SMART PARKING MANAGEMENT SYSTEM USING IOT

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PHASE -1 DOCUMENT SUBMISSION

PROJECT DEFINITION

With growing, Car parking increases with the number of car users. With the increased use of smartphones and their applications, users prefer mobile phone-based solutions. This paper proposes the Smart Parking Management System (SPMS) that depends on Arduino parts, Android applications, and based on IoT. This gave the client the ability to check available parking spaces and reserve a parking spot. IR sensors are utilized to know if a car park space is allowed. Its area data are transmitted using the WI-FI module to the server and are recovered by the mobile application which offers many options attractively and with no cost to users and lets the user check reservation details. With IoT technology, the smart parking system can be connected wirelessly to easily track available locations.

INTRODUCTION

The number of car client's increases was requested more parking spots, and with the growth of the internet of things causes smart urban areas to have picked up grind popularity. In this way, issues, for example, traffic blockage, constrained vehicle leaving offices, and street security are being tended to by IoT. So, several parking organization systems have been organized to decrease such traffic issues and improve the comfort of car users, it has combined smart mobiles, wireless algorithms, and mobile applications. The idea of the Internet of Things (IoT) started with things with Personal communication devices, which the devices could be tracked, controlled to use remote PCs connected with the internet [1]. The Internet of Things (IoT) equals "=' Physical devices, vehicles, structures, and different things implanted with hardware "+" Controller, Sensor, and Actuators "+" organize a network that lets these things to gather and exchange information (Internet) [2]. Sensors are deployed in smart systems, which in turn collect information from the device for processing and analysis .So, Sensors would be deployed in the parking area and through the mobile application for helping the user to know the freedom of parking places on a real-time basis with more efficiency, and less cost [3]. A smart parking system reduces the time to locate available places and reduces fuel consumption. The paper is organized as follows: First, it presents the concept of the smart parking system and its various functions, then its reviews previous research and studies on the implementation of smart parking. Then it describes the system implementation and operation and gives a conclusion of the smart parking application.

SMART PARKING SYSTEM

One of the most important problems facing large cities is congestion and parking . So, using Automated Parking System Management is an efficient technique using the Internet of Things to manage the garage . Smart parking is an electronic tool that enables the user to find vacant parking spaces through information technology and by using appropriate sensors . Among the most used types in smart parking, systems are data routing systems, smart payment systems, and electronic car parks. These types require disclosure of whether parking spaces are vacant or not. With the user registration in the system, a unique identifier is created for him, and with the booking, it has the booking details, and via their smartphones, the entire time, exit time, and money are calculated. The System building consists of, the lowest level, including the functions of sensing, data transmission is created during a middle level, and upper-level deals with the storage and processing information, and user interfaces.

The Problem Definition

People usually travel around within the parking regions trying to find an appropriate place to park in, to solve this problem, the automated car parking system has created. Assistive technology is needed, which may provide parking information for registered customers using smartphones and their applications. Users can obtain the service by registering, and in case of booking, the destination and the estimated time of arrival are determined, and the booking details are sent to the user.

Aim of the project

The smart car parking system is an integrated system to recognize the nearest available parking zone. So, the main purpose of the system is to provide a solution to the parking problem, to reduce the time to search for parking lots, and to eliminate unnecessary travel for vehicles

How Smart Parking Works

Smart parking suggests an IoT-based system that sends data to free and busy parking places via net/mobile applications. The IoT-network includes sensors and microcontrollers, which are found in each parking place. We implemented an enclosed smart parking project (SPMS), that using the Internet of Things and IR sensors, where available parking places can be displayed in a web application, then the user receives a live update about the availability of all parking places and chooses the best one. Smart parking IoT implementation is usually divided into the following

