Smart Parking System Using MITAppInventor And ThingSpeak

Harichandana B S S - 15IT118
Information Technology
National Institute of Technology Karnataka
Surathkal, India 575025
Email: bh.sschandana@gmail.com

Raut Kajal Dattatray - 15IT153
Information Technology
National Institute of Technology Karnataka
Surathkal, India 575025
Email: kdraut2015@gmail.com

Badri Ravali - 15IT207
Information Technology
National Institute of Technology Karnataka
Surathkal, India 575025
Email: ravali1197@gmail.com

Megha C Savalgi - 15IT220
Information Technology
National Institute of Technology Karnataka
Surathkal, India 575025
Email: maggihp.savalgi@gmail.com

***Abstract*—Around the world, thousands of businesses and public authorities that offer car-parking facilities are constantly striving to improve quality, convenience and choice. India is facing a new problem nowadays lack of sufficient parking space. With families getting smaller and the total number of motor vehicles exceeding the total number of heads per family, the parking scenario is woefully falling short of the current requirements in the country. The situation is such that on any given working day approximately 40% of the roads in urban India are taken up for just parking the cars. The problem has been further exacerbated by the fact that nowadays even people from low income group are able to own cars. The number of families with cars has become much more than what the country is able to manage. In this paper, we suggest a possible solution to overcome problem with parking slots for vehicles. The main goal is to allow user to see availability and book parking slots before reaching the destination.**

I. Introduction

Current parking planning practices are inefficient and often ineffective at solving parking problems. Conventional parking planning tends to focus primarily on quantity. It assumes that, when it comes to parking, more is always better, and there can never be too much. This type of planning relies primarily on generous minimum parking requirements and public subsidies to provide abundant parking supply.

Innovative solutions can help reconcile this conflict. Parking management includes various policies and programs that result in more efficient use of parking resources. It means, for example, that a parking facility serves multiple destinations, that the most convenient spaces are managed to favor priority uses (such as deliveries and quick errands), and that motorists can easily obtain information on parking location and price. This squeezes more value from each parking space and reduces the amount of parking needed to serve an area.

Every day vehicle drivers have to find a vacant parking space especially during the rush hours. It is time-consuming and it is leading to more traffic, and air pollution. Cities noticed that their drivers had real problems to find a parking space easily especially during peak hours, the difficulty roots from not knowing where the parking spaces are available at the given time. Even if this is known, many vehicles may pursue a small number of parking spaces which in turn leads to traffic congestion.

II. Literature Survey

Since a lot of difficulties for parking and finding parking area is present, many different models are proposed for this issue. In [5] , a model which informs the drivers about the parking slots in the garage by monitoring and managing vehicles in the parking slot. It informs the drivers about the number of empty and available parking slots and also directs them towards the slot. this model makes use of the original WSN and also implements FID and ZigBee technology.

In another paper [6] , a design which uses ARM8 microcontroller for smart parking guidance and also information system which can be run on any embedded system is proposed.This paper also suggests an important and unique feature like getting the status of the parking slot on the internet or web and can update particular time. The free slots for parking are found using a webcam . It captures slots and displays it on touch screen. It will display red color box on LCD if any car is present in the slot. If the slot is free it will display empty slot number. Any person can book the slots using SMS.

Yee H.C & al in [8] have proposed an intelligent and secure parking slots reservation system which is using GSM technology. This model has two modules parking lot monitoring and security reservation module. This work also poposes the use of password for in and out. Pic Microcontroller, LCD and Visual Basic are the main hardware components used to inform the driver. If the password is wrong, motor driver controls the barrier which prevents the driver from parking.

[9] proposes a monitoring parking slot system based on wireless technologies. The model has two modules: monitoring

and master modules. The vehicle's presence is detected by using digital infrared sensors interfaced with the microcontroller. ZigBee will receive status and master module will check for the vacant places in parking.

