, transit authorities, etc.), either in web or mobile applications.



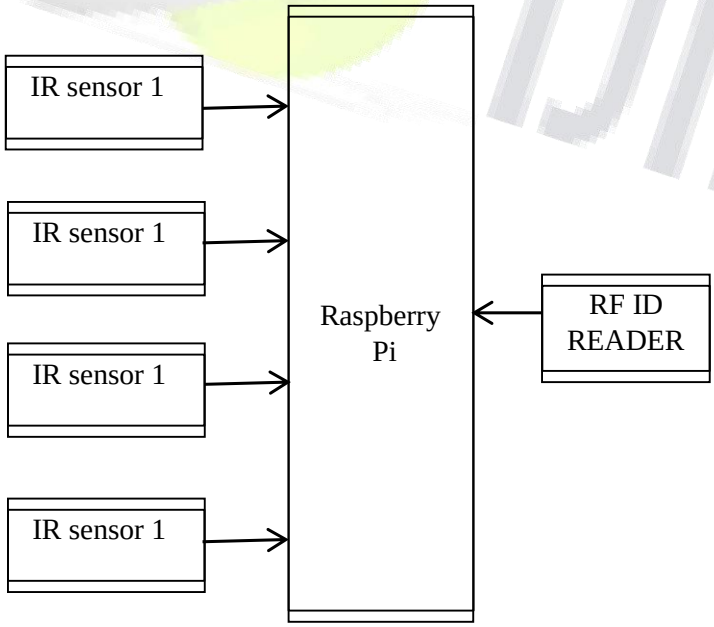


Fig 3.1 proposed device parking section

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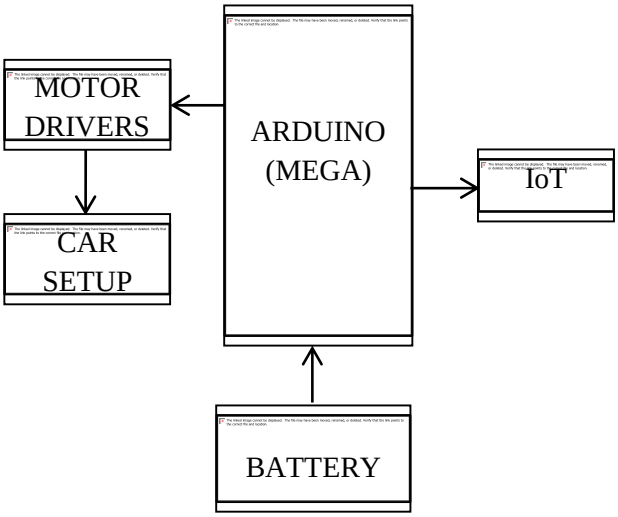
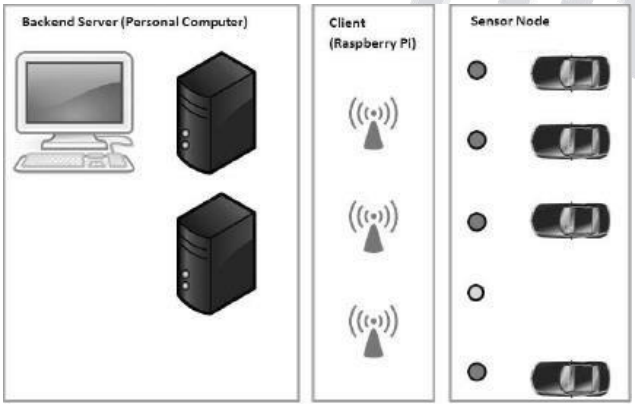


Fig 3.2 proposed device car section

Overall System Operation

The overall system is designed to operate as follows:

- Once every two minutes, the proximity sensors detect if there is a car in the parking spot.
- If a car is located in the spot, no action occurs. If the spot is available, the wireless sensor node transmits the location to the servers located at each parking area.
- The servers send the details to the back-end server which subsequently stores the details in a database.
- Once a user enters areas with the smartphone's application active, the server determines the closest available parking spot to the user's preference, and sends the spot's location to the user.



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The RFID tag can be swiped to enter the parking bay, and swiped again when leaving the parking bay, at which point the system can deduct the right amount from the card.

5. HARDWARE REQUIREMENT

Internet of Things (IoT)

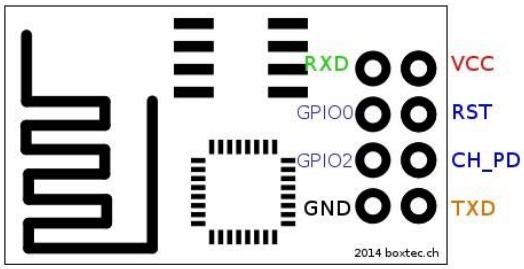
The ESP8266 is a low-cost Wi-Fi microchip with full

TCP/IP stack and microcontroller capability produced by

Shanghai-based Chinese manufacturer, Espressif Systems

The chip first came to the attention of western makers in August 2014 with the ESP-01 module, made by a thirdparty manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no Englishlanguage documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.

The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.



Electrical Characteristics

- Working Voltage: 3.3V
- Maximum IO Driving Power IMAX: 12 mA
- Maximum IO Voltage Level VMAX: 3.6V
- Current Consumption: 100mAmp

Features

- Integrated low power 32-bit MCU
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- 802.11 b/g/n WiFi 2.4 GHz, support WPA/WPA2
- Support STA/AP/STA+AP operation modes
- 10-bit ADC, SDIO 2.0, (H) SPI, UART, I2C, I2S, IR Remote Control, PWM, GPIO
- Deep sleep power <10uA, Power down leakage current < 5uA
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)
- +20 dBm output power in 802.11b mode
- Operating temperature range -40C ~ 125C

FUTURE WORK

Although the current system offers a more design approach in terms of hardware [14], it can be adapted for commercial use,with reduced cost and form factor, in the future. This can be achieved by replacing the Raspberry Pi and Arduino with devices such as PIC microcontrollers. The devices can run using a battery source however the replacement for the batteries may cause problems. This can then be replaced with one power source for all the devices. Future work on the system will also include security features on the smart phone application and the server to insure that personal information of the users is not accessed by unauthorized persons [15], while the security of the underlying proximity detection also needs to be studied further [16]. As seen in the results, it is also of interest to investigate energy harvesting techniques [17].

6.CONCLUSION:

The Smart City Mission is the primary goal of the Government of India. The aim is to develop 109 smart cities all over the country [17]. The present growth in IoT and Cloud Computing makes data accessible anywhere and on any device. In this paper, an online based parking booking and management system are presented to address the parking issues in Hyderabad city and for deployment in Smart Cities. The users can book parking slot at any time and from any location with their Mobile Phone or with a Computer.

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