Centralized Control Parking System Using API Geeknesia

By Giva Andriana Mutiara

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Giva Andriana Mutiara, Gita Indah Hapsari, Aris Pujud
School of Applied Science
Telkom University
Bandung
giva.andriana@tass.telkomuniversity.ac.id, gitaindahhapsari@tass.telkomuniversity.ac.id, aris.pujud@gmail.com

***Abstract*—The increasing number of transportations, need a good maintenance management parking place. Smart Parking System (SPS) is an smart parking system that has been implemented in various places. However, some of the SPS has not provided an information that allows the driver to find an empty parking space easily. In this research, we design an SPS that applies using geeknesia's Application Programming Interface (API) as a centralized IoT server for the embedded system. This system is embedded with the integrated internet-based monitoring system that utilizes server geeknesia.com and a monitoring application parking space on the smartphone. We create the API form in geeknesia.com that will save any changes from the signal sensor as the information of empty space. The testing system is performed with 10 samples parking space area with attached ultrasonic sensor devices. This system is tested to check the correctness of changing data which is generated by the sensor based on the real condition in the parking lot and to see whether the system works. The result showed that the system can read the changes of the sensor, precisely and the changes of the sensor can give the information to the user whether the slot is reserved or empty**

Keywords—component, formatting, style, styling, insert

I. INTRODUCTION

The increasing number of transportations, shopping centers, offices building, and apartments, it needs a good maintenance management parking place, as quickly and easily. Although it has developed a technology called smart parking system which embedded with RFID or ticketing, it still felt not convenience for the drivers who want to park their vehicles. This is because that the driver still has to find an empty parking space, manually. To get a parking space, the driver should encircle the parking area to find an empty parking space. It can be a time-consuming if the driver takes a half hour just to find an empty parking space.

One of the researches that emphasize customer satisfaction on the quality of parking service on the best shopping mall in Bandung revealed that about 80% of customers stated that they usually encircle the parking area to find an empty parking space. [1] Due to the need for efficiency of the time-consuming and the easy to get an empty parking space, it is necessary to implement a system as an embedded or integrated system on the smart parking system.

There are a lot of researches about Smart Parking System which related to this research. A reservation-based smart parking system is a similar research about how the user as a driver can make a reservation for an empty parking space on the busy hour. This research focused on designing a reservation-based smart parking system. [2] Enrique Moguel, Miguel Ángel Preciado and Juan Carlos Preciado made a research about smart parking implemented in a campus, with a smart parking system based on a software system that links hardware and software, with support from Augmented Reality technologies, to provide an enhanced solution in the query of information regarding parking spaces. Smart Parking responds to the need of people with disabilities who have to know the availability of adapted parking spaces.[3] Qi Wu and Yi Zhang do research on parking lots space detection using mapping feature extraction from the graph[4], and it's a little bit similar with Cathrine Wah that monitoring the parking lot using photos taken from the roof of calIT2 with multiple cameras where this system must be able to identify vacancies while differentiating between spaces for different permit holders.[5]

Other research did the research on smart parking system based on embedded system and sensor network, in this research they design and implementation with the prototype of reservation-based smart parking system (RSPS) that permits drivers to effectively locate and withhold the vacant parking spaces. This system use cluster-based algorithm which helps in periodically learning the parking status from the sensor network deployed in parking spaces, the reservation service is influenced by the changes of parking status.[6] The author on [7] proposed the formulate of the optimal placement of the sensors in smart parking as an integer linear programming multi-objective problem optimizing the sensor network engineering efficiency in terms of coverage and lifetime maximization using single-step and two-step solutions implemented in the Mosel Language based on Xpress-MPsuite of libraries.

Another implementation using IoT implementation is smart home and ambient assisted Living Based Internet of Things, the cloud network consists of the gateway using Zigbee, the server and user devices running on third-generation (3G) network. [8] Also, the IoT is using for daily activity monitoring system too, the server is analyzes and reports the daily activities and activity patterns of elderly users using a predefined activity index. [9]

Our research is focused on designed and implemented a monitoring system with IOT implementation. We design the sensors like a position as in our previous research using the ultrasonic sensor. [10] Besides, we also designed a using of MAC Address on smart parking

system.[11]. The IOT is implemented using server geeknesia.com. We use http protocol as a media network to send the sensor status to server geeknesia.com, and the sensor status will save the data as an API. The data in the API then will be retrieved by a request from the user using application smart parking system in the smartphones. The application of smart parking system was hosting using idhostinger.

II. Research Method

In this section, we present the research method. The research starts from the review of our last research [10][11], then study the literature about the tools, the need of the system, reading a journal which has similar research field and makes a design of the general block diagram of architecture and design of the system.

