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Smart Parking Monitoring System using RFID

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Abstract: ***Parking of the vehicle is the major issue in the cities at different location. Although there are many parking issue solutions and considering by past experience a parking solution in which help of RFID device. A smart reserve parking system using RFID is an advanced solution for managing parking spaces using radio-frequency identification (RFID) technology. This system allows drivers to reserve and access parking spaces securely and conveniently using RFID tags. The system uses RFID readers to identify and track the location of tagged vehicles, enabling drivers to find available parking spaces easily.The authentication technique implemented is RFID on the algorithm based on smart cards (RFID- tags). The data stored in the algorithm allows the entry/exit of the vehicle through which unauthorized vehicle not be permitted. The system offers benefits such as enhanced security, reduced traffic congestion, and improved user experience. Additionally, it provides parking operators with real-time data and analytics, enabling them to optimize parking space usage and generate revenue. Despite some challenges associated with the implementation of RFID technology, the benefits of the smart reserve parking system make it a promising solution for managing parking spaces in various environments, including urban areas, airports, and shopping malls***
Keywords: RFID, Tags, Reader, Authentication, Security

I. INTRODUCTION

The recent development of Radio Frequency identification (RFID) framework plays a crucial role in supporting item ID as a widespread basis.Today, RFID technology is widely used for access control, retail networks, maintenance, parking structures, and other purposes..

RFID tag: It is a modest radio chip that contains a basic silicon microchip connected to a little level ethereal and mounted on a substrate. The entire gadget would then be able to be embodied in various materials, (for example, plastic) subordinate upon its planned use. These tags can be applied on various articles like our regularly used things. For the use of RFID tags we need to connect it with a power supply or a battery.

RFID Reader : An RFID reader consists of an antenna, a radio frequency module, a microcontroller, and a power supply. The antenna is used to transmit and receive radio waves, while the radio frequency module is used to encode and decode the signals. The microcontroller is responsible for processing the data received from the RFID tag, and the power supply provides power to the reader. At first the very basic idea of smart parking monitoring is to display the total parking capacity and the occupied capacity of the parking slot so that before entering the parking area user is informed about the parking space weather parking space is available or not. This idea uses the IR sensor of the height sensor.

Various projects has already been done for improving the parking system using RFID tags such as integration of RFID to find the vacant parking space during the rush hours to reduce the time to find the vacant space and also reduce the fuel consumption. [1]

The motive of smart reserve based parking system is-

Simplify the operation of parking system

Increase parking revenue

Alleviate traffic congestion [2]

Fig(1) :- Working of RFID System with

II. METHODOLOGY/PROCESS

Our project mainly focus on the principle of reserve parking for the authorised vehicle only, and can be directly implemented on the locations such as Colleges(for the professors and staff), Hospitals, MNC's and other govt. and private organizations.

We have used RFID tags for the identification of each vehicle so that the vehicle can pass through the parking entry gate.

RFID tags and readers: Today, RFID technology is widely used for access control, retail networks, maintenance, parking structures, and other purposes. RFID tags are inexpensive radio chips that are affixed on a substrate and made of a basic silicon microchip coupled to a small degree of electricity. Depending on its intended usage, the complete device might then be made of different materials (like plastic). These tags can be applied on various articles like our regularly used things. For the use of RFID tags we need to connect it with a power supply or a battery. RFID offer a few points of interest over standardized tags: information are perused naturally, observable pathway not required, and through non directing materials at high rate and far separation.

In our project we have connected the RFID reader to Arduino NANO by jumper wires through power pins, Digital/Analog or signal pins of Arduino to store the data of the vehicle, so that only authorized vehicle can pass through the gate of the parking slot. At the Entry/Exit point of the parking space we have one servo motor which behaves like the gate of the parking slot. We have designed and coded such that motor only rotate by 90 degree so that it functions like a door or a barriers for that we need to connect servo motor with Arduino-NANO by power pins and signal pin of the Arduino-NANO. To display the Data on the LED (16*2), we connected LED to the Arduino by power and signal pins to respective digital pins of the Arduino-NANO, LED displays the car information of the respective car which can either pass by the parking gate or unidentified vehicle.

Hardware of Smart Parking Monitoring System is shown in below fig (2).

