

## A CLOUD-BASED SMART-PARKING SYSTEM BASED ON INTERNET-OF-THINGS TECHNOLOGIES

**K. Komali<sup>1</sup>, Dr. J. Vijaya<sup>2</sup>, Dr. K. Vijaya Prasamsa<sup>3</sup>, Chandana Gouri Tekkali<sup>4</sup>,  
Erusu Rammurthy Reddy<sup>5</sup>**

<sup>1</sup> *Assistant Professor, Computer Science & Engineering, Dadi institute of engineering & Technology, Visakhapatnam,*

<sup>2</sup> *Assistant Professor, Computer Science & Engineering, Vellore institute of Technology-AP, Amaravathi,*

<sup>3</sup> *Associate Professor, Department of Mathematics, Vignan's Institute of Information Technology, Visakhapatnam*

<sup>4</sup> *Research Scholar, Computer Science & Engineering, Vellore institute of Technology-AP, Amaravathi*

<sup>5</sup> *Computer Science & Engineering, GITAM Deemed to be University, Visakhapatnam*

### ABSTRACT

This paper develops a network architecture based on the Internet-of-Things technology.introduces a novel algorithm that increases the efficiency of the current cloud-based smart-parking system. This paper proposed a system for finding free parking slots automatically with least cost based on new performance metrics to calculate the user parking cost by identifying the distance and the total number of free slots in each car park. This cost will be used to offer a solution of finding an available parking space upon a request by the user and a solution of suggesting a new car park if the current car park is full.The simulation results shows that the algorithm minimizes the user waiting time and improve the probability of successful parking and We also successfully implemented the proposed system in the real world.

In the development of traffic management systems, an intelligent parking system was created to reduce people hiring cost and provide optimal use of resources for car-park owners. Currently, the common method of finding a parking space is manual where the driver usually finds a space in the roads through their experience. This process takes time and effort and may lead to the worst case of failing to find any parking space if the driver is driving in a city with high vehicle density. The alternative is to find a predefined car park with high capacity. However, this is not an optimal solution because the car park could usually be far away from the user destination. In recent years, research has used vehicle-to-vehicle and vehicle-to infrastructure interaction with the support of various wireless network technologies such as radio frequency identification (RFID), Zig bee, wireless mess network, and the Internet. This study aimed to provide information about nearby parking spaces for the driver and to make a reservation minutes earlier using supported devices such as smart phones or tablet PCs.

**Keywords:** IoT, RFID, Zig bee (IOT),

### I. INTRODUCTION

In the development of traffic management systems, an intelligent parking system was created to reduce the cost of hiring people and for optimal use of resources for car-park owners. Currently, the common method of finding a parking space is manual where the driver usually finds a space in the street through luck and experience. This process takes time and effort and may lead to the worst case of failing to find any parking space if the driver is driving in a city with high vehicle density. The alternative is to find a predefined car park with high capacity. However, this is not an optimal solution because the car park could usually be far away from the user destination. In recent years, research has used vehicle-to-vehicle and vehicle-to infrastructure interaction with the support of various wireless network technologies such as radio frequency identification (RFID), Zigbee, wireless mess

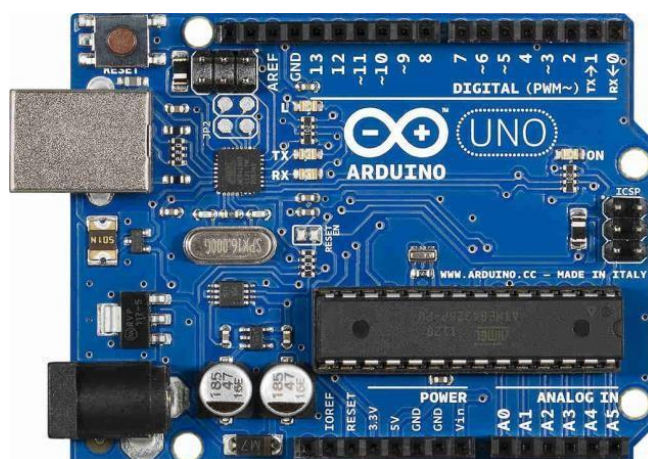
network, and the Internet. This study aimed to provide information about nearby parking spaces for the driver and to make are seriation minutes earlier using supported devices such as smartphones or tablet PCs. Furthermore, the services use the ID of each vehicle in booking a parking space. However, the current intelligent parking system does not provide an overall optimal solution in finding an available parking space, does not solve the problem of load balancing, does not provide economic benefit, and does not plan for vehicle-refusal service. To resolve the aforementioned problems and take advantage of the significant development in technology, the Internet-of-Things technology (IoT) has created a revolution in many fields in life as well as in smart-parking system (SPS) technology. The proposes and develops an effective cloud-based SPS solution based on the Internet of Things. Our system constructs each car park as an IoT network, and the data that include the vehicle GPS location, distance between car parking areas and number of free slots in car park areas will be transferred to the data centre. Furthermore, in the proposed system, each car park can function independently as a traditional carpark. This also implements a system prototype with wireless access in an open-source physical computing platform based on Arduino with RFID technology using a smartphone that provides the communication and user interface for both the control system and the vehicles to verify the feasibility of the proposed system.