In [4] , the design and implementation of a smart parking system using wireless sensor networks and which permit the vehicle drivers to get the location of the free parking slots is proposed. This is based on WSNs,Central Web-Server, Embeded Web-server and Mobile application. The state of the parking slot can be detected by the driver using mobile with the help of sensors in each parking slot which keep track of the state of the slot and report it to embedded web-server and finally the information is sent to central web-server using Wi-Fi networks. One disadvantage is The driver cant make a reservation in mobile interface. Our paper takes the basic idea and further extends it by implementing an automatic billing system and includes OTP verification as well.

III. Problem Statement

The paper is aimed to provide solution for vehicle parking problem by making use of a mobile application which allows drivers to book empty parking slots and provides billing system as well.

A. Objectives

Objectives

- Monitoring the status of the parking slots
- Reading and updating sensor values in ThingSpeak
- Reflecting the changing status of parking slots in mobile app
- Booking and cancellation of empty parking slots
- Providing automatic billing system

IV. Methodology

The project suggest solution for parking slot problem. MITAppInventor is used to build an user friendly mobile application to make it easy for drivers to book empty parking slots. LDR sensors are used to keep track of status of slots. The data sensed and collected from LDR is updated on ThingSpeak channel.

A. Hardware Set-up

The hardware components used for this project are :

- Wemose
- LDR sensors
- Breadboard
- Connecting wires and USB cable

The Fig.1 shows the LDR sensor and structure of connections to be made with wemose. In this project, we use 5 LDR sensors to keep track of 5 parking slots. LDR sensors are connected to wemose(ref. Fig.1) by connecting wires and breadboard. USB cable is used to connect wemose to computer/laptop. We upload program(ref. algorithm1) to wemose using Arduino software.

