Parking-RR: Mobile Application Malioboro Smart Parking Based on IoT Technology

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Abstract. Malioboro is one of the very famous tourist attractions in Yogyakarta and very crowded. Having an atmosphere and lots of culinary or snacks makes it a lot to visit, especially on holidays. Helping visitors find an empty parking space in addition to using the parking reservation feature by thinking of time limits and also alternative parking if the parking conditions around Malioboro are full. Internet of Things (IoT) technology and sensors are used to find information about the availability of database updates about parking capacity based on parking bag conditions. This paper tries to discuss and find a solution by offering an alternative, Parking-RR that can help anyone find a parking space according to the type of vehicle based on data obtained from sensors that are installed and can be seen through Cellular Applications. Parking-RR provides a solution for road users to find parking in the Malioboro area. The simple application display makes it easy for users to access.

1. Introduction

One Smart Parking idea is applied to solve congestion problems that cannot be avoided and become the main focus in big cities[1]. How to manage and solve the density of vehicles to find a parking space for vehicle owners. Malioboro is one of the culinary places in Yogyakarta that are frequently visited by domestic and foreign tourists, for that reason, there needs to be an idea involving IoT technology, Application Mobile, and sensors to solve parking problems that often occur in the Malioboro area where Malioboro has ten parking blocks, which full every time crowded. The application of IoT technology in every field has a good effect which requires fast time to exchange information[2]. IoT technology is supported by some hardware that is embedded in a network and has a certain intelligence that ensures rapid communication of information[3]. According to the survey, drivers in New York can spend 170 hours per year looking for a parking space for their vehicles, and this can consume a lot of fuel [1].

For this reason, it is necessary to build a mobile application to solve vehicle parking problems. Mobile Application is easily accessible anywhere, anytime, which makes it the most popular way currently needed by humans[4]. According to researchers, the most popular mobile application and increased from 17 million downloads to 80 million from 2013 to 2018[5]. This is the motivation for making Mobile Application Parking-RR for use in Malioboro. The hardware that supports Parking-RR implementation is the Ultrasonic Sensor. In general, the nature of a sensor that is detecting temperature pressure, vibration, movement and radar and all sensors can be used to detect a subject that is not human[6]. Ultrasonic Sensor is hardware that is capable of detecting a moving object such as a bicycle, motor vehicle or large vehicle[7]. IoT technology, Mobile Application, Database, Ultrasonic Sensor used to support Parking-RR implementation.

2. Research Sites

Malioboro is a shopping center in Jogjakarta. Malioboro is also very famous for street vendors selling typical Jogja handicrafts and lesehan stalls at night selling gudeg Jogja food and is known as a gathering place for artists who often express their abilities such as playing music, performing arts, pantomime on
this street. Malioboro stretches from Tugu Yogyakarta to the Yogyakarta Post Office intersection. Overall consisting of the street of Margo Utomo, Street of Malioboro, and the street of Margo Mulyo. Figure 1 shows the location of Malioboro Street.

3. Related Work

3.1. Internet of Things (IoT)

Internet of things is a network that involves and connects several performances, including mobile devices, sensors, security in communication involving software that can automatically collect and manage data in an update[8]. IoT also said that it would provide connectivity in all fields; almost all hardware is expected to be connected to the internet [9]. This past decade, the use of IoT is something that we are not aware of using in every time and place. IoT is a trendy technology for invisible data communication that makes all gadgets operate effectively, efficiently reaching shared information sharing goals, and connecting to both hardware and software[10]. The definition of IoT is very broad, which explains that IoT is a smart and intelligent platform in communicating every day that has positive effects as a universal social media[11]. IoT can remotely monitor a process, view data automatically, record and see changes in the world today[12]. IoT can also be very important to be applied in several fields one of which is a concern for the surrounding environment[13]. Here is one mechanism for IoT in communication (Fig. 2).
3.2. Mobile Application

Various studies mention cellular applications that are contemporary that are needed to provide various aspects of service. [14]. One of the advantages of Mobile Application is that it allows users to get information, whether near communication or the distance between islands[15]. However, some research states that many users uninstall their installed applications because they are not considered important[16]. There is a cycle of why the user uninstalled the application, first installing, opening and closing an application, notification updating the application and finally uninstalling the application. For this reason, mobile applications must be made as comfortable as possible and can be useful for application users. In terms of user interface and user needs. Mobile applications are now urgently needed, and application changes are very fast, and almost every day, new applications are always being developed in various stores[17]. Also, the ability of mobile applications includes being able to record sound, transfer data, input, user interfaces, store data and a good level of security so that it can be used easily[18].

