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Smart Car Parking System Based on IoT Concept

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Abstract: *A major problem in day to day life is parking of vehicles especially the car parking at an appropriate place. And this issue indirectly leads to traffic congestion. This paper presents the basic concept of using server or cloud based smart parking services in smart cities as an important application of the Internet of Things (IoT) paradigm. This system will be accessible through a mobile app or through the webpage provided and can be used to monitor or find the empty slots in that area.*

Index Terms : *Car parking, Connectivity(c), Constrained Application Protocol(CoAP), End node(e), Hypertext transfer protocol(HTTP), Internet of Things (IoT), Internet protocol(IP), Message queuing transport telemetry protocol(MQTT), Processing node(p), Smart cities, Transmission control protocol(TCP).*

I. INTRODUCTION

Moving towards smart city application, smart parking is a good example for a common citizen of how the Internet-of-Things (IoT) will be effectively and efficiently used in our daily living environments to provide different services to different users. Any citizen may use his mobile device, a computer having Internet to access the smart city application from anywhere in the world to find a free parking spot in the city and get to know the which parking spot is still available. It provide efficient car parking management through remote parking spot localization and fast car retrieval. Presently, Car parking system is based on reservation basis, but this system has a drawback in terms of time and space. This project management system can be grouped into multi-parking management which can be used to manage both outdoor and indoor parking area and single-parking management which usually targets indoor parking lots[6]. The focus and objective of this project work lies on mono-parking management architectural system which works on real-time basis.

This paper is organized as follows: Section II presents the important concepts related to IoT. The proposed system is introduced in Section III and is being evaluated in Section IV. Finally, the proposed system result is concluded in Section V.

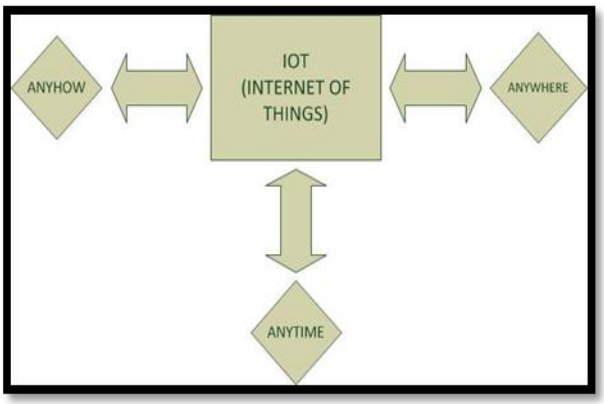

Figure-1: High level view of IoT.

II. SOME IMPORTANT CONCEPTS

A. Basic IoT Architecture:

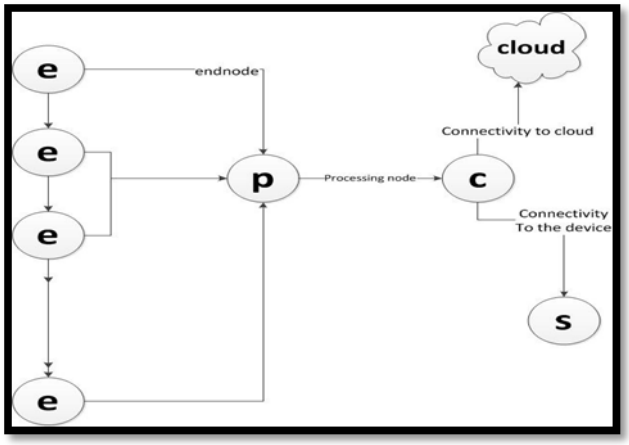

Figure-2: Basic block diagram of IoT.

***END-NODE:** Starting from the front end, end-node is the first node of any IoT system, without this node the 'T' part of IoT i.e. Things is not achieved**,** these end nodes are sometimes also called as objects and they mostly work as sensing nodes. These nodes usually have dual nature. Examples of end-users are all types of sensors but normally these sensors are basic and it can be converted into active device by a designer. In our proposed system we have used IR sensors, Temp sensor, and LDR sensor as end node.

***PROCESSING-NODE:** It's the central important block because it provides an artificial intelligence to the whole circuitry. It processes the data and information received from end-nodes and transfers it to further link for next action which may be software application or cloud based service and data received from application[4] to the previous nodes i.e. End-nodes. Usually this node involves one or more microcontrollers, microprocessors, etc. and may be relatively bigger in size as compared to end-nodes. In our system we have used Arduino microcontroller as the processing node.

