iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** V **Month of publication:** May 2017

DOI:

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Smart-Parking System using Internet-of-Things Technologies and RFID

Shipra Singh[1], Vaibhav Kumar[2]
[1,2]Automation and Robotics, Dr. APJ Abdul Kalam Technical University

***Abstract*: This paper introduces a novel architecture which enhances the efficiency of existing cloud-based smart-parking systems and develops a network architecture based on the Internet-of-the-art technology. In this paper a system has been proposed which, considering the distance to users and considering the number of total places in each car park, at least cost, based on the new performance metric, to calculate the user parking cost. Helps in getting free parking space. This cost will be used by the user to provide a solution to find an available parking spot on request and to suggest a new car park if the current car park is complete.**

***Keywords*: Smart systems, Cloud computing Smart-parking system, Internet of Things, traffic management system, user waiting time minimization.**

I. INTRODUCTION

In the development of traffic management systems, an intelligent parking system was built to reduce the cost of hiring people and optimum utilization of resources for car-park owners. At present, the usual way of finding a parking space is the manual where the driver usually gets a place in the street through luck and experience. This process takes time and effort and if a vehicle is driving high vehicle density, then the worst case of failure to find any parking place can be the case. Alternatively, to get a predetermined car park with high efficiency, however, this is not an optimal solution because the car park can usually be far from the user's destination.

In current years, vehicle-to-vehicle [6] and vehicle-to-infrastructure [8] have been used with the support of various wireless network technologies like Radio Frequency Identification (RFID), Zigby, Wireless Mess Network [7] , And the Internet. The purpose of this study is to provide information about the surrounding parking spaces for the driver and to make reservation minutes using already supported devices such as a smartphone or tablet PC. Apart from this, the ID of each vehicle is used for booking a parking space. However, the existing intelligent parking system does not provide a complete optimum solution for finding parking space, does not solve the problem of load balancing, does not provide economic benefits, and does not plan for the vehicle rejection service.

Things in the current study offer and develop an effective cloud-based SPS solution based on the Internet. Our system creates each car park as an IOT network, and the data in which the number of free slots in the vehicle GPS location, distance between car parking areas and car park areas will be transferred to the data center. The data center acts as a cloud server to calculate the costs of a parking request, and these costs are often updated and can be accessed by the vehicles at any time in the network.

II. PROPOSED ARCHITECTURE

A. System Overview

The system is taken from the idea of IoT [3], [4] The system uses WSN [5] consisting of RFID technology to monitor car parks, RFID Reader shows the percentage of free parking spaces in each car park. The use of RFID facilitates the implementation of large-scale systems at a lower cost.

The system provides a mechanism to stop the disputes in the car park and helps reduce waste time in search of a parking lot. After entering the system, the user can choose suitable parking space. The user will be confirmed through notification at the selected parking location. Then, the system updates the status of parking space "pending", during which the system will not allow other users to reserve it. If after a certain period of time, the system determines that no car is parked at that place, then it changes the status to "Available."

The system meets the WSN node (the state of the car park spaces) in the new car system, therefore, the position of the entire parking system is always updated in real time. The system will help in conspiring parking time for each parking space in real time and support the business with hourly parking charges.

