International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2017 IJSRCSEIT | Volume 2 | Issue 3 | ISSN : 2456-3307

Technical Review on Smart Parking System Using IoT

Abhishek Reddy DV, Athish Tejashwi Kumar, Goutham G, Dr. Jitendranath Mungara

Department of Information Science and Engineering, New Horizon College of Engineering, Bengaluru, India

ABSTRACT

The number of vehicles are increasing day by day and it is very hard for the driver to find a parking space among few. The smart parking system provides the information of available parking spaces to the drivers according to their profile and the details provided. Smart parking systems are proved to help drivers to find and park their vehicle in cost effective manner. This paper gives review about the various smart parking systems, which uses cloud database, RFID, wireless sensor nodes and filtering algorithms like collaborative filtering algorithm.

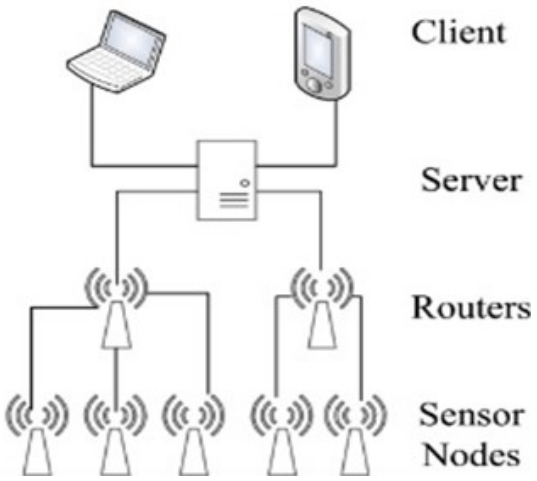
Keywords: ROSAP, Magnetic field sensor, RFID technology,

I. INTRODUCTION

Smart parking is a tool and technique that provides the available parking space for any updated parking lot at any given time. With the increasing number of vehicles, finding a parking spot is becoming difficult and consumes more time. Traditional parking system involves a manual procedure which entails the user to find a free spot by his own expertise. In recent times there have been a number of smart parking system that intimates the user with the number of parking spaces which are available. These systems reduce the time and cost taken for parking. With the usage of the smart parking system the user will be able to obtain the live details of the parking and allows the user to reserve for a spot.

II. RELATED WORKS

iParking an Intelligent Smart Parking System [1] for large parking lots divided into four components such as client, server, routers and sensor nodes. Magnetic field sensors are used for sensor nodes. These sensor nodes detect the presence of a vehicle in a specific slot and are deployed in every slots. Magnetic sensor comes in handy because of its low cost and less affection from environmental factors. The presence of vehicle detection is passed to the server directly or sent by the help of routers for sensors which are deployed far from the server. Once the details are uploaded in the server, the client will be able to access them through web which allows the user to know the free parking spaces.



Dynamic Smart Parking [2] N. Pazoa, proposed a system that relies on available parking information systems, as well as on fixed magnetic on-street sensor and video processing smart camera. This system uses incremental analysis method to guide the user towards a zone in the city, then to suburb followed by a particular street and finally to a free parking space. This smart parking system has 3 components: Data collection and analysis, Incremental search algorithm and Driver guidance application. The data is collected from 4 different sources: Dedicated sensors located on each parking spaces, High resolution embedded camera systems placed at strategic location of the parking area, Analysis of other data sources such as social network and planned events and also from Park Guidance

Information System (PGIS) that has already stored information. The incremental search algorithm is a server application that links the sensed and analysed data together with the user needs. The driver guidance application is a mobile application which uses GPS of the smartphone to guide the user to available parking space. A prototype of the magnetic sensor node consists of detection algorithm and the calibration process.

Detection Algorithm: The 3-axes magnetic sensor measures and represents a magnetic vector in the space Calibration process: It discriminate between the two main states "car detected" and "no car detected". To perform the calibration process, measure the magnetic vector during several tenths of seconds and calculate the average value together with the standard deviation. The smart camera is a complementary technology to the fixed ground sensors in the streets. This is used to find the free space available in the parking area. The disadvantage of this system is the robustness to environmental disturbance such as connection loses for the magnetic sensor node network or shadow of the embedded image system.

Reservation Based Smart Parking [3], Naourez proposed a Reservation based multi-objective Smart parking (ROSAP) algorithm. The system uses a simulated annealing based meta heuristic to assign parking slot to the user by formulating it as Integer Linear Program (ILP). The system receives the information about the user's location, Point of Interest (PI) and finds a parking within a radius r. This radius r is the maximum allowed value of radius in the destination zone of interest. Once the request for a parking is initiated by the user, the information is gathered and managed by Trusted Smart Parking Reservation Authority (TPA). Reception of user request TPA runs Reservation based Smart Parking(ROSAP) with simulated annealing algorithm to find a parking spot with optimal cost efficiency. After the results are generated, the reservation request is forwarded to all the available parking lots in the radius r. Parking lots will check with its capacity constraints and accepts the request if there is enough room. Otherwise, confirmation will be provided for the available slots. If the user is satisfied with the confirmed results for the available slots he can opt for it and the confirmation code will be generated or the user can wait till the next decision making round.