3.3. Ultrasonic Sensor

Sensors, in general, are technically sensing systems that can know the real condition of an object. Of the several sensors, the sensor most often used to measure the distance of an object is the Ultrasonic Sensor[19]. Besides, ultrasonic sensors have the advantage that it can be used to monitor the movement of an object, whether monitoring the crack of the bridge or corrosion changes[20]. There are also advantages of ultrasonic sensors in several studies that are used to measure the level of water level in a container, sea level or flood[21]. Fig. 3 shows how to work briefly about ultrasonic sensors.

![Figure 3. The work of the ultrasonic sensor](image)

4. Proposed Method

The proposed method is centred on the information obtained. The user will use the Parking-RR application to find information on the state of the parking conditions. The workings of this application depend on sensors that send information to the microcontroller next to the cloud forwarded to the database. The database stores information and will provide information to users who need information on the latest parking conditions in Malioboro. After getting the information, the user himself knows which parking blocks are full and which are still empty, making it easier for users to find the right and fast parking without traffic jams. The following is a brief description of how the Parking-RR application works.
Figure 4. Framework of Parking-RR

In Figure 4 more clearly explains how the Parking-RR application involves several communication technologies such as cloud, IoT or database that have an important role in sending information or data. This technology is created with the IoT concept of how parking lots are installed by a number of sensors then translated by a microcontroller and sent to the database to the user via the cloud.

5. Results and Discussion

The results and discussion of this study focus on the initial design of the Parking-RR application, the following explanation:

1. Parking-RR Application Structure

   The basic concept for creating a RR parking application is the application structure. The application structure created consists of several important elements, as discussed below:

   a. Creator

      Parking-RR application maker or also called a programmer (program maker), so the desired goals make that.

   b. Device

      The Parking-RR application was made to assist users in finding parking and can be run by several platforms, namely mobile phones and desktop computers.

   c. Additional features

      Added the advantage of the Parking-RR application, which is payment booking parking. Users can pay directly for the initial booking process before the user arrives at his destination. If you do not use parking facilities, automatically the payment cannot be returned. And the time limit has been determined 1 hour from the initial booking.

   d. Database

      Save some user browsing history. Consists of user data, day, date and time that the user before and after using the Parking-RR application.

   e. Action

      The purpose of the Parking-RR Application is to make it easier for users to find parking. The action taken by the user is booking parking.
In Figure 5 the complete structure of the application is to be made. Starting from the beginning of the manufacture involves the programmer, thinking about the important additional features that support the establishment of the intended application.

2. User interface

The user interface in the Parking-RR application is a display to the user in booking parking. Which consists of several features that must be inputted. Consists of user data, location of time and place of parking reservations at Malioboro tourist attractions. Following is the initial design for creating a Parking-RR application.

In Figure 6 Describe the results of the display to the user or a simple user interface consisting of several fields that must be completed by the user so that they can easily use them.
6. Conclusion
It can be concluded that the Parking-RR application involves the development of current technologies such as IoT and the effect of the use of sensors to make it easy for domestic and foreign tourists to find parking around Malioboro. With the RR-parking application provides time efficiency, travel effectiveness for tourists.

7. Contribution
With the Parking-RR application, it makes a significant contribution to helping domestic and foreign tourists in finding a parking space around Malioboro by presenting a simple application display that is easy to understand and use effectively and efficiently in providing solutions to meet user needs. This study provides a new concept and provides a direct payment feature for parking reservations that can be used easily in the payment process if tourists want to use parking booking around Malioboro. Besides, it also encourages tourists to visit at another time because of the guaranteed convenience of the RR-parking application, whose main function is to find a parking space around Malioboro.

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