IoT Based Car Parking System

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ABSTRACT

Parking space is becoming a serious problem due to the day-by-day increase in number of vehicles on the road. Particularly, in cities with large population, or in places where sports or artistic events are scheduled, looking for parking space is a major problem and finding a parking spot can be a frustrating experience. To combat this problem, some parking lots have introduced sensors to detect when a car enters or leaves a parking lot to track capacity and alert drivers if they are full. This is a partial solution that allows drivers to determine if a parking lot has open parking spots, but not the exact location of those spots. Smart Parking Sensor Network project aims to develop a low-cost sensor-based parking system to map the usage of parking areas. This system consists of sensor nodes which can detect the occupancy of parking space; relay nodes to communicate between sensor nodes and the server; server application to get data from the relay nodes and send data to mobile application; and a mobile application to display the parking areas and the occupancy of the parking areas on a map. The vehicle detection sensor node was developed with low cost and low power sensors and components. The vehicle detection sensor node was designed with magnetic sensor and a distance sensor. The magnetic sensor detects the presence of the vehicle, and the distance sensor clarifies it. The mobile application was developed using Android and the server application is hosted in AWS (Amazon Web Services).

Keywords: smart parking, internet of things, sensor network

I. INTRODUCTION

The "Smart Campus" concept is an initiative to use ICT (Information and Communication Technology) within a college Campus to improve the quality and performance of the services, to reduce costs and resource consumption, and to engage more effectively and actively with its members. Smart Parking is a constituent of a Smart Campus that looks to address the issue of parking within a campus. The difficulty in finding available parking spaces within a campus wastes time and fuel and impose stress among visitors and employees. In a regular parking area, there is no way to know where the available parking spaces are. By delivering a real time map of the availability of parking spaces, smart parking idea directly impacts on the sustainability of the University, its revenue and the level of its service.

This parking system consists of sensing devices to determine the occupancy at the parking space, a network to transfer data, a server application to process the data, and a mobile application to display occupancy of the parking spaces. Smart parking is a huge industry overseas, but not in Sri Lanka. Because of that, all the components should be bought from foreign vendors to implement a smart parking system, which includes the vehicle detection node, the relay node (to communicate between server and sensors) and the applications. The average price of a vehicle detection node is 3000-8000 and the average price of a parking system is 5-6 lacs per year (excluding taxes and delivery cost). Therefore, it is prohibitively expensive for a developing country like India to deploy large-scale smart parking systems using imported components. To address this issue, this system presents a low-cost solution, which can be developed within the country and deployed in mega scale.

II. LITERATURE SURVEY

With the growth of population and economic development, the number of vehicles on the road is increasing day by day. Parking is becoming one of the major problems for cities, and is becoming very costly [1], [2]. Because of this, parking is limited in major cities including universities and major attractions all around the world [2]–[4]. For instance, finding parking space during major events (such as during game day or graduation day) is challenging.

Commuters lose working hours and consume fuel while searching for empty parking spots. It can be extremely frustrating for drivers to search for a parking spot in a parking lot. This frustration can occur either due to the parking spots being difficult to find or because another driver has taken the parking spot before they can reach the spot. Thus, intelligent, innovative, and efficient ways for parking will have to be built to accommodate the parking demands efficiently. To help drivers, some parking lots have installed parking guidance systems that attempt to notify the drivers of open parking spots. One such common system has sensors at each parking spot with a light that can be viewed from far away. The light is on by default and only turns off when a vehicle is occupying the parking spot. This allows drivers to see where vacant parking spots are at without having to circle the parking lots. This basic system works well for drivers that are already in the parking lot but does not help drivers who are still traveling to their destination.

III. PROPOSED ARCHITECTURE

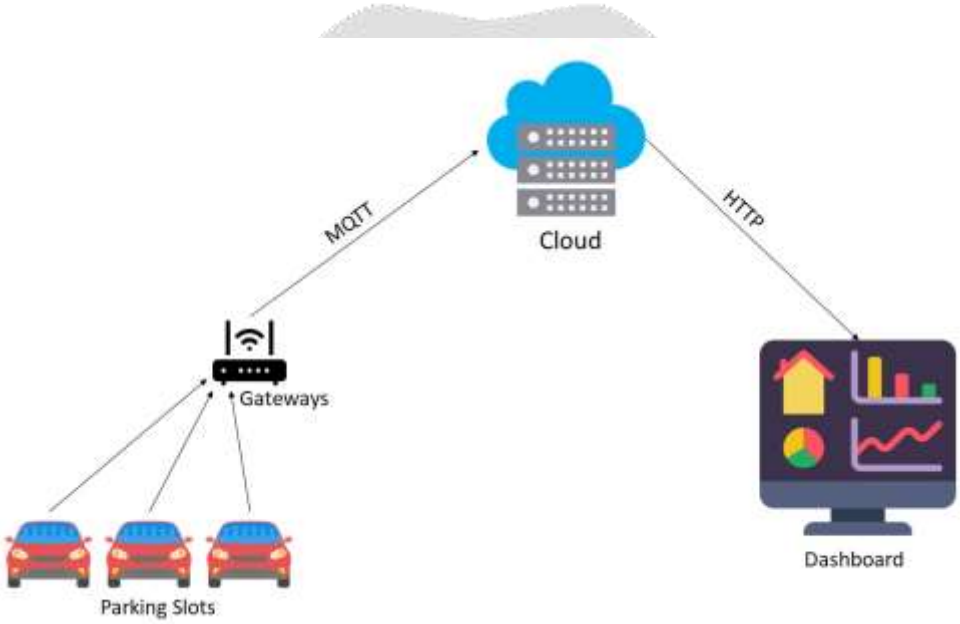

Figure 1 - System Architecture

The system architecture of the solution is given in Fig. 1. This architecture consists of three main sections: a sensor network, a server, and a mobile application. The sensor network consists of vehicle detection sensor nodes and relay nodes. Sensor nodes connect to relay nodes through a wireless communication medium (WiFi/MQTT). Relay nodes connect to the server through a wireless communication medium (WiFi). Sensor nodes do not connect to the server through the outer network because these nodes are designed to be low cost with limited communication capabilities. The relay nodes are more powerful and will transfer data using the MQTT (Message Queuing Telemetry Transport) protocol. The server application will be on the Internet and will send data about the occupancy of parking areas when requests come from the mobile application. send data about the occupancy of parking areas when requests come from the mobile application.

IV. CONCLUSION

The proposed system is very powerful to monitor available parking space from anywhere and anytime using mobile application. This system will be capable to do monitoring through mobile and web application. We will achieve the good result to parking slot monitoring using high quality sensors with MQTT. It is satisfied with the performance through the analysis of remote monitoring system and experiment results for the designed parking sensors for college campus. Moreover, this proposed system has main advantages which are reduce time required to find available parking space, reduced fuel consumption.

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