Smart Parking Mobile Application using Ultrasonic Detector

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Outline

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Introduction
Car parking is known as a convenient parking spot for car owners to park.

Ultrasonic sensors operate with sound waves, and as many variables do not impact the identification of obstacles. This makes ultrasonic more reliable than infrared sensors.
System Development
Include the johnny-five library to talk to Arduino and library firebase-admin as directory to fetch the database

Declaration the firebase URL https://myparking-d4c01.firebaseapp.com

Setup the pin for each sensor
First ultrasonic – pin A0
Second ultrasonic – pin A1

Each pin changes updated to Firebase setting

Status result update at Firebase

End
4 important units

1) sensor unit: The sensor unit consists of an ultrasonic system used to determine the gap between the vehicle and the measurement using the sound wave. The ultrasonic model is HC-SR04

2) controller unit: it consists of the Arduino UNO microcontroller that is used to control the sensor, build a connection with the firebase server and update any changes in the hardware to the firebase. This activates an ultrasonic sensor and collects the sensing data to be passed to the data transmission and retrieval unit.

3) data transmission and

4) acquisition unit and user interface unit.
Visual Studio Code

The framework is used to develop Node.js application for the desktop running on the Blink layout engine. It is accessed through the command palette or through a .json file.
Wu-Jeng Li, et al. claimed that data collection is one of the core features of the Internet of Things [8]. With Firebase cloud, the controller was straight directly connected with its database to read and write data. Firebase include access to its real-time database in iOS. Essentially, Firebase is a cloud-based Google software blend that provides real-time database, security communications, routing, and storage. They also used Android for mobile application development, JavaScript for web application and REST API is a general network service that can be used for common programming language. Lastly, Admin SDK is used in the Node environment to execute JavaScript application.
JavaScript is a type of programming language that is used by web developers to create web sites. According to Techwalla Portal, Deborah Lee Soltesz stated that “JavaScript can exchange data with a server. This simplifies the potential to leverage server-side resources to build powerful Web applications.”
Mobile phone application is the main important thing that related to the phone either it can operate online or offline. On Vividus portal, posted by Jason stated that rather than portable web browser that need a client to dispatch a web browser, enter a URL and sit tight for the web page to load, mobile applications are significantly a faster option [10]. It just takes some time to dispatch a mobile application because most of the data is stored in the application itself making it conceivable to work offline.
Result and analysis
Prototype
Apps
vehicle occupied lot A1 and the LED turns into red
Figure 12

Distance value (cm) vs number of measurement at parking lot A0
Figure 13: Distance value (cm) vs number of measurement at parking lot A1
• Figure 12 and 13 show the repetability of ultrasonic sensor measurement for 30 tests. The measurement indicate that there is a small variation between each measurement. It occurs when the sensor detects the different shape of the vehicle, and also when the car is parked in various locations. When there is no car park at the parking lot, the measured value is 12.1 cm.
Figure 14
Figure 15

The different value of actual and measured distance vs number of measurement at parking lot A0
• The distance between the sensor and the car for parking at A1 and A0 are 9.03 cm and 9.06 cm respectively. The average value has been calculated from 30 different measurements. The results for A1 and A0 are plotted in the graph in Figure 14 and 15 respectively.
Conclusion

As a conclusion, this work success to build IoT system for parking lot prototype. The code for Arduino that write using Visual Studio code software by include the desired library for Arduino and Firebase could help to reduce the use of multiple platform in this work. The prototype are working properly and can communicate with the Firebase smoothly. For accuracy, it shows 100% result of car detection with standard deviation for A1 and A0 sensors are 0.32 and 0.5 respectively. The proposed system can be enhanced with some other features for future development. Firstly, this system can include the GPS service in the user applications such that the user can know the distance to the parking lot in real-time. This service will demonstrate the way and lead the drivers to their chosen parking lot. This system can also be upgraded with the booking service feature where customer can reserve their preferred parking lot in advance.