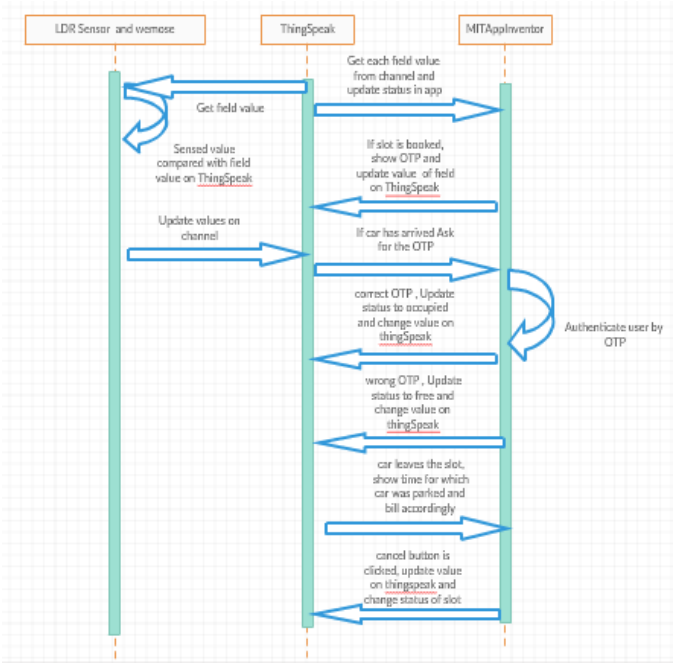

Fig. 1. Sequence Diagram

Fig. 2. LDR sensor

Fig. 3. ThingSpeak Interface

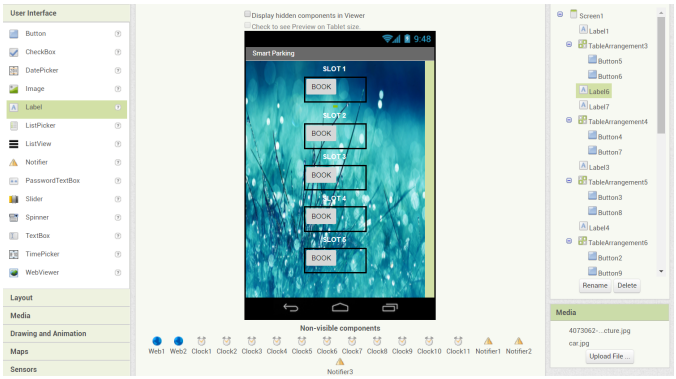

Fig. 4. MITAppInventor Interface

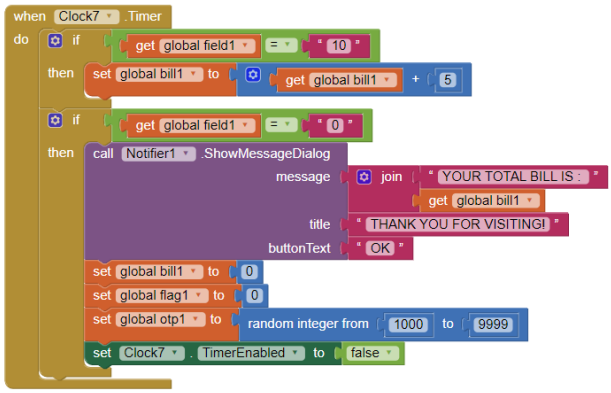

Fig. 5. Billing System

B. MITAppInventor

A user friendly application is built using MITAppInventor. The application provides user with options for booking of free slots and cancellation of booking. Whenever a user wants to book a parking slots, he/she would choose to book from the available empty parking slots. The user is provided with the option to cancel the previous booking, if any. At the time of booking the parking slot, user is given an OTP that must be remembered by the user to park his/her vehicle after arrival. After the user arrives at the parking slot he/she asked to enter the OTP given at the time of booking to ensure that the slot was booked by the same user. The billing system for parking slots starts as soon as vehicle is parked at the slot. The bill is charged based on the time the parking slot was used. When the user removes his/her vehicle, he/she is provided with bill to pay. And the status of the slot is changed back to empty to allow other users to book it.

C. ThingSpeak

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud. We use ThingSpeak to store the values we got from LDR sensors, also we read the values to update the status of paking slot in mobile app.

Algorithm1 (Arduino) :
Set-up the hardware connection as mentioned in above subsection.
1: WriteAPI = ThingSpeak write API key
2: ReadAPI = ThingSpeak read API key
3: Username and password to connect to internet (wifi/enthernet) *4:* SensorValue = Read sensor value
5: if (SensorValue is less than Threshold)
Update the value in thingSpeak and Mark the slot as empty.
else
Update the value in thingSpeak and Mark the slot as occupied.

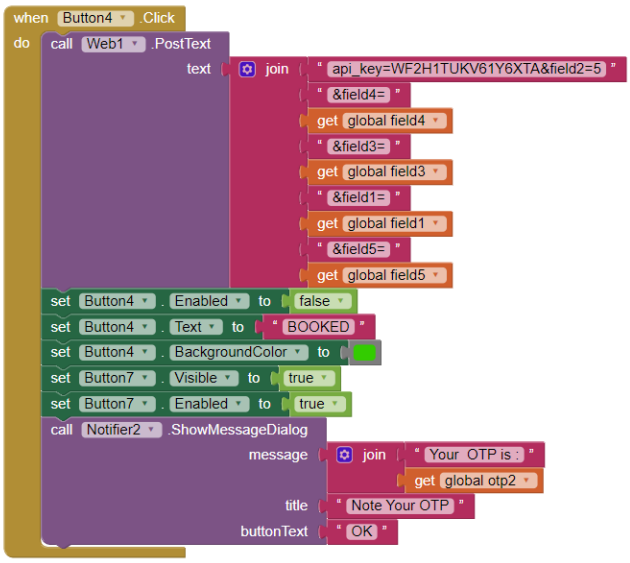

Fig. 6. OTP

D. Work Done

The working of the proposed system is as follows: Firstly, the LDR sensors are placed between each parking slots. Whenever a car arrives near the slot, the ldr sensor senses a change in the light intensity and updates this value in the ThingSpeak through a wemos using Wifi. ThingSpeak maintains the status of each slot through different fields in the channel, each field representing status of a particular slot. The field value 0 indicates empty parking slot, 5 indicates that that particular slot is unoccupied but has been booked by some user using the mobile app while the value 10 indicates that the slot has been occupied . These changes ae continuously monitored by the mobile applicatication built using MITAppInventor. Any change is reflected in the app:
a) If the slot is empty, then the button's color turns White and the text valueof the button is changed to "Book" indicating availability to book the slot.
b) If the slot is already booked by some other user , then the