***CONNECTIVITY:** Connectivity is must in any system to establish a connection, which may be wired or wireless. The main task of this node /link is to transfer the data gathered after processing of data sent by the end node to the application software or to cloud. Connectivity allows data transfer in duplex form. In this desired system we have used Ethernet shield to send data over the cloud.

Here in this part we deal with many layers of the network to establish a connection between hardware and software. Protocols used in each layer have a specific task. Physical layer deals with the electrical and mechanical support to the system. Every system has a MAC address which is unique. This system needs to dynamically assign IP address to each node and users so a connection which is DHCP enabled is used. For a secure and fast connection MQTT[2] protocol is used along with TCP (wired connection). As HTTP is often too verbose and works on point to point communication method but what actually needed is quality of service delivery, bandwidth efficient, data agnostic and continuous session awareness, which is totally satisfied by MQTT[2]. This protocol works on pub/sub (publish and subscribe) basis, which allows one to many communication and in this the clients are unknown to each other and every client can be a publisher or a subscriber. It guarantees delivery of service and buffering as well as retaining of messages. This protocol needs a broker to deal between the clients or between the publisher and subscriber[2].

***APPLICATION:** Cloud based service is the end point in IoT system which is essential to see the true output of the project or the output of the data send forward by senor nodes or the end nodes. Users can easily modify and manipulate the info available on this node and can apply various techniques to make its representation effective. Examples of some such applications are weather information apps, security systems, etc. In this parking system we have used a html page to view the output.

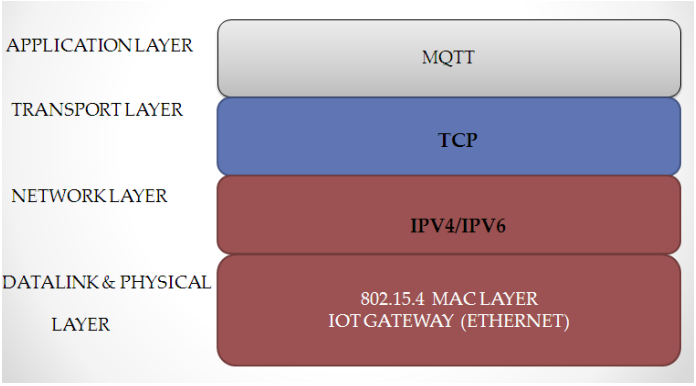

Figure-3: IoT protocol stack.

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 are full, All the slots on HTML page will be RED and a pop up will be generated "Parking Full".
- For temperature of parking area, if it is greater than threshold, then pop will be "Temperature to high".
- For Light of parking area, if it is less than threshold, then pop up message will be" Turn on Light".

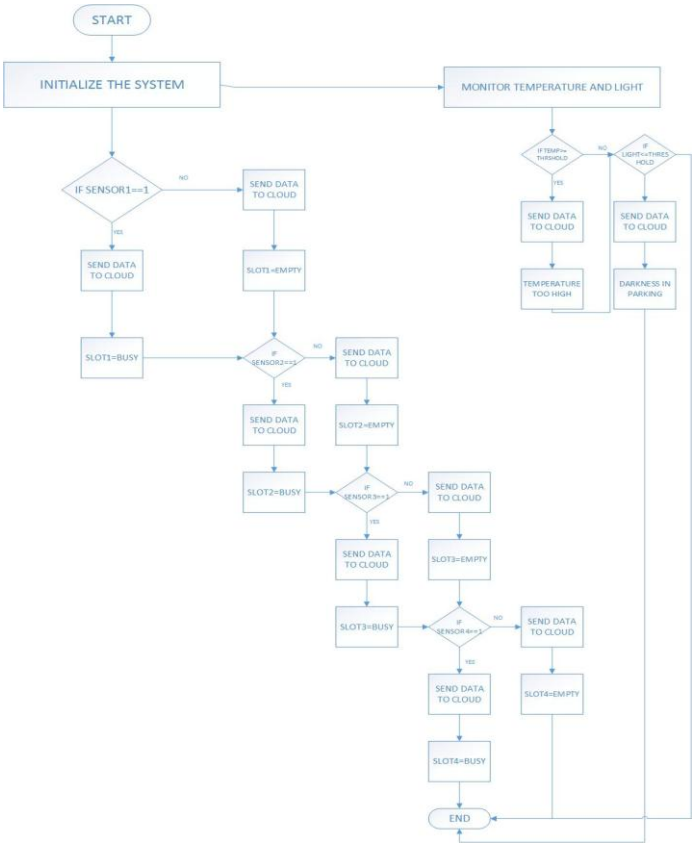

Figure-4: Flow chart.