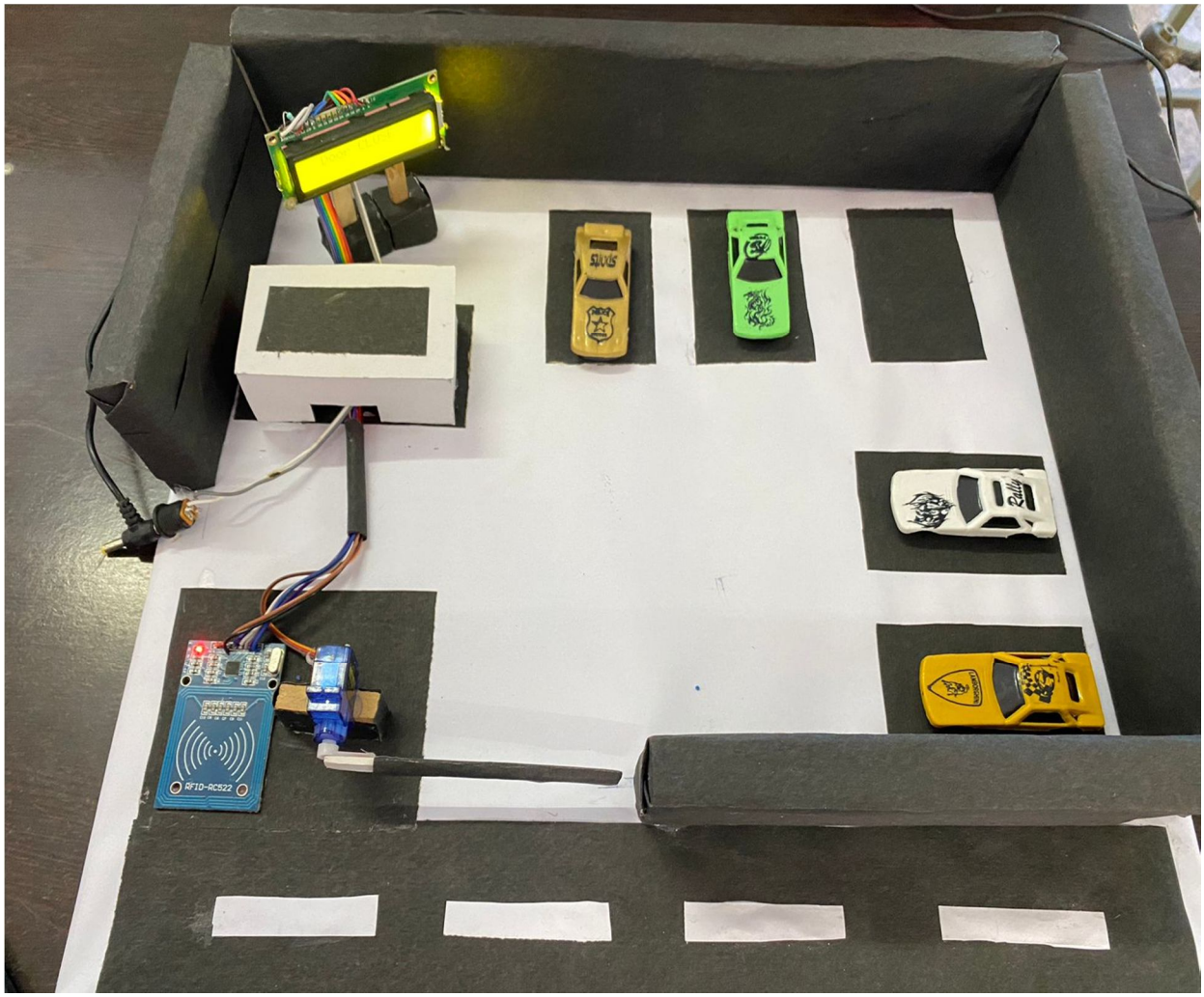


Fig:- 2 Hardware of Smart Parking Monitoring System

III. COMPONENTS

A. Arduino-Nano

The compact and adaptable Arduino Nano development board is based on the well-liked ATmega328 microprocessor. It performs similarly to the Arduino UNO but has a more compact design. The Nano may be readily incorporated into a variety of circuits and applications and is intended to be used for small-scale projects.

The Arduino Nano board features a USB interface for easy programming and communication, 14 digital input/output pins, 8 analog input pins, and 6 pulse-width modulation (PWM) pins. It also has a 16 MHz quartz crystal oscillator, a mini USB port, and a DC power jack.

The board is compatible with the Arduino IDE, which allows users to easily write and upload code to the board.

The Arduino Nano is perfect for applications that need mobility or have a small footprint due to its small size. Both novice and expert producers choose it because of its affordable price and user-friendly interface.

Complete Pin diagram of Arduino NANO is shown in below fig (3).