We design the general block diagram as shown in figure 1. We can see in figure 1a, that the vehicle will trigger the sensor. The change of the sensor will be read by the microcontroller and send it to geeknesia.com through ESP 12e, and save it in API form. In figure 1b, we can see the diagram block user interface whilst we have to create the interface of smart parking system for the user, posting it in a hosting and retrieves the API form from geeknesia.com and convert it according to the interface as an information about parking space.

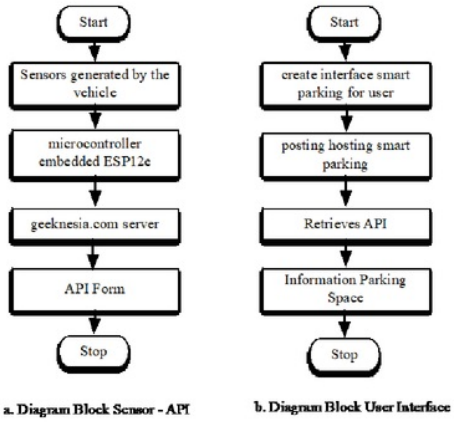

Fig. 1. Diagram Block System

The architecture of the system can be seen in figure 2. We can see that the data generates by the sensor (S1, S2, … etc) will equal 0 when a car placing the parking slot (S1) or equal 1 if the car doesn't exit the parking slot. The signal data will send to the microcontroller. The microcontroller which is embedded with module ESP 12e board will configure the signal data and send it to server geeknesia.com and yield the result in the API form and if there is a request from the user through web server www.smartparking.com application, the data in the form of API will be sent to the user through the internet.[12]

The detail of the flow of the data architecture and design system can be seen in figure 3. We describe the flow of the data in the system. The data from ultrasonic sensor will send the signal data to the microcontroller through cable media then the signal data will reconfigure in the microcontroller, while ESP12e board will send the data to the server using WIFI through http protocol. The data will be updated or send depend on the particular request from the user. On the side of the user, if the users need to see the information of the condition of the parking lot, they can access www.smartparking.com application on the smartphone, and this website will get the data from geeknesia.com in real time

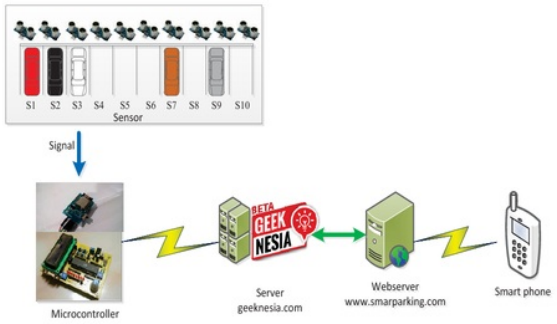

Fig. 2. Architecture System

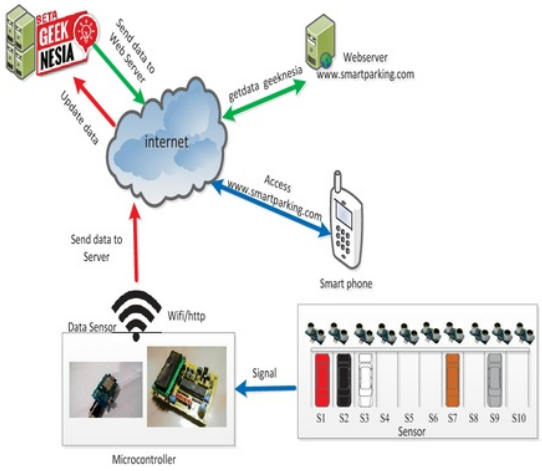

Fig. 3. Detail Data Flow Diagram of Design Architecture System

III. Result and Analysis

After doing design and architecture the system, in this section, we propose some testing to test the availability of this system in two scenarios. The first scenario is testing the sending serial data from the sensor to API form, and the second scenario is testing the system from the viewpoint of the user. The scenario can be seen in figure 4.

A. First Scenario

Define abbreviations and acronyms the first time they are First scenario is testing the sending serial data from sensor to server geeknesia.com and save the data in the API form. This test aims to check the correctness of changing

data which is generated by the sensor based on the real condition in the parking lot. The truth table of the serial data sensor can be seen on table 1.

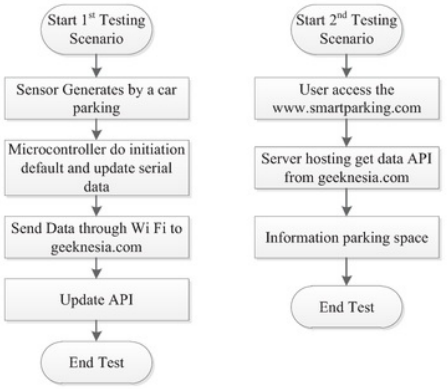

Fig. 4. Flowchart of Testing Scenario.