IV. EVALUATION

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 area's 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].

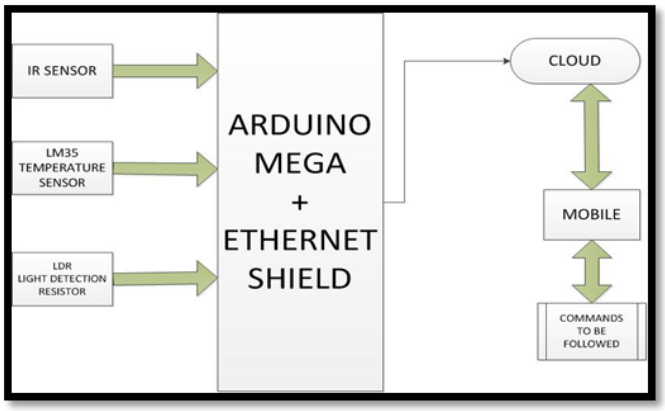

Figure-5: Block Diagram.

V. RESULTS AND DISCUSSIONS

Parking slot allotment implementation using IoT concept for smart car parking are as follows:

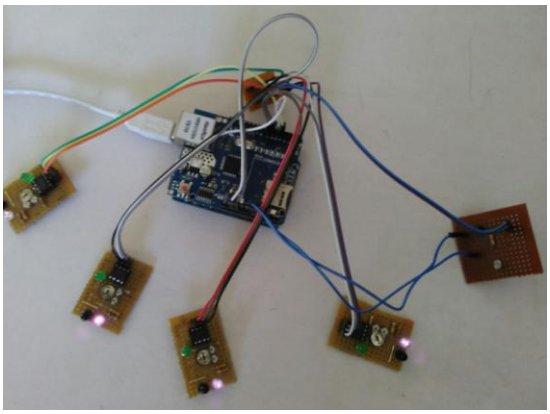

Figure-6: Empty parking slots.

Here the figure shows 4 empty parking slots as the green led is not glowing

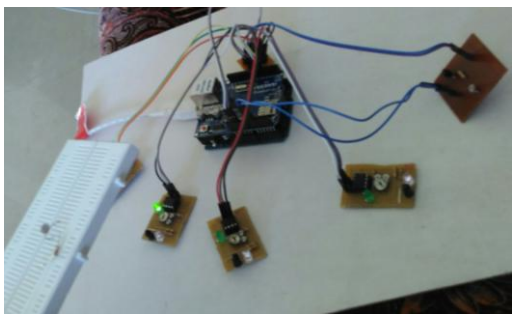

Figure-7: slot 2 is full.

This figure indicates that slot 2 is full, because green led is glowing.

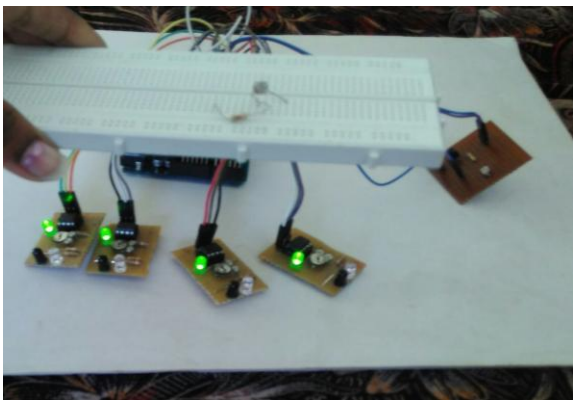

Figure-8: All the slots are full.

This figure shows all the leds are glowing which means the parking lot is full.

Figure-9: Web page displaying the project.

This figure shows the web page from where we can avail two facilities, i.e. services and start.