B. System Architecture

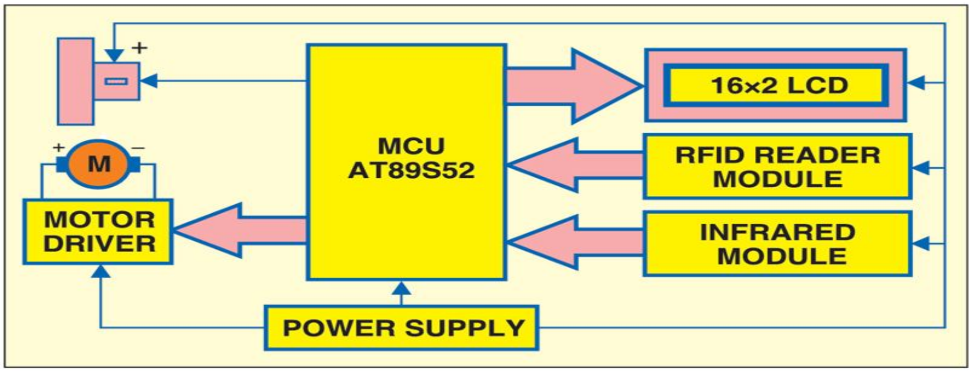


Fig. 1 shows our smart IoT parking system

C. Elements in the system

1) *Cloud-based server:* This is a web unit that stores the processing information provided by local units located in each car park. The system allows a driver to search and find information about parking spaces from every car park, without the need to directly access the cloud-based server, to access the local server node.
2) *Local unit:* This unit is located in every car park and stores information about each parking place, as shown in Figure 2. Local unit includes.
3) *Control unit:* This is an Ardino module, which is connected using RFID Reader. The card reader certifies the user's information and then displays this information on the screen. If the RFID tag or card information is correct, the Arduino module will control the opening of the door to enter the vehicle. The Ardino module connects to the cloud server through an internet connection to transfer data from the cloud server database to a local car park.
4) *Screen:* The capacity of this local car park, the total percentage of total space, the status of the RFID tag checking, the user card and a small map of the local car park when entering.
5) *RFID Tag or ID Card:* It is used to check and verify the user's information and calculate the percentage of total free locations in each car park.
6) *Software client:* this is an application software system. Playing on the Android operating system, users will install it on their smartphone and use it to reserve parking spaces. Users can access the system via 3G / 4G mobile connection.

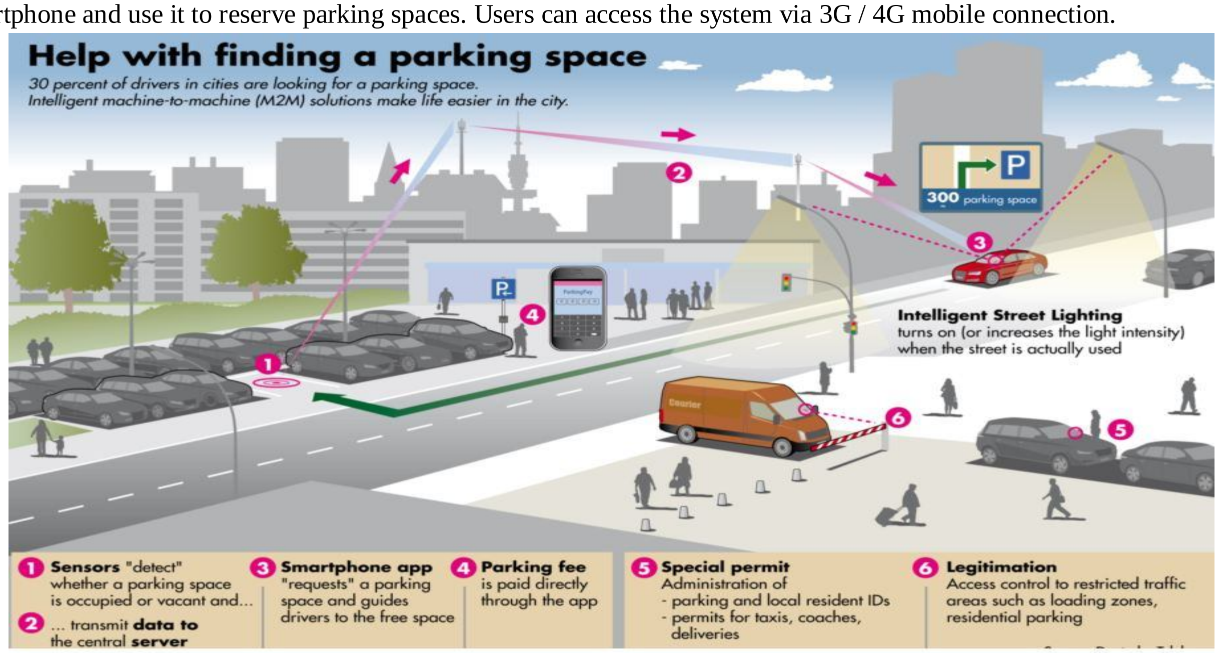
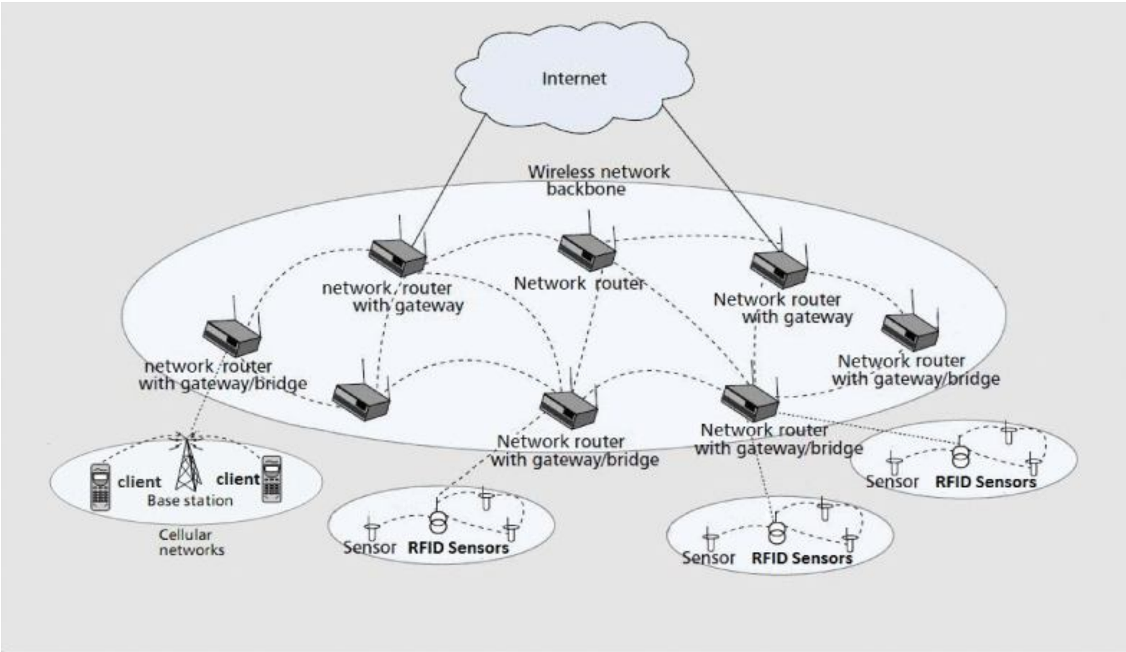


