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Smart Parking System - A Solution to the Driving Stress due to Parking Menace

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Abstract: ***In today's world, availability of safe parking for vehicles is one of the major contributing factors towards the increasing stress level of the drivers. This is contributed majorly by the increase in the number of vehicles on the roads and drastic reduction in the free space available to park the vehicles. Finding a safe space to park the vehicle has become a cumbersome task for the drivers. This worsens when the place is a huge city, like the metro cities. A big problem is when the driver finds a parking lot and enters it but only to find it full. This leads to a lot of stress to the driver, waste of fuel and also a lot of damage to the environment that can be avoided with a well-managed parking system. In this paper, we have introduced a smart parking management system which addresses the above said difficulties. It can help the drivers to know of a parking space, its free space availability and the cost of parking even before reaching the spot. The driver can also book his space for a time slot in advance. This avoids the need to roam around searching for parking. This is especially helpful to a person new to the place. This system also gives the driver an option for various payment schemes for the different facilities available. This paper proposes a system with a network of sensors and actuators that can sense the occupancy of the parking spaces. The system uses processors that can handle herculean tasks but at lower costs. For the drivers who haven't booked his spot, there is a facility of an open Wi-Fi hotspot that connects the smartphone of the driver to the system and lets him choose the spot. Also it allows the driver to make cashless payments. For each spot that is booked, the gate to that particular parking space will only be open. This avoids parking at spots other than that is selected. So by using the basic modern technologies that is at everyone's disposal, the proposed system can reduce the parking related stress for the driver, which in turn reduces the overall driving stress as one of the major problem gets taken care of by the system even before the journey starts.***

Keywords: Tensilica ESP 8266, Real Time Monitoring, Parking Management, Networking of Sensors

I. INTRODUCTION

Drivers searching for parking are estimated to be responsible for about 30 percent of traffic congestion in cities. Historically cities, businesses, and property developers have tried to match parking supply to growing demand for parking spaces. It has become clear that simply creating more parking spaces is not sufficient to address the problem of congestion. New approaches
using smart parking systems look to provide a more balanced view of parking that better manages the relationship between supply and demand.

Smart parking can be defined as the use of advanced technologies for the efficient operation, monitoring, and management of parking within an urban mobility strategy. The global market for smart parking systems reached 93.5 million dollars, with the United States representing 46 percent market share, and offering a strong growth opportunity for companies offering services in the United States and overseas.

A number of technologies provide the basis for smart parking solutions, including vehicle sensors, wireless communications, and data analytics. Smart parking is also made viable by innovation in areas such as smartphone apps for customer services, mobile payments, and in-car navigation systems. At the heart of the smart parking concept, is the ability to access, collect, analyse, disseminate, and act on information on parking usage. Increasingly, this information is provided in real-time from intelligent devices that enable both parking managers and drivers to optimize the use of parking capacity.

II. LITERATURE REVIEW

In this section, the various works done in relation to the smart parking system is discussed. These provides a method for sampling the problems where we can appropriately use this Smart Parking System. The references can be found summarized below.

A. Need for a Smart Parking System [1] : Locating a parking spot during peak hours in most populated areas like shopping malls, universities, exhibitions or convention centres is difficult for the drivers. The difficulty rises from not knowing where the available spots may be at that required time. Smart Parking is a parking system, usually a new one that is equipped with special structured devices (things) to detect the available parking slots at any parking area.

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B. Need for using Internet of Things (IOT) in Smart Parking System [2] : This is an application based on Internet of Things (IoT) that in Real-Time environment have sensors and devices embedded into parking spaces, transmitting data on the occupancy status; and the vehicle drivers can search for parking availability using their mobile phones or any infotainment system that is attached to the vehicle. Hence the driver would know where there is an available spot to park his vehicle in less time, reducing the energy consumption and air pollution. The Client or the sensor posts the parking slot occupancy status to a web service URL. The Java based web service is built using Spring and Hibernate to connect to the backend system.