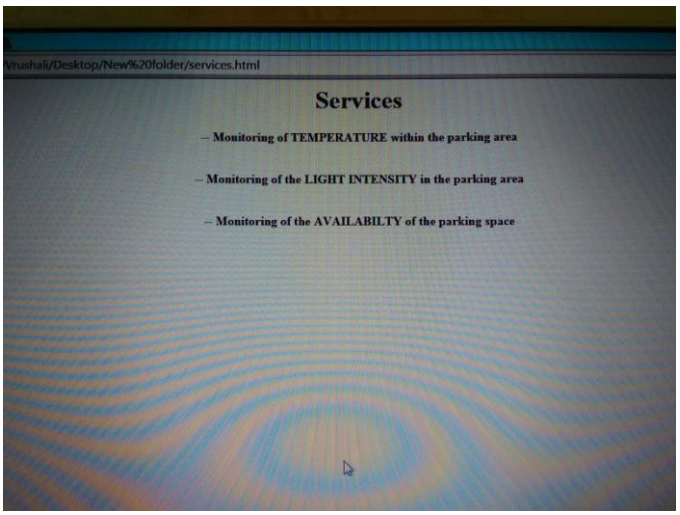

Figure-10: Services tab .

This figure shows the facilities availed by this parking system.

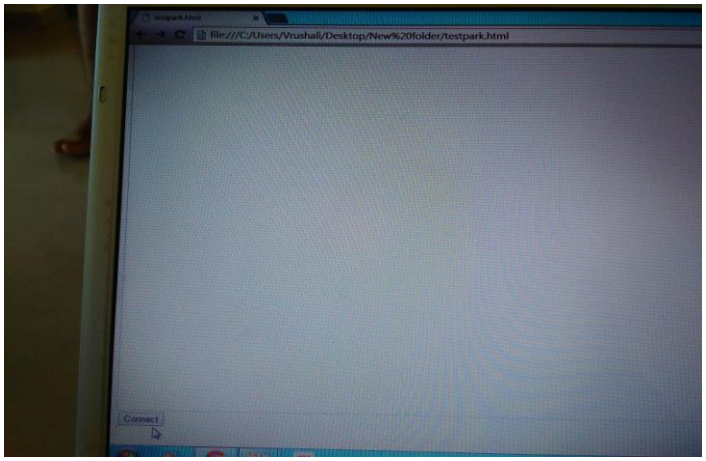

Figure-11: Start tab.

This figure shows the actual window from where we can monitor the parking area.

Figure-12: HTML page .

This figure shows all red boxes which indicate the parking is full.

Figure-13: Pop up message .

This figure shows the pop-up message generated when the the user tries to access the parking area which is full.

VI. 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[8] also fully automated system using multilayer parking method. Safety measures such as vehicle no. tracing, driver face-recognition.

References

[1] Benenson, K. Martens and S. Birr. 2008. "Parkagent: An agent-based model of parking in the city,"Comput. Environ. Urban Syst. Vol. 32, no. 6, pp.431–439, November.

[2] Vasieis Karagiannis 2015." A Survey on application layer protocols for the Innternet of Things"CSSN Research lab,Greece..

[3] K. Cheung and P. Varaiya. 2007. "Traffic surveillance by wireless sensor network: Final report," Univ.California, Berkeley, CA, USA, Tech. Rep.UCB-ITSPRR-2007-4.

[4] Geng Y. and Cassandras C. G. 2011. "A new "smart parking" system based on optimal resource allocation and reservations," in Proc. IEEE Conf. Intell. Transp.Syst. pp. 979–984.

[5] Y. Geng and C. G. Cassandras. 2013. "New "smart parking" system based on Resource allocation and Reservations," in Proc. IEEE Transactions on Intelligent Transportation Systems. Vol. 14, No. 3, September.

[6] Antoine Bagula.2015."on the design of smart parking networks in the smart cities:An optimal sensor Placement Model." Italy.

[7] M.V. Saradhi and S. Nagaraju, "Development of a Low-Cost ZIGBEE and GSM SMS-Based Conductor Temperature and Sag Monitoring System," in International Journal of Engineering Science and Technology, Vol. 2, No. 4, pp. 372-381, 2010.

[8] M. Patil, V.N. Bhonge, "Wireless Sensor Network and RFID for Smart Parking System," in IJETAE, Vol. 3, No. 4, 2013.

[9] Bagula, A.B. Modelling and implementation of QoS in wireless sensor networks: A multiconstrained traffic engineering model. EURASIP J. Wirel. Commun. Netw. 2010,2010, 1–14.

[10] H.A.B. Sulaiman, M.F.B.M. Afif, M.A.B. Othman, M.H.B. Misran, and M.A.B.M. Said, "Wireless based Smart Parking System using ZigBee," in IJET, Vol. 5, 2013.

[11] ABI Research, Smartphone OS Results: Android Dominates High Growth Developing Markets Technology Market Intelligence, Smartphones and Handsets Market Research, 2014.