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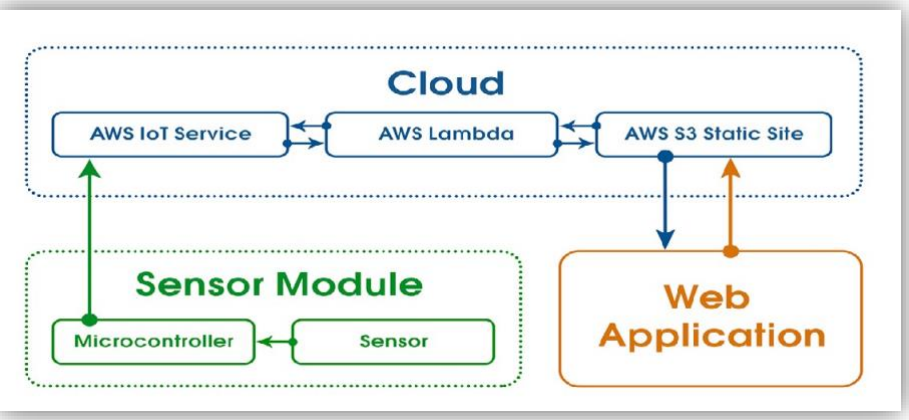
1	**Collection**	The collection depends on parking sensors to collect real-time parking. The parking systems may use sensors like Infrared, and Ultrasonic Sensors detect whether a parking slot is empty or not . Also, an ESP8266 Wi-Fi chip comprises of the TCP / IP protocol, that licenses any microcontroller to contact a Wi-Fi network.
2	**Processing**	The processing unit acts as interference between the sensors and the cloud . It includes an Arduino which is a processor on-chip. All the sensors are wirelessly connected to the processing unit, and data collected from various sensors are sent to it through the esp8266 chip.
3	**Deployment**	It deals with communication methods. Message Queue Telemetry Transport Protocol (MQTT) is a publish-subscribe based messaging protocol that is used on top of the TCP/IP protocol
4	**Services**	It can be made available to users once they finish storing data and monitoring information.
5	**Connection**	Interested in the Internet of Things layer that deals with the database of parked cars through a shared server. The cloud stores data for available parking lots, user sites, profiles, etc. .It keeps a track of each user connected to the system and stores a backup of the information stored in the cloud.
6	**Mobile application**	It is the interface application between humans and the system.

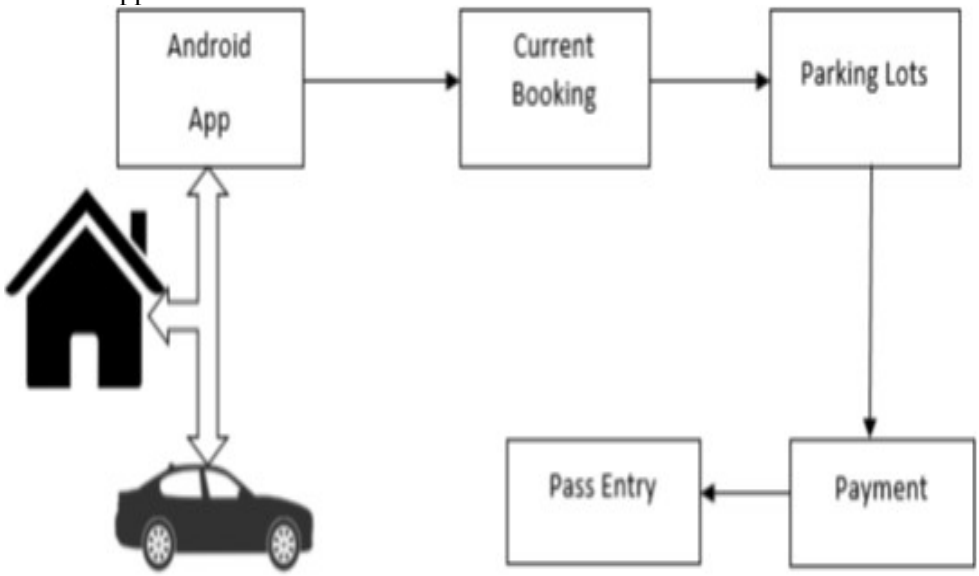


IMPLEMENTATION & WORKING

The Proposed System

Finding a place to park cars involves three-stage. First, the parking area which has Arduino devices along with the sensors to interact between the user and the parking area. The second stage contains the cloud services which act as an intermediary between the user and the parking area. The third

stage is the user side. The user gets a notification of the availability via mobile applications. For each parking region, Arduino sensors are positioned, and the sensors detect the number of parking slots, the number of free, and booked slots. WIFI module is used for communication between the mobile app and sensors.



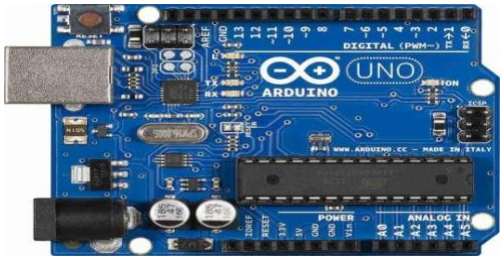
The smart parking implementation

Components of Proposed System

The proposed system works through a set of commands within the Arduino and it needs hardware components to work suitably.