TABLE I. THE TRUTH TABLE TESTING OF PARKING SENSOR

Sensor	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
ON/OFF	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Declare	R/E	R/E	R/E	R/E	R/E	R/E	R/E	R/E	R/E	R/E

On Table 1 above, the default position of each sensor for the initial position is equal to 1. This situation describes that the parking slot is an empty condition (E). When a car parked in slot S1, the sensor S1 will generate and the signal will change S1 = 1 and its describes that the parking slot has been reserved (R).

On Figure 5 we can see the testing serial data sensor when a car parked in the slot S1, S2, S6, S8, S9. In the first line that serial data from sensor is S1=0, S2=0, S3=1, S4=1, S5=1, S6=0, S7=1, S8=0, S9=0, S10=1. This means that an empty parking space is available in S3, S4, S5, S7, S10. Then, this serial data sensor is sending to geeknesia.com in the form of API form. The truth table can be seen on Table 2.

On Figure 6, we can see the updating action of the form API when the parking lot is in default condition or when the entire parking slot is an empty condition.

The response of update data in geeknesia.com can be seen at figure 7. Data from geeknesia.com is in API form and the type of the data is JSON Form.[13]

B. Second Scenario

The second scenario is testing the system from the viewpoint of the user. This scenario aims to see whether the system works. This system works to give the information to the user about parking space in the parking lot. In this scenario, user will access the www.smartparking.com. This website is hosting on server idHostinger as a server with the free account (Figure 7).

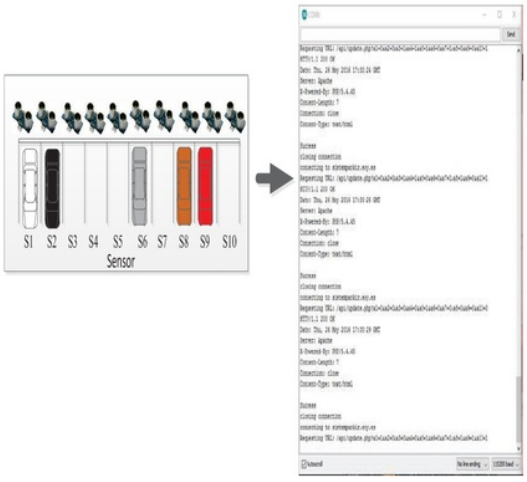

Fig. 5. Testing Serial Data Sensor.

TABLE II. THE RESULT TESTING OF PARKING SENSOR

Sensor	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
ON/OFF	0	0	1	1	1	0	1	0	0	1
Declare	R	R	E	E	E	R	E	R	R	E

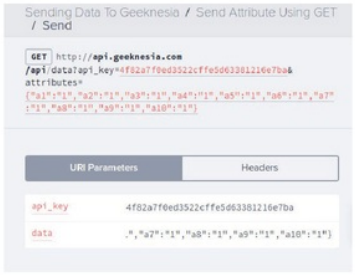

Fig. 6. Testing Serial Data Sensor

The website www.smartparking.com is designed using pHp My SQL with the table as in figure 8. On this figure, we can see that available parking is in area3 (S3), area5 (S5), area8 (S8), area9 (S9), area10 (S10).

When the user accesses www.smarparking.com on the smartphone, the user will see the interface as seen in figure 9. This figure gives the information to the user, while area parking area2 (S2), area3(S3), area7 (S7) is available to park the car for the user. The truth table of this system can be seen in Table 3.

