

IoT Based Smart Car Parking System

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Abstract- In the current era the number of vehicles is increasing day by day. Parking vehicle in metropolitan cities has created havoc indeed that has created a major problem to park their vehicles in designated place which leads to traffic congestion during peak hours. Which leaves the user to search for their parking? This paper resolves the issue of parking system and has come up with IOT (Internet Of Things) enabled parking space and allocation mechanism. Smart parking involves use of ultrasonic sensor, Arduino Uno and cloud server. This system will be accessible through a android application to monitor the vacant slots available in parking area. This enables interaction between smart parking system and the user. it proposes to implement the parking system based on reservation. Every user has a unique OTP to occupy their own reserved slot.

Keywords- IOT (Internet Of Things), Android application, OTP, Arduino Uno ,Ultrasonic sensor ,cloud server.

I. INTRODUCTION

As quote says " why walk when drive " that is when journey on wheels started and which has created hard ongoing problem to park vehicles into parking slots.in urban cities as population is going on increasing the production of vehicles has also increased but parking space available has become congested to park N number of vehicles out of that people are finding it a great problem to search the available space during peak hours and festive times which consumes lot of energy and waste valuable time which is a major drawback, in order to replace the above issue .Internet of things was first introduced in 1999 at auto ID center and first used by Kevin Aston. As evolving this latest burning technology, it promises to connect all our surrounding things to a network and communicating with each other with less human involvement. Still internet of things is in beginning stage and there is no common architecture exists till today [1]. There is lot of researches and implementations are currently being going on in all the respective areas. Thus there is no guidelines or boundaries exists to define the definition of internet of things. So depending on the context, application the internet of things has different definitions. Shortly it is defined as the things present in the physical world or in an environment are attached with sensors or with any embedded systems and made connected to network via wired or wireless connections [2], [3]. These connected devices are called as smart devices

or smart objects. And it consists of smart machines which communicating interacting with other machines, environment, objects etc. And also it incorporates to connect any two machines, machine to human and vice versa etc. IOT technology grows in various fields of smart applications but we have not yet found boundary constraints of this technology. Some smart applications which it has implementing currently such as on smart grids, smart lighting, smart energy, smart city, smart health etc. This is broadly classified into three categories such as sensing, processing and connectivity. Whereas sensing includes sensing the speed of vehicles and humans or any objects (accelerometer), sensing of temperature, pressure etc. [9]. And these can be processing by using some processors such as network processor, hybrid processor MCU/MPU etc. And the devices are connected by using some technologies called GPS, Wi-Fi, BT/BTLE, RFID etc.

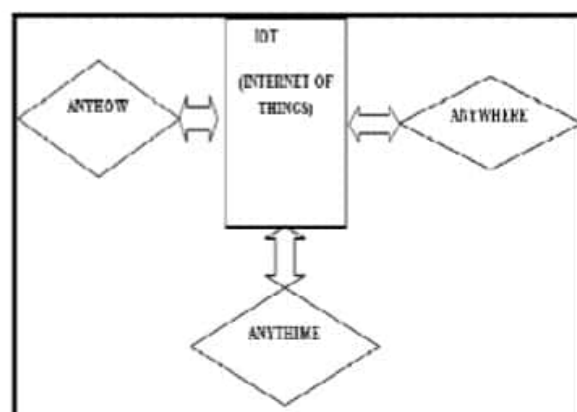


Fig. 1 Block diagram of IoT Applications

II. LITERATURE SURVEY

The parking scheduling is converted into an off-line problem. The offline problem is described as a linear problem. The linear problem was solved using an algorithm. Finally, experimental simulations were done. However, this paper does not deal with the guiding of vehicles. Paper [2] proposes a solution for parking lot based on wireless sensor network and radio-frequency identification (RFID). The paper [2] however does not deal with a large-scale parking lot. Paper [3] has proposed a parking system based on ZigBee network. Here, a web service is used to collect information about the parking space. Our approach is based on 8051 type microcontroller that is Arduino microcontroller, Arduino runs with Arduino IDE application that should be installed in system. We do

simple embedded C code in microcontroller and directly put it into the Arduino system. We do simple embedded C code in microcontroller and directly put it into the Arduino microcontroller. Hence, it works according to code system keeps track of number of cars entered in parking building. The counting will be display using liquid crystal display board.

III. PROPOSED SYSTEM

The proposed system is the combination of the hardware and software to form a complete module. Exchanging of all the information or data between mobile and sensor circuitry is done by CLOUD [5]. The algorithm defining the parking slot allotment is as follows: Initially selection & checking for car parking is made from mobile or computer using cloud. Checks for availability for parking slots S1, S2, S3, S4. If parking slot is free, the particular slot on HTML page will be Green. If All parking is full, All the slots on HTML page will be RED and a pop up will be generated "Parking Full". The hardware unit for the prototype of the system is represented by the block diagram. It contains an Arduino microcontroller as the main processing unit and it gets inputs from the IR sensors which guide the user to know the empty parking space, [5] LDR is a light dependent resistor which sends an alert pop-up when the darkness increases, temperature sensor i.e. LM35 monitors the parking areas temperature. The data obtained from these sensors is fed to the microcontroller. The microcontroller is programmed in such a way that if any one of the sensor senses the vehicle then the corresponding output is sent to the cloud, through protocol & various layer of OSI model which we can access the data on our mobile through an app or through a html page on the computer and view the parking lot of any locality to get the empty parking slot [6].

