# AUTOMATIC FREE PARKING SLOT STATUS INTIMATING SYSTEM

**E.Anitha[1] , Anitha M.A[1], N.Blessita Gracelyn[1], S.T. Santhanalakshmi[2]**

[1,2] *Dept. of Computer Science and Engineering, Panimalar Engineering College,Chennai-600 123, INDIA.*

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**Abstract -** *Internet of Things (IOT) plays a significant role in connecting the encircling environmental things to the network and created simple to access those un-internet things from any remote location. It's inevitable for the folks to update with the growing technology. and usually folks face issues on parking vehicles in parking slots in a very town during this study we have a tendency to style a Smart Parking System (SPS) that permits the user to seek out the closest parking lot and offers handiness of parking slots in this several parking lot. And it primarily specialize in reducing the time to find the parking tons and conjointly it avoids the spare traveling through stuffed parking tons in a very parking lot. so it reduces the fuel consumption that successively reduces carbon footprints in an environment. we have a tendency to propose a wise parking system detection and finding the put location of a consumer's vehicle mistreatment ultrasonic sensing element and uploaded knowledge to the IOT. The planned system detects vehicles in indoor and out of doors parking fields, accurately.*

***Key Words***: **Internet of Things(IOT),Smart Parking System (SPS), Ultrasonic sensing element.**

## 1.INTRODUCTION

Recently, IoT(Internet of Things) has studied within the varied application fields of human elbow room. IoT relies on the good sensors and therefore the middleware for connecting between shoppers and terminal devices. It will offer the general public with the fascinating data regarding varied things deployed in our close setting above all, the smart parking system is one in all the most comes for IoT. In gift parking management systems , only the administrator has data regarding the parking areas occupied by vehicles. Since the present parking system cannot use the active data exchanging, it didn't offer useful parking data for drivers. to resolve this downside, smart sensors and therefore the middleware for handing them square measure required. The vehicle parking location service has been planned on the exploitation of RFID devices. during this service, the drivers have to be compelled to receive associate RFID tack on the doorway of parking zone. The tag provides the vehicle location service for drivers through the RFID reader of car parking zone. However, this approach is inconvenient as a result of the driving force should receive the RFID tag in the entrance. additionally, the price for RFID tag is required .In this paper, we tend to propose a replacement good parking system to solve the matter of the exiting parking systems supported the wireless detector network and Bluetooth of smartphone. The proposed system uses supersonic sensors for indoor parking lots and a magnetic detector for outside parking heaps. For the location service of parking vehicles, the Bluetooth and USIM ID square measure exploited. supported the smartphone, the planned system not solely provides the convenience for customers however system not only provides the convenience for consumers but also contributes to low implementation cost compared to the previous RFID tag method.

### 1.1 HARDWARE DESCRIPTION

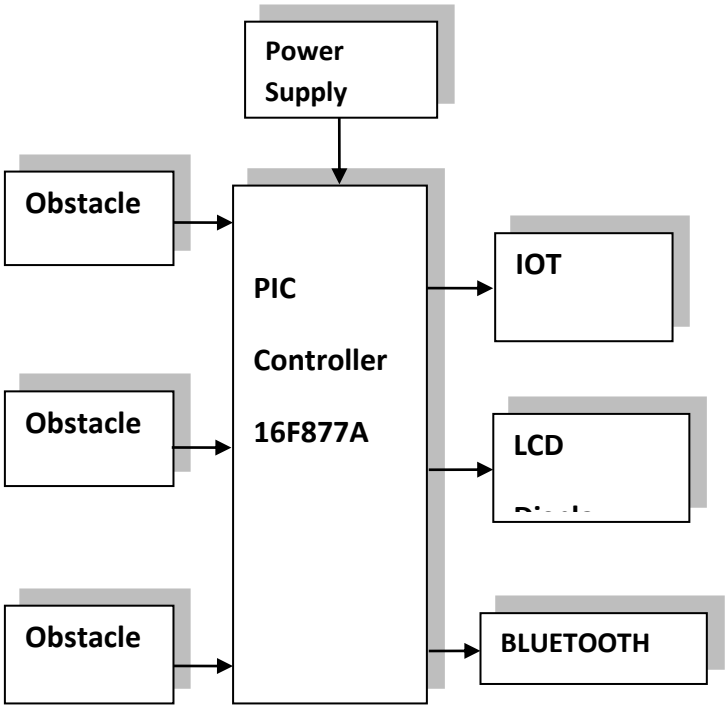


**Fig -1**: Block diagram of parking system

### 2.1 Hardware Architecture

The hardware of smart parking system is composed of the wireless sensor motes, gateway, and server. The sensor motes are deployed on the parking lot, which are monitoring the vehicle existence on each parking slot and are sharing with customer smartphone. The gateway is in charge for the data transmission to server. The sensor motes are constructed with MicaZ product involved in Atmega 128L MCU. We made the indoor motes with ultrasonic sensor and the outdoor motes included magnetic sensor. All motes have the BLE module.

