Smart Parking System Using IoT

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Abstract: Parking problems are common in most major cities. The limited availability of parking results in traffic congestion, air pollution as well as driver frustration. The price for parking expansion is usually prohibitive or extremely high. Recently researchers turned to apply technologies for efficient parking management. It is realized that this simple invention could be applied to monitor vehicles in parking places can be implemented. In this system, the driver can get the status of the parking slot through the website. The system can then inform drivers of the number of available parking spaces. The system should be performed over the less network-traffic and minimize the database server interruptions maintaining the synchronization in the client data fast and accurate response. The system should apply to large and small areas. The system should provide reliable performance.

Keywords: database, IoT, technologies, performance

Introduction
Nowadays parking is a big problem in the major cities. The expansion of the parking slot is impossible and finding the free parking slots in open parking tougher. So there are many systems by using the technologies provided the efficient parking management but the existing systems use the brute force method to perform this activity. On a device will update the data into the database and the client device is continuously requesting the updated data on the database server which leads to the more amount of load on the database server. The network traffic increased and the data on the clients will not in the synchronized manner. For those problems, there is a solution called the firebase real-time database. The Firebase Realtime Database is cloud-hosted. Data is stored as JSON and synchronized in real-time to every connected client. There will be a module built out by node MCU and the ultrasonic sensor which is used to update the status of the parking slot to the firebase. When the change in the data of the Realtime Database, all of your clients share one Realtime Database instance and automatically receive updates with the newest data. In this model, the client device doesn't need to interrupt the database server continuously. When the change occurs the client will receive the data so less network usage. As the equipment is small it provides a portable feature which supports to use in the open area parking. The devices are individual bodies so it supports use as our requirement those can be used for large and small scale areas.

Block diagram

Requirements

Hardware requirement

NodeMCU
NodeMCU V3 is an open-source firmware and development kit that plays a vital role in designing an IoT product using a few script lines. Multiple GPIO pins on the board allow us to connect the board with other peripherals. This ability to read the ultrasonic data. With the help of the ESP8266 Wi-Fi SoC can connect with the internet and send the data to the firebase.

Ultrasonic sensor
An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has traveled to and from the target).

Software requirement

Firebase real-time database

The Firebase Realtime Database is cloud-hosted. Data is stored as JSON and synchronized in real-time to every connected client. When the change in the data of the Realtime Database, all of your clients share one Realtime Database instance and automatically receive updates with the newest data.

Key capabilities

Real-time

Instead of typical HTTP requests, the Firebase Realtime Database uses data synchronization—every time data changes, any connected device receives that update within milliseconds. Provide collaborative and immersive experiences without thinking about the networking code.

Offline

Firebase apps remain responsive even when offline because the Firebase Realtime Database SDK persists your data to disk. Once connectivity is reestablished, the client device receives any changes it missed, synchronizing it with the current server state.

Accessible from Client Devices

The Firebase Realtime Database can be accessed directly from a mobile device or web browser; there’s no need for an application server. Security and data validation are available through the Firebase Realtime Database Security Rules, expression-based rules that are executed when data is read or written.

Web technologies

The programming knowledge required to build a webpage like HTML, CSS, JavaScript. Some knowledge on working with the JSON objects and JSON format data.
Results

Data of available slots

Map of slots

Conclusion

In this project, we are presented and advance improvements to the existing system the can be implemented right now with the technical advancement. In my project, I used a fire base real time database to send the data to the client when the parking slot is changed over the website. by that, the database server load will be reduced and network traffic is minimized. a reliable consistent system can be created.

Future Scope

In the future, we would like to add the slot reservation feature with the location-based system, and we will suggest the nearest and available slot for the driver if he ok with it he can reserve the solve and he will directly navigate to that slot.
References


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