Smart Parking System for a Smart Campus

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Abstract— *Now a days, people are increasingly demanding parking lots, and their security awareness is most important for parking. The development of new technologies such as information and communication has led to the increasing automation of parking lots, and unmanned services have become the norm. Smart Parking Mobile Application for Parking System has realized networked data sharing through network platforms. In this paper, we discussed the multiple subsystems that adopts technologies of the Smart Parking Application for Parking System with help of information technology. This system is to solve the problem of car driver or owner difficulties in finding parking spaces, avoid blind parking, improving parking efficiency, improve the utilization of the traffic road and alleviate the traffic congestion*

Keywords— Parking Resource Management Centre, Smart Parking Allocation Centre, Parking Controller, Active Infrared Sensor, Parking Guidance and Information, Zone and Central Control Unit

I. INTRODUCTION

Smart Parking Application for Parking System is composed of multiple subsystems such as entrance and exit management, parking guidance, parking space guidance, reverse vehicle search, automatic license plate recognition. The Smart Parking Mobile Application for Parking System can help the owner to quickly find the parking space, avoid blind driving, and eliminate the troubles of the owner to find the car, effectively improve the utilization of the traffic road and alleviate the traffic congestion. Looking at the popularity of Internet of Things, most organizations prefer to automate their processes/systems. By doing so, their users can easily access the system no matter where they are. Obviously, the Internet has become a key issue. Therefore, it is used in various fields such as education, health, tourism and business. As a result, the Internet of Things has come into place and has grown more prominent among communities that are becoming smart to provide a convenient life to the users, admins, etc.

II. PROBLEM STATEMENT

Chaotic parking was triggered by the full amount of parking spaces, leading directly to a traffic jam. The government has therefore also hoped to combine the remaining resources of different parking lots in the area, but this is often not accomplished by the complicated and varied parking network. Absence of any proper parking management system in campus leads to the inappropriate parking behavior of vehicles which in turn leads to overflow of vehicles not having any parking space. There is also a problem if there is parking space available and people being unable to utilize it because of the hassle to look for a free parking space. Unavailability of the Smart Parking System in this smart era creates collection of data very difficult which also leads to wrong data, wrong guidance, and ultimately make the drivers complain.

III. TECHNICAL ASPECTS

A. Smart Parking Application Architecture

The Smart parking system Architecture is based on Parking Guidance and Information (PGI) system. This system includes a Driver Request Processing Centre (DRPC) and Smart Parking Allocation Centre (SPAC). In fig. 1, parking resource management centres are to collect and update in real time all parking information that spread through the Internet or VMS. The DRPC collects driver parking requests, and the system intelligently allocates and reserves parking spaces for drivers based on driver requirements and parking resource status. In addition to this, the system is modular and service-oriented which includes web applications for parking operators, web applications for end users, and two types of mobile applications, one for end users and one for Parking controller.

The proposed system allows the operator to customize the parking space and to define the details.

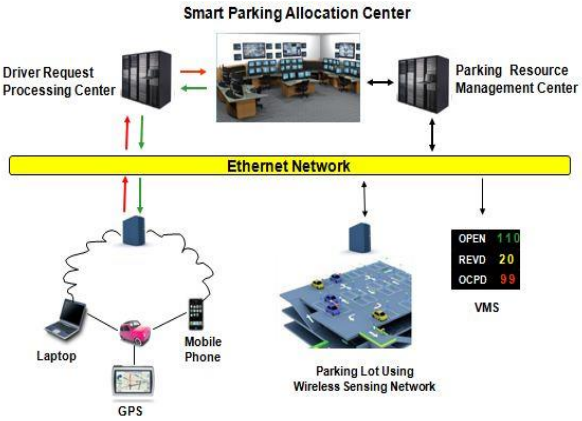

Fig.1: Smart Parking Application Architecture

In addition, smart parking systems should be based on a sensor-based approach and a multi-layered architecture for achieving modularity and scalability, as well as providing different services for different parking system users.

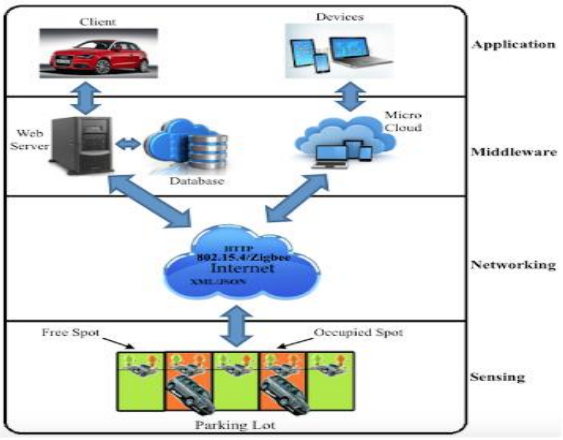

Fig.2: Framework for application architecture

The framework in fig.2 consists of four layers: sensing, networking, middleware, and application layers.