C. Availability Prediction of Parking Spaces [3] : A various factor considered in the decision of the parking choice is done by parking utility function. Driving time and distance, the distance on foot, the cost of parking, traffic congestion by guidance itself and possibility to find vacant parking lot when a car enters. The proposed system and algorithm enables car drivers to find the most appropriate parking lot and redundant time and energy. The system can face the parking problem caused by unavailability of reliable, more efficient and modern car park system. The growth in low-cost, low-power sensing and communication technologies is creating a pervasive network infrastructure called the Internet of Things (IoT), which enables a wide range of physical objects and environments to be monitored in _ne spatial and temporal detail. The detailed, dynamic data that can be collected from these devices provide the basis for new business and government applications in areas such as public safety, transport logistics and environmental management.

D. Parking System usually developed [4] : In many cities, car drivers search for a parking slot during the peak hours or in traffic congestion. This paper presence an efficient method to check the availability of the parking slot and to reserve a slot. Existing work focuses on availability of the parking slot only. However, drivers in this fast paced world can't judge whether a parking spot is available on-demand. To overcome this disadvantage, smart parking with reservation option using cloud based environment is proposed. This make the drivers easier to park the vehicles and also overcome traffic congestion. Drivers can initiate request using reservation app in the android mobile to determine the availability of the parking slot. If the slot is available a driver can reserve a slot through online payment system. The propose system also enables drivers to cancel the reserved parking slot. Amount will be refunded after cancellation charges. Thus a low cost prototype for smart parking with reservation is proposed using sensor, Arduino and android in Cloud Platform.

III.DESIGN OVERVIEW

The proposed system can be easily depicted using the Block diagram which provides an overall blue print of the project, Smart Parking System. The overall representational functioning of the system is shown in the block diagram in figure 1. As shown in the block diagram, Tensilica ESP8266 is the processor which act as the brain of the system. IR proximity sensor is used to detect the presence of vehicles. We can also use the ultrasonic sensor or metal proximity sensor to detect vehicles.

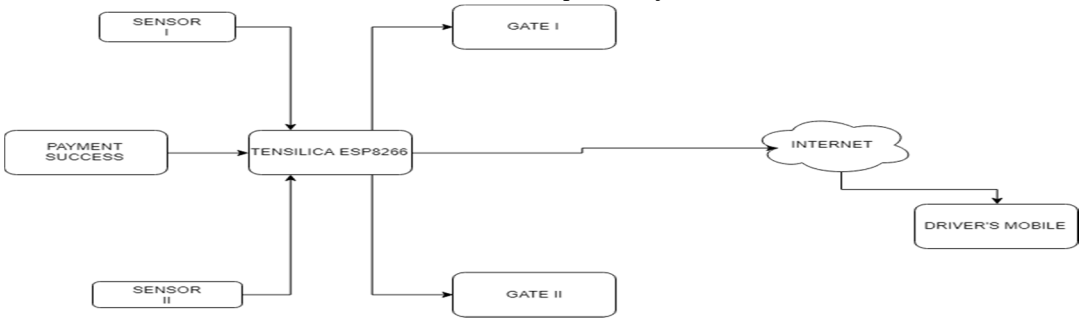


Fig.1. Block Diagram of Smart Parking System

A switch is activated when the payment is successfully made by the driver. The driver can interact with the system using the Wi-Fi hotspot that is built in to the Tensilica. So the driver can know the parking space availability and the status of the parking spot. He can also make the payment from his mobile. The system can also display the status of the parking lot so that the driver need not even come to its proximity if the lot is full. The driver can connect to the system using the WI-Fi hotspot and can select the spot for parking. In this project, there are two types of parking spaces in the same lot, based on the payment to be made. One spot is the budget oriented spot where the vehicle can be parked safely. The other spot is a more premium spot which are shaded and other facilities like cleaning can be incorporated. When the driver selects a spot and the payment is confirmed, the gate towards that area will open and the driver can park at that spot. The next driver when connects to the system will find thye previous parking to be occupied and has to go for the available parking spots.