### 2.2 IOT

The internet of things (IoT) is that the network of physical devices, vehicles, buildings and alternative things embedded with natural philosophy, software, sensors, actuators, and network property that modify these objects to gather and exchange knowledge. In 2013 the Global Standards Initiative on web of Things (IoT-GSI) outlined the IoT as "the infrastructure of the data society. The IoT permits objects to be perceived and controlled remotely across existing network infrastructure, making opportunities for a lot of direct integration of the physical world into computer-based systems, and leading to improved potency, accuracy and economic profit. once IoT is technologies like good grids, good homes, intelligent transportation and good cities. every factor is unambiguously recognisable through its embedded ADPS however is in a position to interoperate at intervals the existingInternet infrastructure. specialists estimate that the IoT can carries with it virtually fifty billion objects by 2020.increased with sensors and actuators, the technology becomes AN instance of the a lot of general category of cyber-physical systems, that additionally encompasses

### 2.3 Ultrasonic Sensors

Ultrasonic sensors (also called tranceivers after they each send and receive) work on a principle just like radar or sonar that measure attributes of a target by decoding the echoes from radio or sound waves severally. ultrasonic detectors generate high frequency sound waves and measure the echo that is received back by the sensor. Sensors calculate the measure between causing the signal And receiving the echo to work out the gap to an object.This technology may be used for measuring: wind speed and direction (anemometer), fullness of a tank, and speed through air or water. For activity speed or direction a tool uses multiple detectors and calculates the speed from the relative distances to particulates within the air or water. To live the number of liquid in a very tank, the sensor measures the gap to the surface of the fluid. any applications include: humidifiers, sonar, medical prenatal diagnosis, thief alarms, and non-destructive testing. Systems generally use a transducer that generates sound waves within the ultrasonic vary, above 20,000 hertz, by turning power into sound, then upon receiving the echo flip the sound waves into power which may be measured and displayed. The technology is restricted by the shapes of surfaces and therefore the density or consistency of the fabric. as an example foam on the surface of a fluid in a very tank might distort a reading.


**Fig. 2**. Ultrasonic sensor

### 2.4 LCD

The lcd commonplace needs three management lines and eight I/O lines for the information bus.

• eight information pins D7:D0

Bi-directional data/command pins. Alphanumeric characters are sent in American Standard Code for Information Interchange format.

• RS: Register choose

RS = zero -> Command Register is chosen

RS = one -> information Register is chosen

• R/W: scan or Write

0 -> Write, one -> scan

• E: alter (Latch data)

Used to latch the information gift on the information pins.

A high-to-low edge is required to latch the information

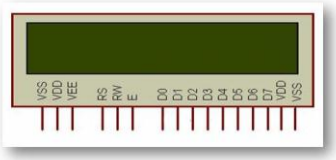


**Fig.3**. LCD

## 3. SOFTWARE TOOLS

### 3.1 Software Architecture

TinyOS is used to control the Bluetooth module, a magnetic sensor, and an ultrasonic sensor. Fig. 2 shows the software architecture for smart parking system. The mote installs PkSensorMote which controls an ultrasonic sensor and a magnetic sensor and transmits the collected data to the gateway. The BaseStation module is installed on the gateway. This module receives the data from the radio communication and sends them to the Parkinglot Monitor module on the Host PC. The Parkinglot Monitor module records the received data to the database and monitors the parking lot state on real-time. The smartphone application can communicate with sensor motes on parking lots by using Bluetooth. This application can transmit their USIM ID to the server and receives their vehicle location information from the database through the Internet.

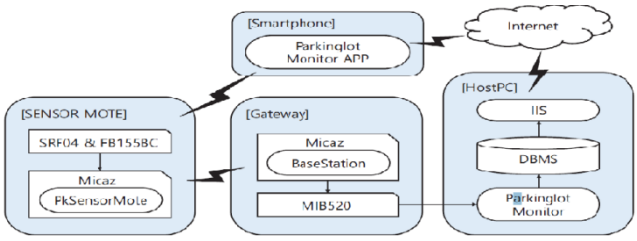


**Fig. 3.** Software architecture.

### 3.2 Embedded systems

As time progressed, use of microprocessor-specific assembly-only as the programming language reduced and embedded systems moved onto C as the embedded programming language of choice. C is the most widely used programming language for embedded processors/controllers. Assembly is also used but mainly to implement those portions of the code where very high timing accuracy, code size efficiency, etc. are prime requirements. Initially C was developed by Kernighan and Ritchie to fit into the space of 8K and to write (portable) operating systems. Originally it was implemented on UNIX operating systems. As it was intended for operating systems development, it can manipulate memory addresses. Also, it allowed programmers to write very compact codes. This has given it the reputation as the language of choice for hackers too.