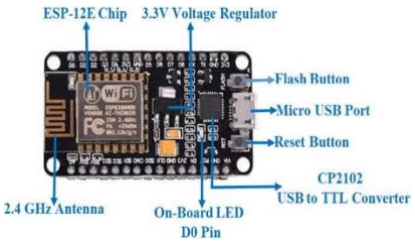
Hardware Components& Circuits

Arduino is a project created by the largest technical community of engineers and developers to develop interactive control projects using various types of electronic boards programmed with free programming language .



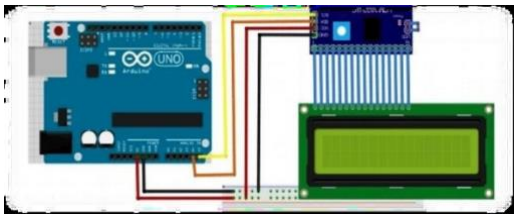
GSM Module is a circuit which is used to set up communication between mobile phones and microcontroller. It is used to send SMS, MMS, and voice messages through a mobile network .

Node MCU is an open-source Lua built firmware and development board targeted for IoT based applications, that relies on the ESP8266 Wi-Fi, and the ESP-12 module .

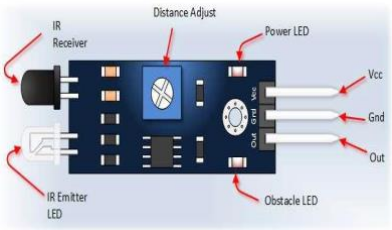


LCD DISPLAY UNIT

16×2 LCD Display with I2C is an electronic display module that produces a visible image that can display up to 32 characters on a single screen [28]. LCD Display uses many numbers of Pins of Arduino for connecting Inter-integrated Circuit (I2C). It decodes the data received from the I2C Bus into Parallel data that is required for the LCD Display.



1. TCRT5000 Circuit: An Infrared (obstacle sensor) uses to detect the presence of the object or any other reflective surface in front. Its package has a Photodiode that uses to generate an IR signal and a Phototransistor which can be used to read the IR signal that is reflected [29]. The obstacle detected if the reading of the IR sensor is “0”.



2. A servo motor is a motor with a gearbox and a Shaft transmission that gives motion greater torque and greater precision [30]. When the engine is pulsed at a certain time, the engine rotates the angle according to that time.

A servomotor

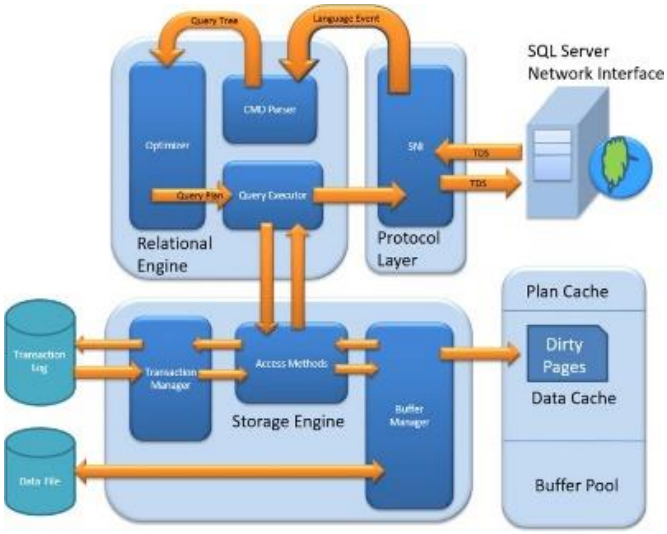
Piezoelectric Sensor converts physical parameters, for example, acceleration, strain, or pressure into an electrical charge which can then be measured .

Piezoelectric Sensor

Second: Software Components & Circuits

Arduino IDE supports the languages C and C++ using distinct guidelines of code architecture, which stores a software library from the wiring project, which runs common input and output procedures.

MS SQL Server is a client-server architecture that accepts, processes, and replies to the client request with processed data.



CONCLUSION:

The services provided by smart parking have become the essence of building smart cities. This paper focused on implementing an integrated solution for smart parking. The proposed system has several advantages, including detecting parking spaces using the Internet of Things and calculating the time of entry and exit and calculating the expected cost. An attractive and effective application was designed for Android mobile phones. The system benefits from avoiding wasting time and reducing pollution and fuel consumption. Users can book a car park for 24 hours.