FIGURE2. Local unit.

Volume 5 Issue V, May 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

III. NETWORK ARCHITECTURE

We use the car park network (CPN) architecture infrastructure / backbone as shown in the architecture fig 3 (A), where dashed lines show wireless links and solid lines indicate wired links. Such parking networks include router Which are in the form of infrastructure for connected customers. CNPN infrastructure / spinal cord can be built so that sensor networks can be connected using wireless radio technology. Router manages self-configurable and self-linking networks. Gateway can be connected to the Internet by functionality. This approach is also known as infrastructure, provides spinal cord for traditional customers and the integration of CPN with existing WSN through Gateway / Sage Functionality in the router. make capable. Traditional customers with the same radio technology as router can communicate directly with the router.



(a)

(b)

FIGURE3.

A. Infrastructure/backbone of the CPN architecture.

B. CPN deployment for car parking system.

We have assumed that each car park has a node in CPN, in a real-time environment; the deployment network is shown in the picture 3 (B) where each car park is labeled

1) P_1 is car park number 1; N_1 is the total parking spaces in P_1.
2) P_2 is car park number 2, N_2 is the total parking spaces in P_2.
3) Pn is car park number n, Nn is the total parking spaces in Pn.

Total capacity of the system N = N1 + N2 + N3 + ... + NN (spaces). The D network has the actual distance between the two nodes. D_{IJ} The distance between the nodes P_I and P_J is fig. 4 shows our network.