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A. Tensilica ESP8266

The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Espressif Systems. The chip with the ESP-01 module allows the microcontroller to connect to a Wi-Fi network and make simple TCP/IP connections making use of Hayes-style commands. However, at the earlier time there was almost no English-language documentation on the chip and the commands it accepted. The low price and that there were very few external components on the module made it a popular choice for many developers. With the completely self-contained Wi-Fi networking capabilities, ESP8266EX can perform either as a standalone system or as a slave to a host MCU. When ESP8266EX hosts as the standalone application, it promptly boots up from the scratch. The integrated high speed cache helps increasing the system performance and optimize the system memory. Also, ESP8266EX can be integrated into any microcontroller design as a Wi-Fi adaptor through SPI / SDIO or I2C / UART interfaces. ESP8266EX integrates antenna switches, RF balun, power amplifier, low noise receiver amplifier, filters and power management modules. The compact design of the processor minimizes the PCB size and demands minimal external circuitries. Besides the Wi-Fi functionalities, ESP8266EX also integrates an enhanced version of Tensilicas L106 Diamond series 32-bit processor and on chip SRAM. It can be interfaced with external sensors and other devices through the GPIOs. Software Development Kit (SDK) provides sample codes for various applications. Espressif Systems Smart Connectivity Plat- form (ESCP) enables sophisticated features including fast switch between sleep and wakeup mode for energy-efficient purpose, adaptive radio biasing for low-power operation, advance signal processing, spur cancellation and radio co-existence mechanisms for common cellular, Bluetooth, DDR, LVDS, LCD interference mitigation.