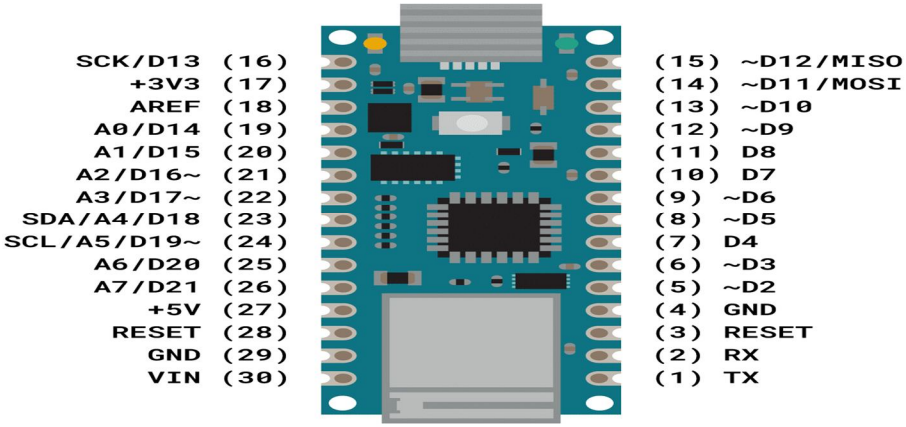


Fig 3 :-Arduino_NANO Pin diagram

B. Servo Motor

The rotary actuator or linear actuator known as a servomotor (or servo motor) enables precise control of angular or linear position, velocity, and acceleration. A servomotor is a closed-loop servomechanism that regulates its motion and ultimate position using position feedback. A signal (either analogue or digital) indicating the output shaft's command position is the control system's input.The servo motor in this project rotates by 90 degree to open and close the gate of parking slot and as shown in result fig (7) & (8).

Servo motor SG90 is shown in fig(4).

Fig:-4 Servo motor SG90

C. RFID System

Radio waves are used by the RFID (Radio Frequency Identification) technology to automatically identify and track tags that are fastened to items. Tags, readers, and software are the common components of an RFID system. Tags are tiny electrical devices with an antenna and a chip. They can be attached to or embedded in objects and can store and transmit data wirelessly to a reader.Readers, also known as interrogators, are devices that emit radio waves and receive signals back from the tags.

They are typically connected to a computer or network and can read multiple tags simultaneously, Software is used to manage the data collected by the readers and tags. It may be used to manage inventories, monitor items, and offer other helpful data.Access control, inventory management, supply chain management, and asset monitoring are just a few of the uses for RFID systems. They may increase productivity, accuracy, and security and have several benefits over conventional barcodes.
Figure (5) below depicts an RFID tag and reader.

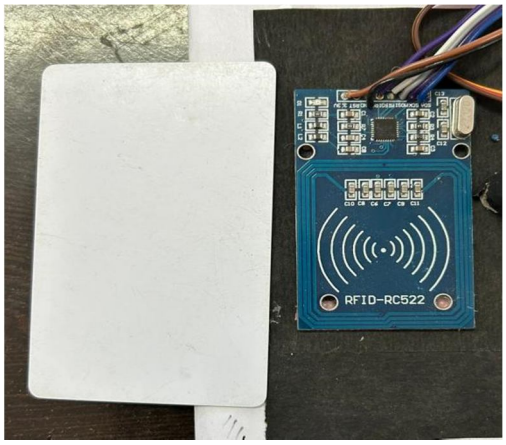


Fig:-5 RFID tag and RFID Reader

D. LED Display

16*2 LCD is named because; it has 16 Columns and 2 Rows

a) Pin1 (Ground /Source Pin) : This is a GND pin of display , used to connect GND terminal to the microcontroller unit or power source.

b) Pin2 (VCC/Source Pin) : This is the voltage supply pin of the display, used to connect the supply pin of power source.

c) Pin3(V0/VEE/Control Pin) : This Pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.

d) Pin4 (Register Select/Control Pin) : This pin toggles among command or data register, used to connect a microcontroller unit pin and obtain either 0 or 1(0 = data mode, and 1 = command mode).

e) Pin5 (Read/Write/Control Pin) : This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).

f) Pin 6 (Enable/Control Pin) : This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit and constantly held high.

g) Pin 7-14 (Data Pins) : These Pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4 wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8 wire mode , 8 pins are connected to microcontroller unit like 0 to 7.

Following Pin diagram is shown in below fig(6).