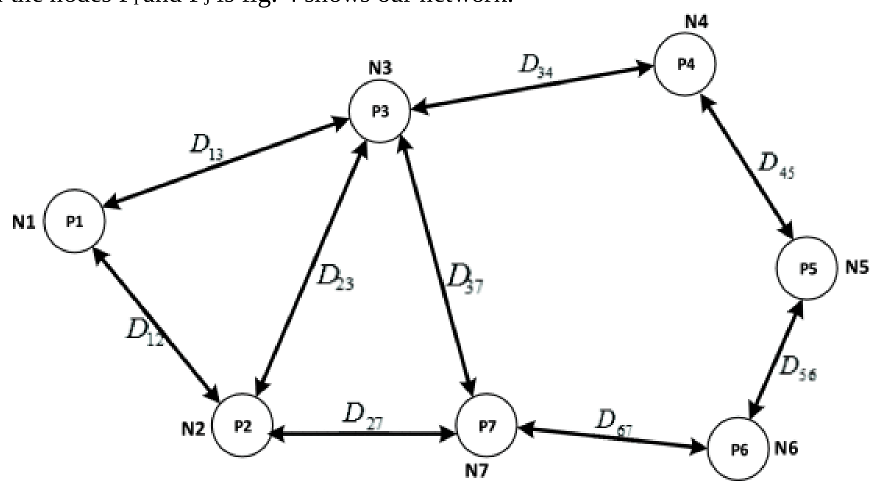


FIGURE4. Parking network

Each node has a neighboring table to maintain the current state of the network and information about the predefined length queue. On the other side, the queue node is used to control the number of vehicles forwarded in the neighboring table for each node, whose purpose is to overload the number of vehicles more than the capacity of the node. Has to stop. In our proposed system, each node will broadcast a message on its neighboring nodes after adding or dropping a node. This message contains information on its total free resources.

To increase the performance of finding free parking resources, each node includes information about the current number of free parking resources in neighboring nodes in the neighboring table. Our idea is to use the number of total free parking resources in each node to calculate the cost for choosing a car park.

To calculate the cost between the nodes in the network, we use a function called F (α, β). F (α, β) is a function that depends on the distance between two nodes and the number of free parking spaces in the destination node. F (α, β) is considered as a weighted link between the two nodes in the parking network. If two nodes are connected directly, then F (α, β) = ∞. If the vehicle comes in node and the node is full, then the vehicle will be sent to the next node, which is the neighbor of this node with the smallest value of F (α, β) in the neighboring table. We calculate the cost function F (α, β) for node p from node P_i,P_j i.e.,

$$Fij=Fij(\alpha,\beta)=\alpha\times dijDup+\beta\times tjTup(1)$$

Where α is a coefficient which depends on the length of the path between the two nodes and β is a coefficient which depends on the number of free slots in the destination node. F (α, β) is the opposite of the distance between the two nodes and is directly proportional to the total free slots in the destination node. Based on which parameter we believe that two parameters are more important, i.e. distance or free slot, we can adjust α and β to achieve better network performance. The parameters obtained from α and β are used, and their value is [0,1] if α = 0, we consider the number of spaces to calculate the cost for the user only. If β = 0, we only consider the distance between two nodes to calculate the cost for the user.

IV. CONCLUSION

This study proposes a parking system that improves performance by reducing the number of users failing to find parking space and reducing the cost of going to the parking space. Our proposed architecture and system have been successfully simulated and implemented in a real situation. The average wait time for each car park is reduced for the service, and the total time of each vehicle in each car park is less.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

REFERENCES

[1] Y. Geng, C. G. Cassandras, "A new 'smart parking' system based on optimal resource allocation and reservations", Proc. 14th Int. IEEE Conf. Intell. Transp. Syst. (ITSC), pp. 979-984, Oct. 2011.

[2] Y. Geng, C. G. Cassandras, "New 'smart parking' system based on resource allocation and reservations",IEEE Trans. Intell. Transp. Syst., vol. 14, pp. 1129-1139, Sep. 2013.

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

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

[5] I. F. Akyildiz, I. H. Kasimoglu, "Wireless sensor and actor networks: Research challenges", Ad Hoc Netw., vol. 2, no. 4, pp. 351-367, Oct. 2004.

[6] C. Rhodes, W. Blewitt, C. Sharp, G. Ushaw, G. Morgan, "Smart routing: A novel application of collaborative path-finding to smart parking systems", Proc. IEEE 16th Conf. Bus. Infom., pp. 119-126, Jul. 2014.

[7] I. F. Akyildiz, X. Wang, W. Wang, "Wireless mesh networks: A survey",Comput. Netw., vol. 47, no. 4, pp. 445-487, Mar. 2005.

[8] N. Mejri, M. Ayari, R. Langar, F. Kamoun, G. Pujolle, L. Saidane, "Cooperation versus competition towards an efficient parking assignment solution", Proc. IEEE Int. Conf. Commun., pp. 2915-2920, Jun. 2014.

[9] Thanh Nam Phami , Ming-Fong Tsai , Duc Binh Nguyni, Chyi-Ren Dow And Der-Jiunn Deng "A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies" ,IEEE Access, date of publication September 9, 2015, date of current version September 23, 2015.