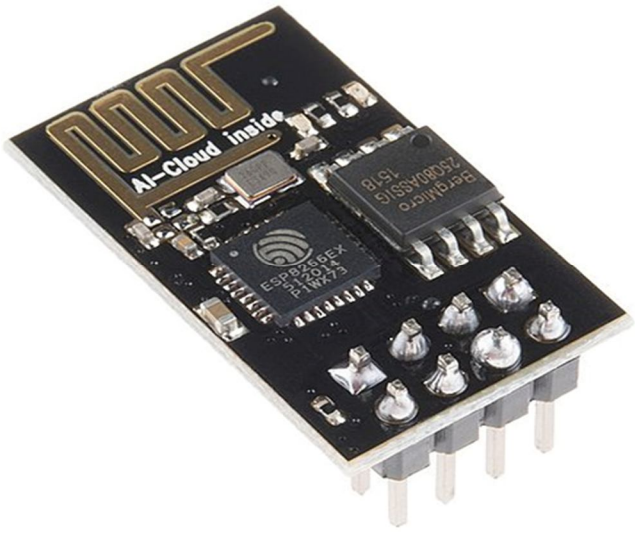


Fig. 2. Tensilica ESP 8266 processor

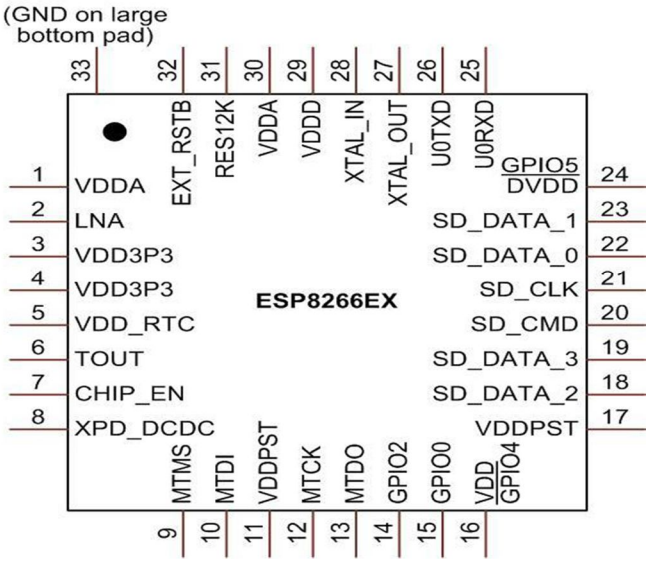


Fig. 3. Pin Diagram of ESP 8266

The packaging of 8266 EX is QFN 32 pins package. QFN stand for Quad- Flat-NO leads which means that there are four sides where pins are present. the package is at the top. This type of package does not have pins or leads built into them. We have to make our own connections from the source left for connecting on the package. The pinout of the ESP 8266 is shown in fig 3.

TABLE I
Hardware Specification Of Tensilica Esp 8266

PARAMETERS	SPECIFICATIONS
CPU	Tensilica L106 32-bit processor
Available Peripheral Interfaces	UART/SDIO/SPI/I2C/I2S/IR Remote Control GPIO/ADC/PWM/LED Light and Button
Operating Voltage	2.5V – 3.6V
Average operating current	80 mA
Operating Temperature range	-40 Celsius to 125 Celsius
Package Size	QFN 32 pin (5mm X 5mm)

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B. Sensors

IR Sensor module has great adaptive capability of the ambient light having a pair of infrared transmitter and the receiver tube, the infrared emitting tube to emit a certain frequency, encounters an obstacle detection direction (reflecting surface), infrared reflected back to the receiver tube receiving, after a comparator circuit processing, the green LED lights up, while the signal output will output digital signal (a low-level signal), through the potentiometer knob to adjust the detection distance, the effective distance range 2 to 10cm working voltage of 3.3V-5V. The detection ranges of the sensor can be adjusted by the potentiometer, with little interference, easy to assemble, easy to use features, can be widely used robot obstacle avoidance, obstacle avoidance car assembly line count and black-and-white line tracking and many other occasions. The IR sensor module used in this project is EC-0141 module. An example of the IR sensor module is shown in figure 4.

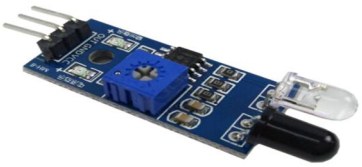


Fig. 4. EC 0141 IR sensor Module

TABLE II
Specifications of IR Sensor Module Ec0141

PARAMETERS	SPECIFICATIONS
Detection Range	2 to 10 cm
Detection Angle	35 degrees
Comparator Used	LM393
Operating Voltage Range	3 to 5 V

In place of the IR sensor, other sensors like the proximity sensor can be used in the parking spots to detect the presence of a vehicle at that spot.

C. Power Supply Unit

A power supply unit converts mains AC to low-voltage regulated DC power for the internal components of a computer. Modern personal computers universally use switched-mode power supplies. Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage. Power supply units can also be used to shift the level of DC voltages to meet the different power supply requirements in the whole system. This provides a way to use the same power source for the various levels of power requirements in the same circuit. In this project, the power supply required by the processor to function correctly is 3.3 V. The proximity sensor module also requires the same 3.3 V for its operation. Since the loads on the power supply system is not very heavy on this prototype, we can use a 9 V battery for power supply. This 9 V should be converted to 3.3 V. For this we make use of ASM1117 IC whose 2nd pin s connected to the 9 V battery and we get 3.3 V output from the 3rd pin. The circuit that is used to get the required supply voltage at a smooth level is shown in figure 5.