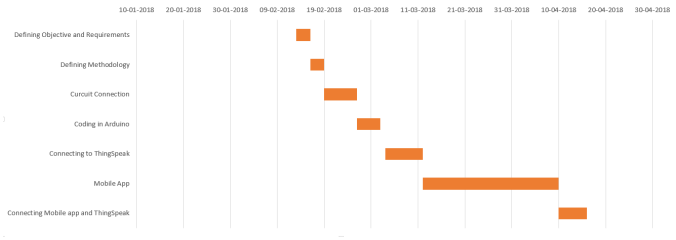

Fig. 7. Gantt chart

color code is green with the text as ”Booked” and the button is disabled. If the same user has booked a slot then cancel option is also availability.
c) If the slot is already occupied, the color of the corresponding button is changed ro red with the text value as ”Occupied” and the button is disabled.
Whenever a user Books a slot , The Booking function is also reflected in the ThingSpeak channel of that particular slot and He/she is provided with a OTP. When that user arrives at the slot , he/she has to enter the OTP for verification . This prevents any other user from entering the parking slot.If the user enters the correct OTP code, the timer is triggered to keep trackof the toatal time the vehical has been parked. This is then used to calculate the total amount that the user should pay. This amount is displayed to the user along with the total parking time.

V. Results and Analysis

This paper proposes an algorithm which results in reducing the time taken by drivers in searching for an empty parking slot and also manages the parking space. Thus, human intervention is not required to direct drivers for parking. This reduces the overall effort required in the paking process and also due to automatic billing system, fair service is provided for all.

VI. Conclusion

It has become important to solve problem of vehicle parking system as vehicles are increasing in number day by day and space to park them is reducing at the same time. This paper suggest one of the easy solutions that can be used to solve this problem with parking slots. As we have mentioned in the paper, it is very easy and cheap to set-up the system and it’s effective as well. It uses modern method for authentication of users like OTP , easily available services like ThingSpeak, MitAppInventor and Arduino. Thus, we can say this solution can be used, extended and implemented on large scale to solve paking problems in future.

Induvidual contribution

The work was divided into four equally important parts as Hardware, MITAppInventor background work, interface between MITAppInventor and ThingSpeak, interface between Arduino and ThingSpeak.

MITAppInvetor background work was done by Harichandana(15IT118), Hardware connection and working was handled by Ravali(15IT207), Interface between Arduino and ThingSpeak was implemented by Kajal(15IT153), Interface between MITAppInventor and ThingSpeak was implemented by Megha(15IT220).

References

[1] Yang, J., Portilla, J., & Riesgo, T. (2012, October). Smart parking service based on wireless sensor networks. In IECON 2012-38th Annual Conference on IEEE Industrial Electronics Society (pp. 6029-6034). IEEE.

[2] Patil, M., & Bhonge, V. N. (2013). Wireless sensor network and RFID for smart parking system. International Journal of Emerging Technology and Advanced Engineering, 3(4), 188-192.

[3] P.DharmaReddy, A. RajeshwarRao, Dr. Syed Musthak Ahmed (2013). An Intelligent Parking Guidance and Information System by using image processing technique. International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 10, October 2013

[4] Rahayu, Y., & Mustapa, F. N. (2013). A secure parking reservation system using gsm technology. International Journal of Computer and Communication Engineering, 2(4), 518.

[5] Yee, H. C., & Rahayu, Y. (2014). Monitoring Parking Space Availability via ZigBee Technology. International Journal of Future Computer and Communication, 3(6), 377.

[6] https://www.instructables.com/