(i) Sensing layer: This defines a platform in which RFID devices are embedded in the parking lot to detect the presence of the car and strategic points in the parking lot. These are used to identify the car based on a unique mapping between the RFID tag and the car.

(ii) Network layer: The network layer proposes different communication modes in this layer to support communication from the primary sensor and anchor sensor to the sensor gateway and from the gateway to the parking user (parking driver, remote user and parking owner).

(iii)Middleware Layer: The middleware layer, which is a layer that performs context recognition using intelligent algorithms and efficient visualization techniques to present intelligent services and user-friendly interfaces to users.

(iv) Application layer: This is a layer that defines different services and provides them to different users. The client device has connected to the parking database via TCP/IP.

B. Smart Parking Application Detection Technology

As shown in fig.3 smart parking system requires several pieces of equipment: ultrasonic sensors, LED indicators, indoor display boards, outdoor display board (s), zone control unit (ZCU), central control unit (CCU), network switch, telephone cable and management software .The ultrasonic detector over a telephone cable sends its state information to the zone control unit, the zone control unit receives the information and then collect and transmit it to the central control unit, which processes the collected data and sends instructions to ZCU and LED panel.

Info Station as shown in fig.3 operates in the parking area and periodically collects aggregate presence information from all the cars in the area sensor which is disposed of, for example, by Wi-Fi, ZigBee, or other short-range wireless technologies. When the parking lot occupancy status changes, information will be pushed to the Internet cloud Parking Information Centre (Info Centre).

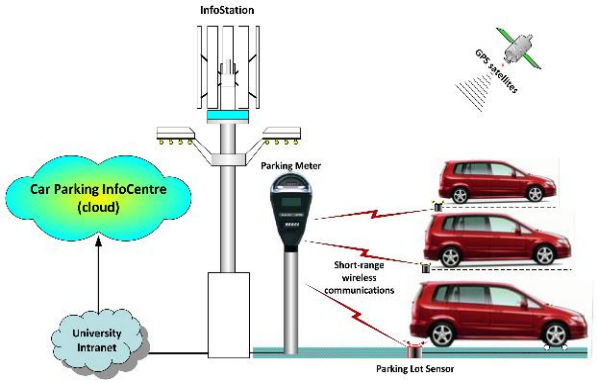

Fig. 3: Detection Technology architecture

C. Parking Guidance and Information (PGI)

The parking guidance system of the Parking Guidance and Information (PGI) provides the driver with complex parking information in the controlled area. These systems incorporate the software for service delivery of traffic monitoring, messaging, and variable message signs storage. Smart parking lot which uses a range of technologies to help drivers find empty parking spaces, car location and improve their experience when returning the vehicle. As shown in fig. 4, this includes an illumination sensor and adaptive parking indicators, and an indoor positioning system (IPS). PGI can be divided into two different aspects. This can be used to monitor the entire campus or to monitor only specific parking. The information provided by the system helps the driver decide how to reach the intended destination and to determine the parking spaces available in the parking facility

Various sensors are placed at the entrance, exit and in each parking space to detect the presence of the car. According to fig. 4, LED lights are connected to the sensor and the sensor is placed in each parking space in the parking lot. This is used to give a parked state. Based on the information obtained, the implemented process will analyse the information to display accurate information for the driver to view.

Thus, the telecommunications network can transfer the processed data to other modules. It is also possible to use mobile phones for guidance and the

analysis uses the Global Positioning System (GPS) to track vehicles. The map of the driver's current location is sent to their mobile phone based on the current position of the customer based on GPS data and the status of the three nearby parking lots. In addition, parking guidance systems based on network and GIS technology can disseminate information to users via the Internet, mobile phones and/or PDAs.

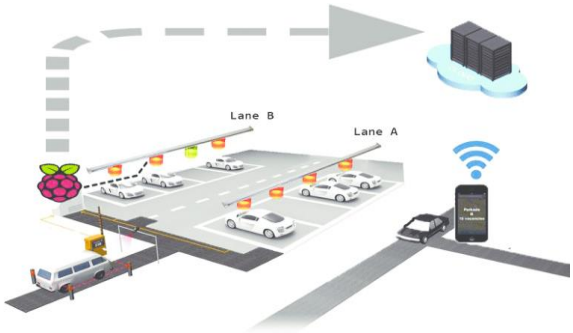

Fig. 4: Smart Parking system

EXPECTED DELIVERABLES

The proposed parking system will lay a foundation for a better smart parking management in the campus. The proposed system will help drivers find a suitable parking space for their vehicles and save a lot of time spent in finding a proper parking spot. The final system will allow a proper parking management as this can keep check of the vehicles which are wrongly parked and as well as guide drivers to the best parking spot near them. The LEDs in the parking lot help cars find a vacant spot and gives an idea of the current occupancy of parking lot helping in a better decision for parking.

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