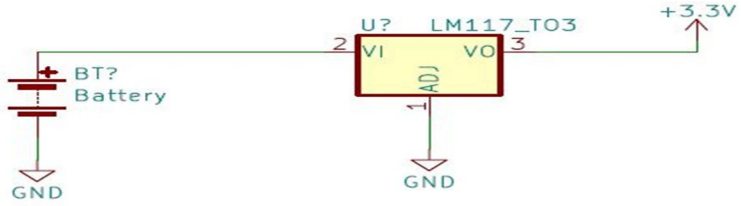


Fig. 5. Power supply circuit for the Smart Parking System

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IV. RESULT

Experiment using the Smart Parking System is successfully completed and the results are tabulated in the table 3 shown below. Fig 5. shows the final prototype of the system that is ready to be implemented on an parking lot.

TABLE III
Results Showing the Accuracy Of The System

Parameter	Number of checks	Number of successful outcomes
Vehicle detection at main gate	20	20
Driver's mobile connected	10	10
Parking spot selection	10	10
Real time status of parking lot	15	15
Status when fully occupied	20	20

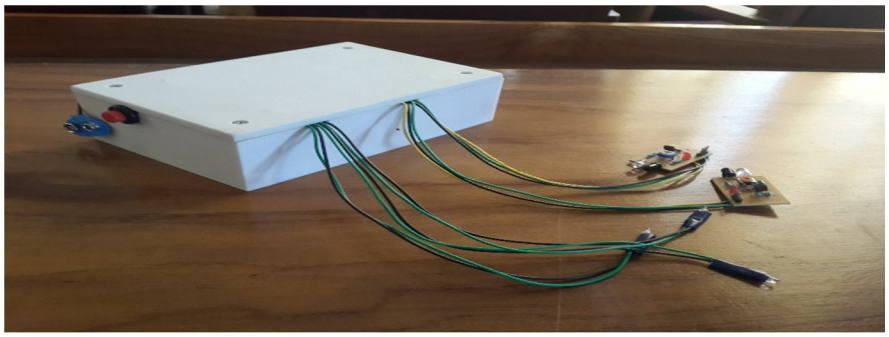


Fig. 5. The final system prototype ready to be implemented

V. CONCLUSION

The smart parking system prototype has been designed and developed successfully. Single chip microcontroller is used to control the traffic flow of cars in the smart parking system. Availability of vacant places on each floor is checked by the microcontroller with the help of IR sensors. It can be observed that control system for smart parking system has achieved the undoubtable performance to regulate the entry and exit of the car to several lots accurately. The entry and exit phases of the car depend upon the availability of the free slots ad time required for exit. The smart parking system prototype has been designed and developed successfully. Single chip microcontroller is used to control the traffic flow in the smart parking system. Availability of vacant places is checked by the microcontroller with the help of IR sensors.