Cloud Based Smart Parking, Thane [4] proposed a system based on Nearest neighbour algorithm that increases the efficiency of current cloud smart parking system. The system uses Wireless Sensor Network (WSN) [7] having RFID technology to monitor the free parking space in the car park. The smart parking system they have defined consists of 3 elements; Cloud based server, Local unit and Software client.

The parking network architecture of the system uses nearest neighbour algorithm in which each car park is node. The node is labelled with two parameters; the car park number P_i and total parking space N_i in P_i.

The total capacity of the system is given by $N=N_1+N_2+\ldots\ldots+N_n$. D_{ij} is the distance between the two nodes P_i and P_j in the network.

The function $F_{ij}(\alpha, \beta)$ gives the cost between the nodes in the network. We calculate the cost function $F_{ij}(\alpha, \beta)$ from node P_i to P_j .i.e.,

$$F_{ij} = F_{ij}(\alpha, \beta) = \alpha \times \frac{d_{ij}}{D_{up}} + \beta \times \frac{t_j}{T_{up}}$$

Where α = coefficient that depends on the length of path between the two nodes.
β = coefficient that depends on the number of free slots in destination node.
d_{ij}= distance between nodes P_i and P_j,
D_{up}= upper bound of the distance.
t_j= Number of spaces occupied at node P_j and
T_{up}= Upper bound of the capacity of the overall parking network.
The average waiting time in the queue T_a of the car park is expressed as

$$T_a = \frac{\mu_s^2}{k(\mu_s - \mu_A)}.$$

where μA = Inter arrival time between the 2 users.
μs = Service time.
k = Number of parking lots
Assuming that $\mu_s > \mu_A$, so the queue does not explode.

III. ANALYSIS

Thus we have referred 4 different types of Smart parking mechanisms. The problem with these systems is that, each one has limited functionality. Cloud based system reduces the average waiting time in queue and provides navigation to reach car park. Reservation

based parking system allows users to reserve a park space. Among these, ROSAP filtering algorithm has more advantage over other algorithms because it reserves the parking space near to destination.

IV. CONCLUSION

The extensive study made on smart car parking system reveals that the cost and the time taken for searching a parking space is reduced by implementing smart parking systems. From our research we have found lots of smart parking systems, sometimes the user may face difficulty in using a system, chances are less for user to like all the smart parking systems. So the algorithms can be improved by using good statics and making efficient use of available data. In future we can work to construct system which allows the user in finding a parking slot effortless, reserve park space, navigation to reach car park and also the facility to monitor his car in the car park.

V. REFERENCES

[1]. Dongxu Zheng, Xi Zhang, Yuanchao Shu, Chongrong Fang, Peng Cheng and Jiming Chen," iParking: an Intelligent Parking System for Large Parking Lots", IEEE Infocom 2015, State Key Laboratory of Industrial Control Technology, Zhejiang University, China, 06 August 2015

[2]. N. Pazos, M. Müller, M. Favre-Bulle, K. Brandt-Dit-Grieurin, O. Hüsser, M. Aeberli, N. Ouerhani," Dynamic Street-Parking Optimisation", 2016 IEEE 30th International Conference, Applied Science University Western Switzerland (HES-SO), HE-Arc Engineering School, Switzerland, 23 May 2016

[3]. Naourez Mejri, Mouna Ayari1, Rami Langar, Leila Saidane, "Reservation-based Multi-Objective Smart Parking Approach for Smart Cities", IEEE Conference, LIP6 / UPMC University of Paris ; 4 Place Jussieu, 75005 Paris, France, 03 October 2016

[4]. THANH NAM PHAM, MING-FONG TSAI, DUC BINH NGUYEN, CHYI-REN DOW, AND DER-JIUNN DENG", IEEE access, A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies", Department of Information Engineering and Computer Science, Feng Chia University, Taichung 407, Taiwan, Department of Computer Science and Information Engineering, National Changhua University of Education, Changhua 500, Taiwan, September 9, 2015

[5]. J. Holler, V. Tsiatsis, C. Mulligan, S. Karnouskos, S. Avesand, and D. Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence. Amsterdam, The Netherlands: Elsevier, 2014.

[6]. I. Wigmore, Internet of Things (IoT). Newton, MA, USA: TechTarget, Jun. 2014.

[7]. I. F. Akyildiz and I. H. Kasimoglu, ''Wireless sensor and actor networks: Researchchallenges,''AdHocNetw.,vol.2,no.4,pp. 351–367,Oct.2004.