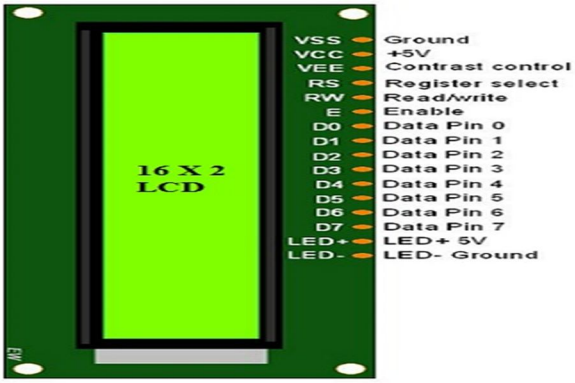


Fig 6:- LED(16*2) Pin Diagram

IV. RESULT

The reserve parking spaces feature, effective management of the space, and reduced time waste are only a few of the benefits of this kind of smart parking monitoring system. By registering with the system just once, it enables users to park their cars. Depending on the user's needs and preferences, this can be implemented and adapted for usage in a variety of settings.
Figures (7) and (8) below demonstrate how the smart parking monitoring system operates..

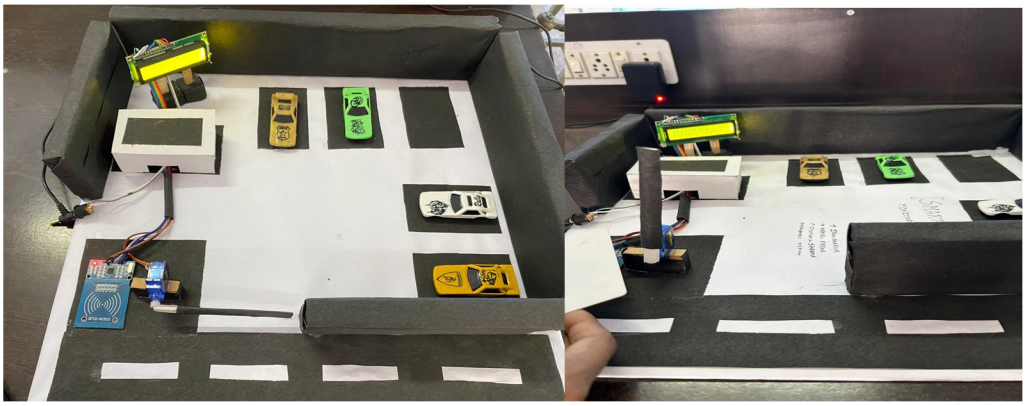


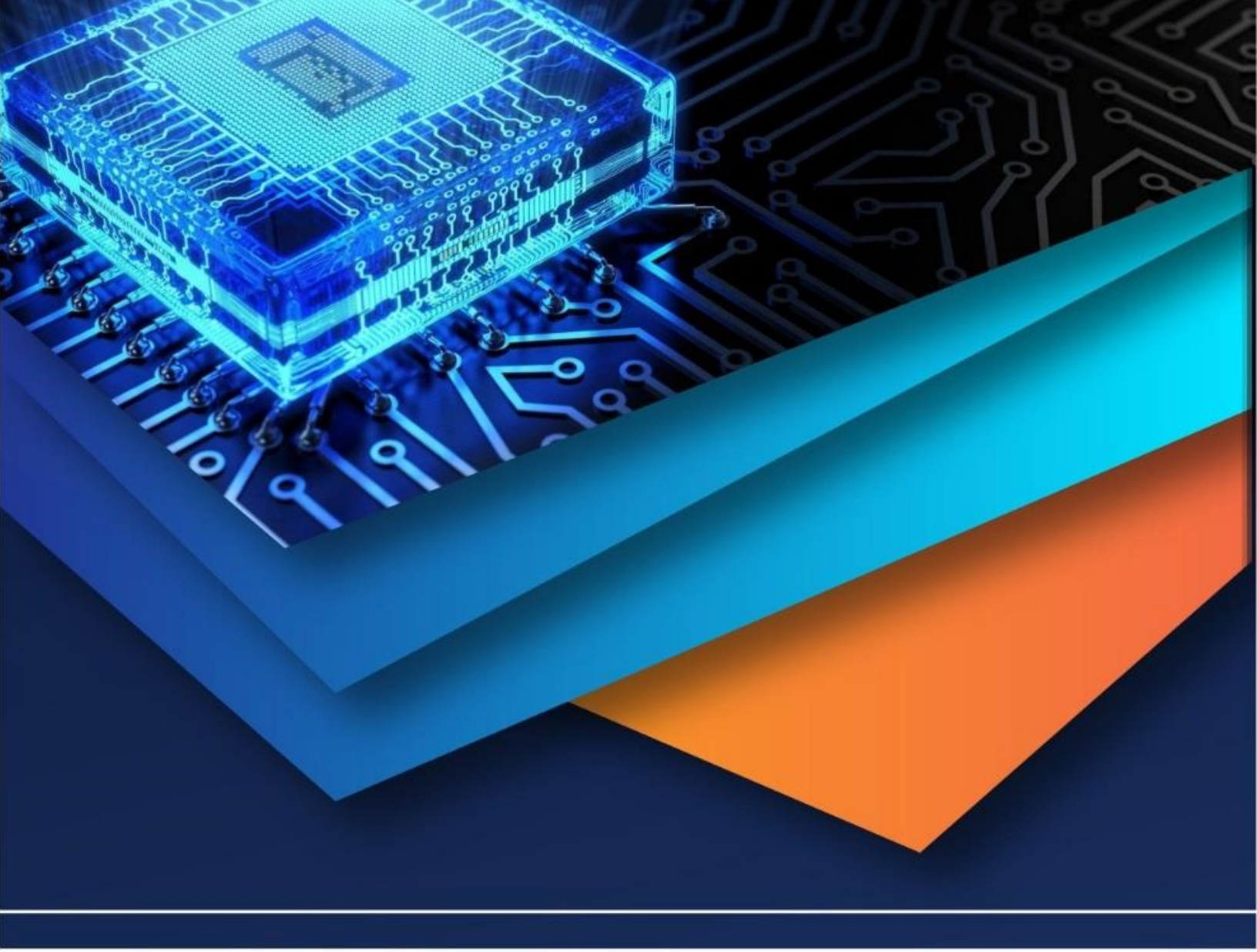
Fig.7 Gate Closed without RFID tag Fig.8 Gate automatically opens when RFID Sensor senses the RFID tag