VI. FUTURE SCOPE

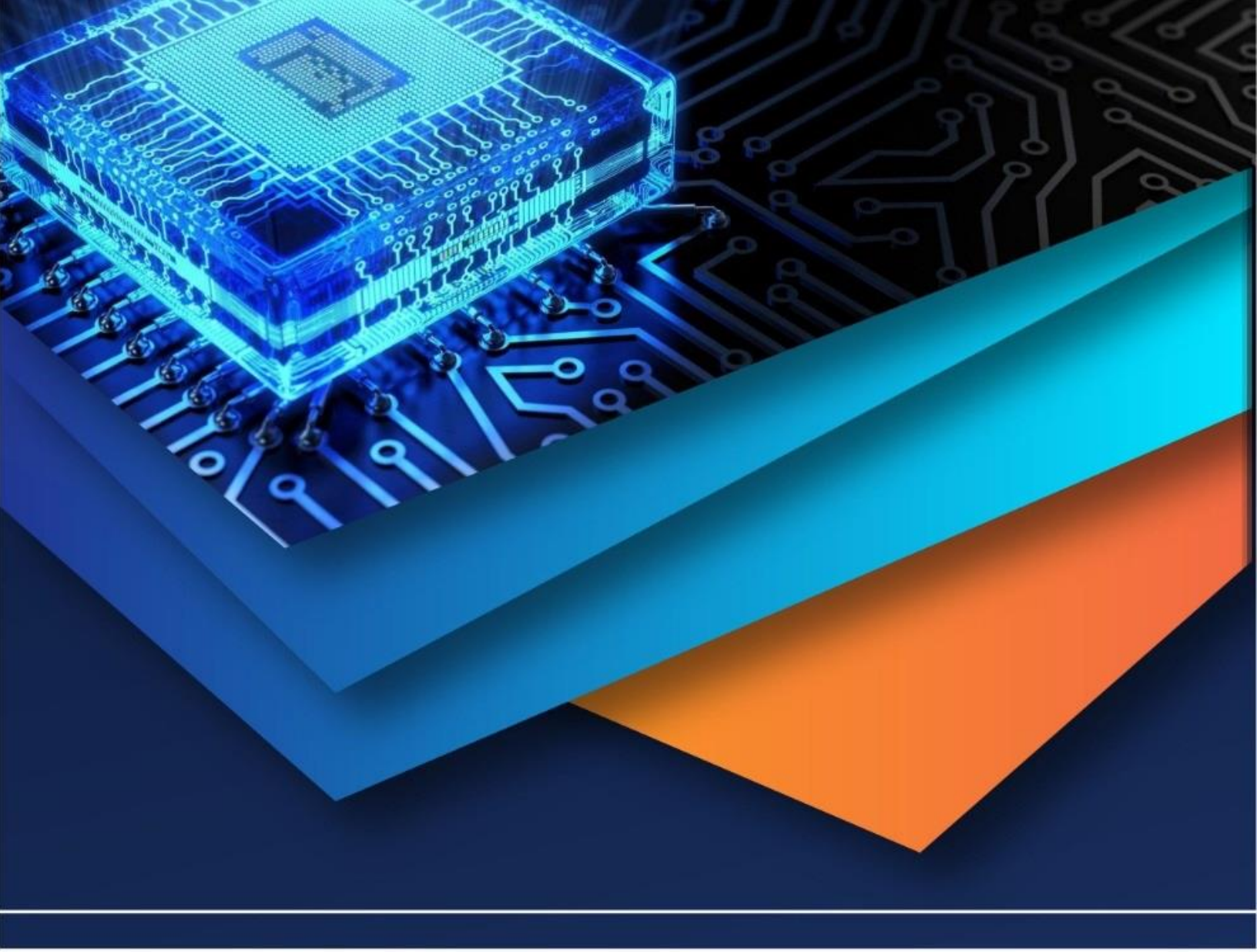
This project can be further modified to include the following functionalities.

A. Website for prebooking of parking space.
B. Facility for timed parking by allowing parking for limited time.
C. Seasonal payment options for regular customers.
D. Number plate reading to avoid time wasting for prebooked customers.

REFERENCES

[1] Sandeep Saini, Rishikesh Mishra, Sudharshan Avhad, A project report on Automatic Car Parking system.
[2] Jong-Ho, Hong-Bae Jun, A study on smart parking guidance Algorithm,, International Conference on Trends in Intelligent Electronic System, vol. 2 p 563-566, Nov. 2007
[3] Y Zheng, S rajasekharar, C Leckie, "Parking Availabilty Prediction for sensor enabled car parks in Smart Cities" IEEE 10th International Conference 2015
[4] A Botta, W. De Donato, V Persico, A Pescap, "On the Integration of Cloud Computing and Internet of Things," IEEE International Conference, August 2014
[5] Z Ji, I Ganchev, M O'droma, X Zhang, "A Cloud based Intelligent Car Parking Services for Smart cities" General Assembly and Scientific Symposium(URSI GASS) 2014, XXXIth URSI IEEE , Aug. 2014
[6] P Ballon, J Glidden P Kranas, A Menychats, S Ruston, S Vaan Der Graaf , "Is There A Need for Cloud Platform for European Smart Cities, IIMC International Information Management Corporation, Oct. 2011

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