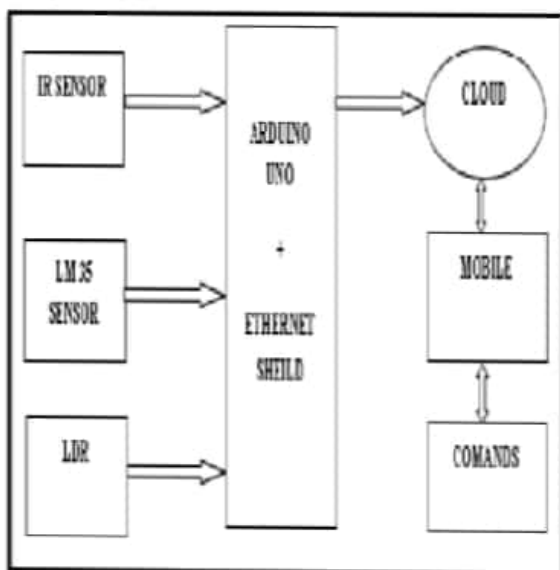


Fig. 2 Block diagram of proposed system.

Details of the components

Arduino

The Arduino Uno is a microcontroller board. It is used ATmega328p. Arduino Uno have 14 input/output pins and output pin (PWM outputs as of which 6 can be used) and 6 analogy inputs. The Arduino Uno circuit acts as an interface between the software part and the hardware part of the project. Arduino board is one type of microcontroller. It is able to read input like light sensor, detect motion and gives an appropriate output on it. Arduino works like a brain so here we can store programs code.



Fig.3 Image of Arduino

Ethernet Shield

Ethernet shield it is used for connecting Arduino to internet. This shield allows us to exchange data worldwide through the internet connection. We can use this stuff in controlling the robot or many things with a speed of 10/100 MB. It comes under Arduino Ethernet library.

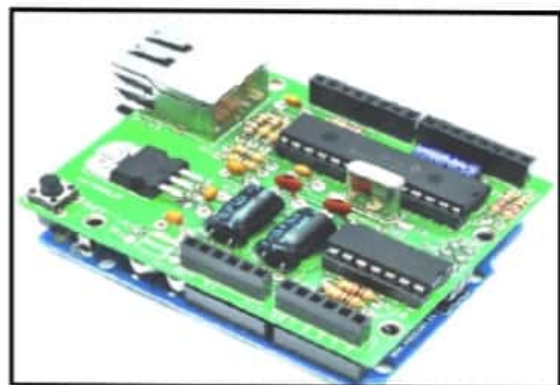


Fig.4 Image of Ethernet Shield

RFID

A Radio Frequency Identification Tag (RFID) tag is an electronic tag that exchanges data with a RFID reader. Here

we are going to use Active tag of RFID. While RFID's original uses were primarily for inventory tracking in retail environment, this technology has quickly created a presence in an extremely diverse number of fields including easy gas payment, credit card replacement. RFID tag has chip, memory and an antenna.

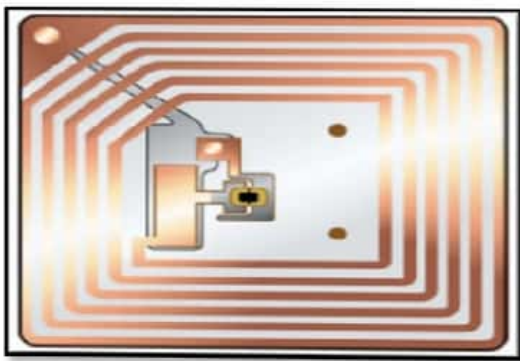


Fig.5 Image of RFID

IR Sensor

An IR sensor is an electronic device that emits to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only IR radiation rather than emitting it, that is called as a passive IR sensor.



Fig.6 Image of IR Sensor

Advantages

The importance of smart parking is:

- Accurately sense and predict spot/vehicle occupancy in real-time.
- Guides residents and visitors to available parking spot.
- Optimize Parking Space Usage.
- Simplifies the parking experience and adds value for parking stakeholders, such as merchants and drivers.
- Helps the free flow of traffic in the city leveraging IoT technology.
- Enables intelligent decisions using data, including real-time status applications and historical analytics reports.
- Smart Parking plays an important role in creating better urban environment by reducing the emission of CO₂ and other pollutants.

- Smart Parking enables better and real time monitoring and managing of available parking space which results in significant revenue generation.
- Provides tools to optimize workforce management.

IV. CONCLUSION

The smart parking system based on IoT concept has been implemented using various sensor circuitry and cloud (server). It is an efficient system for car parking which prevails traffic congestion. This work is further extended as smart car parking system with automatic billing system also fully automated system using multilayer parking method. Safety measures such as vehicle no. tracing, driver face recognition. Also care has taken so that there is no malfunction of wrong vehicle entering into the allocated slot by providing an unique OTP to each person and ensuring the same person parks in the given slot.

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