V. FUTURE SCOPE

The future scope of smart reserve parking system using RFID technology is quite promising, with many potential advancements and improvements on the horizon. Some of the key areas of future development include:
Integration with Smart City Systems: Smart reserve parking systems using RFID technology can be integrated with other smart city systems, such as traffic management systems, to improve overall traffic flow and reduce congestion. This integration could provide real-time information on parking availability and suggest alternative routes to drivers based on real-time traffic data.
Integration with Autonomous Vehicles: As autonomous vehicle technology continues to advance, smart reserve parking systems using RFID could be integrated with these vehicles to allow them to automatically locate and park in available parking spots. This could reduce the time and energy required for drivers to search for parking spaces and improve overall parking efficiency.
Use of AI and Machine Learning: Smart reserve parking systems using RFID technology can be improved through the use of AI and machine learning algorithms. These algorithms can analyze parking usage patterns, predict future parking demand, and optimize parking space allocation to improve overall parking efficiency.
Integration with Mobile Payments: The integration of smart reserve parking systems using RFID technology with mobile payment systems could enable drivers to easily pay for parking using their mobile devices. This could improve overall payment management and reduce the need for physical payment systems, such as cash or credit cards.
Environmental Monitoring: Smart reserve parking systems using RFID technology can be integrated with environmental monitoring systems to detect and report on air quality, noise pollution, and other environmental factors. This could help parking lot operators to identify and mitigate environmental risks associated with parking lots.
Overall, the future scope of smart reserve parking system using RFID technology is quite promising, with many potential advancements and improvements on the horizon. These developments have the potential to significantly improve overall parking efficiency, reduce traffic congestion, and enhance the overall parking experience for drivers.

REFERENCES

[1] Jhonathan J. Barriga, Juan Sulca, and Jose Luis Leon, “Smart Parking : A Litreture Review from Technological Prespective”, Applied Sciences, 2019,
[2] Fadi Al - Turjman , Arman Malekloo , “ Smart Parking in Iot- enabled cities; A survey”, Elsevier , 2019.
[3] Llogari Casas Cambra , Gerard Herrera Sague , “Creating An Interactive Mirror Experience through Web Technologies” , International Journal of Scientific and Research Publications, 2015 , ISSN 2250 - 3153.
[4] M.Y.I. Idris, Y.Y. Leng, E.M. Tamil, N.M. Noor and Z. Razak, “ Car Park System: A Review of Smart Parking System and its Technology”, Information Technology Journal, 2009, ISSN 1812-5638.
[5] Hongwei Wang, M.S., “Reservation Based Smart Parking System” ,University of Nebraska, 2011.
[6] L.Mainetti, L.Patrono, M.L.Stefanizzi, R. Vergallo, “ Integration of RFID and WSN Technologies in a Smart Parking System”,University of Salento Lecce Italy, 2017.
[7] Eirini Eleni Tsiropoulou, John S. Baras, “RFID-based smart parking management system” , Taylor & Francis, 2018, ISSN 2333-5785.



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