As assembly language programs are specific to a processor, assembly language didn't offer portability across systems. To overcome this disadvantage, several high level languages, including C, came up. Some other languages like PLM, Modula-2, Pascal, etc. also came but couldn't find wide acceptance. Amongst those, C got wide acceptance for not only embedded systems, but also for desktop applications. Even though C might have lost its sheen as mainstream language for general purpose applications, it still is having a strong-hold in embedded programming. Due to the wide acceptance of C in the embedded systems, various kinds of support tools like compilers & cross-compilers, ICE, etc. came up and all this facilitated development of embedded systems using C.

### 3.3 MPLab

Microchip encompasses a giant suite of computer code and hardware development tools integrated inside one computer code package known as MPLAB Integrated Development setting (IDE). MPLAB IDE may be a free, integrated toolset for the event of embedded applications on Microchip's PIC and dsPIC microcontrollers. it's known as AN Integrated Development setting, or IDE, as a result of it provides one integrated setting to develop code for embedded microcontrollers.

MPLAB IDE runs as a 32-bit application on MS Windows, is simple to use and includes a bunch of free computer code elements for quick application development and super-charged debugging. MPLAB IDE additionally is one, unified graphical program for extra micro chip and third party computer code and hardware development tools. Moving between tools may be a snap, and upgrading from the free computer code machine to hardware rectify and programming tools is completed in a very flash as a result of MPLAB IDE has constant program for all tools.

## 4. OPERATIONS OF SMART PARKING SYSTEM

### 4.1 Vehicle Identification and Location Recognition

To inform the vehicle parking location for users, firstly the available states of each slot in parking space are identified. The ultrasonic sensor emits the ultrasonic to the objectives and can measure the distance to them as using the echo waves. We installed an ultrasonic sensor on the ceiling of a parking slot and measure the distance until the bottom. The distance between the ceiling and bottom is regarded as the basic distance value. If a vehicle occupies a parking slot, the new distance is measured between the ultrasonic sensors on ceiling and the vehicle hood. The difference of distances let us identify the existence of vehicle on the parking slot. Since an ultrasonic sensor is very sensitive to the rain, snow, and dust, some problems are occurred in outdoor environment. Usually, vehicles are made up the parts over 100 involved in magnetic materials. Due to magnetic property in vehicles, the magnetic sensor can detect the movement of vehicles. The magnetic sensor in our sensor mote can measure the three axis of magnetic wave, so it can detect the vehicle entering into the parking slot with reliability [7, 8, 9]. To identify the vehicle of customer in the parking lot, we need the unique value to each customer. In this research, as the unique ID, the USIM ID of customer smart phone can be exploited. As the ID of USIM chip and the ID of sensor mote transmit to the server, the vehicle of each customer is identified. To transmit the USIM ID to the sensor mote, we choose the BLE. In our research, to transmit the USIM ID without errors, we choose the sensor mote near to the customer's smart phone. To choose the best mote among the customer surrounding sensor motes, we exploit the RSSI (Received Signal Strength Indication) of BLE .The RSSI values measured in three sensor motes, called as C2, C8, C9. They are installed on the ceiling of 2.6 meter height, and deployed with 2.3 meter interval each other. The test vehicle parks under the C9 mote. We can find that the RSSI values form the C9 mote are higher than those of C2, C8 motes, because the vehicle is located close at the C9 mote.

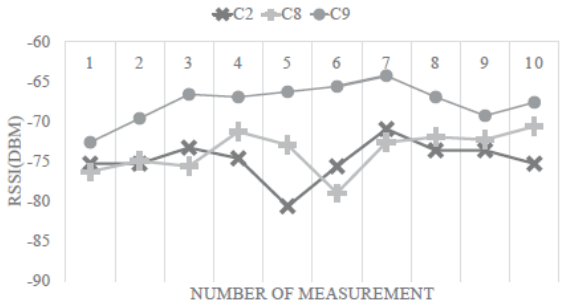


**Chart -1** RSSI measurement from 3 sensor motes.

### 4.2 Consumer Service Procedure

As the consumer parks the vehicle in the parking slot, the sensor mote detects the vehicle entering in its sensing area. Next, the consumer connects his/her smartphone to assigned sensor mote via BLE connection, and sends the USIM ID. If the consumer requests the location of vehicle using the smartphone, the smartphone sends its USIM ID to the server. The server can find the vehicle location in parking lot using USIM ID.

## 5. CONCLUSION

In this paper, the smart parking system was proposed on the Bluetooth communication between the smart phone and wireless sensor motes. It supported the identification of entering and leaving vehicles in parking slot and memorized the vehicle parking location. Since the smart phone is used, the customer has the convenient service for vehicle parking location. In our experiments, the proposed system had shown the accurate parking location service in parking lots. Compared to the previous method, the proposed system supported the low implementation cost. For the future work, the more accurate RSSI measurement method will be studied, and the additional applications for smart parking space are developed, such as accident alarm, reservation for parking slot, and so on.

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