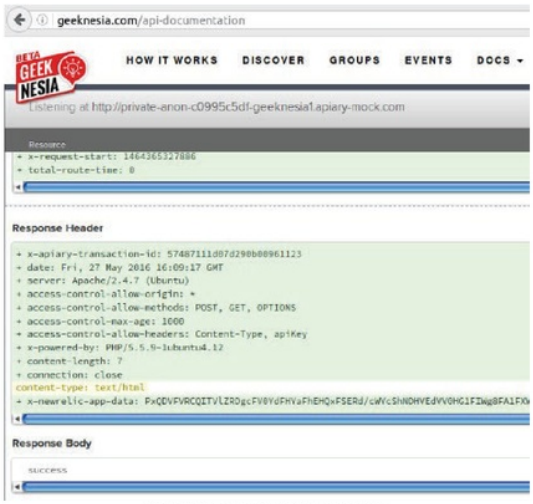

Fig. 7. Testing Serial Data Sensor

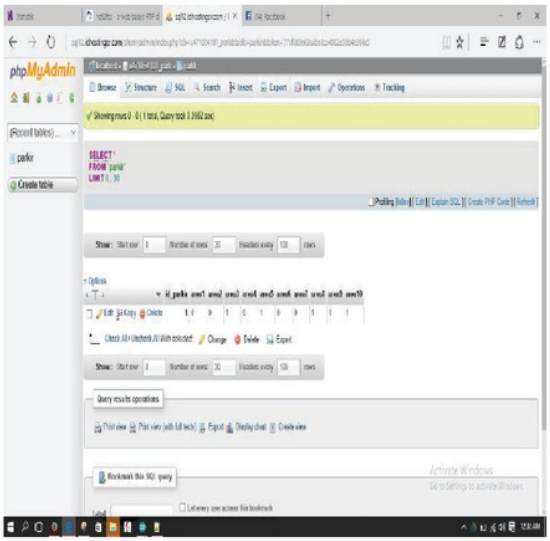

Fig. 8. Table Data Interface

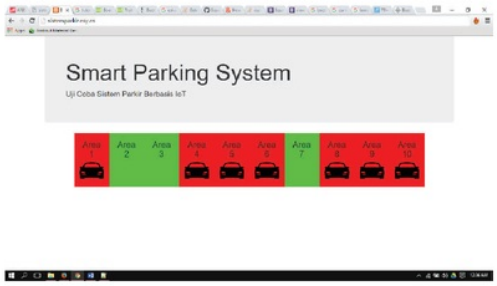

Fig. 9. The Interface on Web Server

TABLE III. THE ATTEMP OF RESULT TESTING OF PARKING SENSOR

SENSOR	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
ON/OFF	0	1	1	0	0	0	1	0	0	0
Declare	R	E	E	R	R	R	E	R	R	R

Based on Figure 9, the website on server IdHostinger will get the data from server geeknesia.com as we can see on the Figure 10.

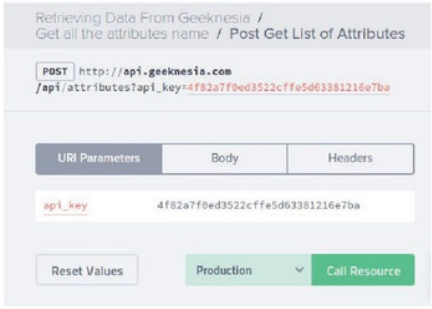

Fig. 10. Retrieving Data from Geeknesia.com

When the retrieving data in server geeknesia.com is calling from www.smartparking.com, the data in API form will send the data in JSON form as we can see in Figure 11.

Fig. 11. JSON Form in Geeknesia.com

The configuration JSON form on the geeknesia.com will reconfigure by www.smartparking.com as can be seen in Figure 12, and the JSON data then will give the information to the user as we can see on Figure 9 while area parking S2, S3, S7 is available to park the car for the user

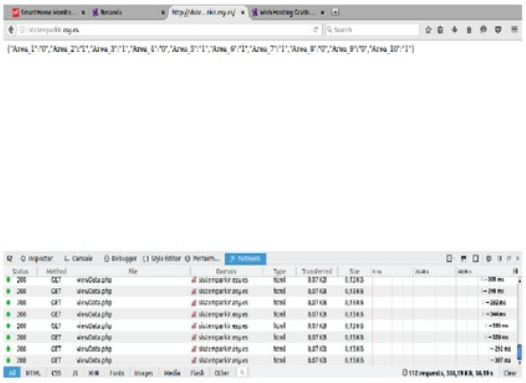

Fig. 12. Configuration Data JSON in www.smartparking.com

Based on the testing of the second scenario, we can say that the user can access the site and see the information about the empty space parking area from the website. The retrieve data API form geeknesia.com into www.smartparking.com can inform the user properly.

IV. Conclusion

Based on the scenario of the testing system above, we can conclude that the testing system in the first scenario is done successfully. The system can read the change of the sensor and send the data to server geeknesia.com, precisely. The testing on the second scenario is also running smoothly. The user can access www.smartparking.com smoothly and the system gives the information about the condition of the parking space to the user in real time system very clearly. Based on this all result, we can say that smart parking system can be implemented using IoT technology through server geeknesia.com.

Another conclusion that can be concluded from the test results is the server geeknesia.com gives the designer of application hardware is easy and simple to implemented in cyberspace using IoT Technology, but the design of the database system for API is still restricted by geeknesia.com. Besides that, server geeknesia.com support for the big system and also support update data in real time system.

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