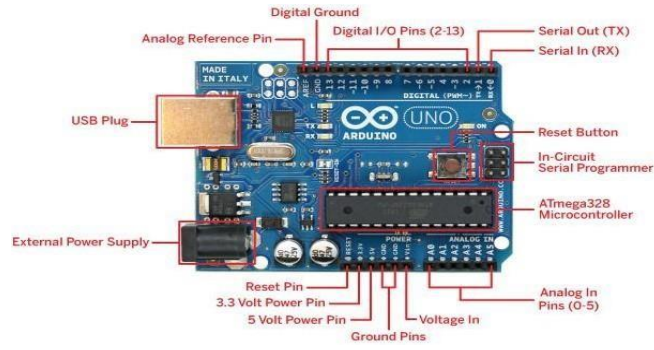
## II. PROPOSED SYSTEM

To resolve the traffic problems and take advantage of the significant development in technology, the Internet-of-Things technology (IoT) has created a revolution in many fields in life as well as in smart-parking system (SPS) technology. This proposes and develops an effective cloud-based SPS solution based on the Internet of Things. Our system constructs each car park as an IoT network, distance between car parking areas and number of free slots in car park areas will be transferred to the data center. The data center serves as a cloud server to store the parking information. The SPS provides the nearest parking slot to the user from the area where he located and is based on several innovative technologies and can automatically monitor and manage car parks. Furthermore, in the proposed system, each car park can function independently as a traditional car park.

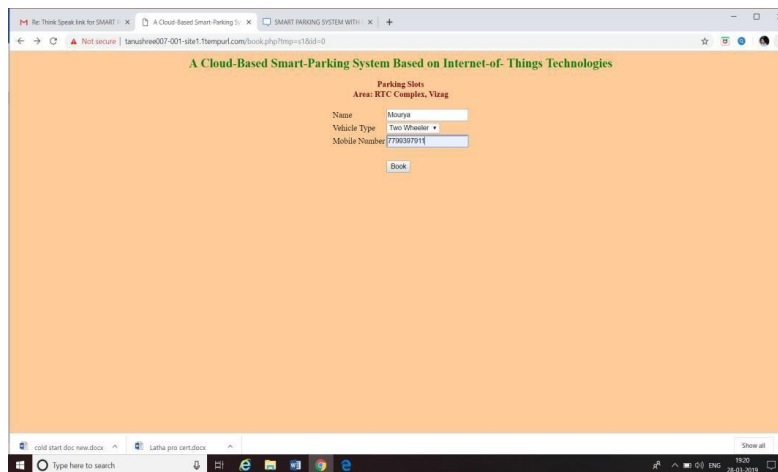
### Implementation

The working of Arduino microcontroller is where the proper connection is made. Checking all the input ports as well as the power supply connection. The output of the pins can be connected with the external devices according to their applications. The program to be executed for the applications can be done by using Arduino software. From this Arduino software, we can edit according to the applications. This software can work on c and c++ programming language. It is fully a high-level language. By using the conditions of working, we can create a program to proceed for the applications. Then after, these programs can be uploaded through the Arduino microcontroller by using the power jack cable. The program can be uploaded to the microcontroller and ready for further process. ATMEGA-328 microcontroller can save a program and these IC can acts as a processor to do the process without any error.





Screen Shots:



### III. CONCLUSION

This study has proposed a parking system that improves performance by reducing the number of users that fail to find a parking space and minimizes the costs of moving to the parking space. Our proposed architecture and system have been successfully simulated and implemented in a real situation. The results show that our algorithm significantly reduces the average waiting time of users for parking. The simulation of our system achieved the optimal solution when most of the vehicles successfully found a free parking space. The average waiting time of each car park for service becomes minimal, and the total time of each vehicle in each carpark is reduced.

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