Department of Engineering

The Hong Kong Institute of Vocational Education (IVE)

MBS4522 IoT Applications

Mini Project: Smart Car Park

Instructions:

Please follow the detailed manual and complete all of them. You need to submit a report that shows the screenshot results of major steps and answer questions if any. Please also include your copyable source code (e.g. C, C++, Arduino) at the end of the report. Here are some instructions:

1. Write down all your answers/screenshot to a PDF file. (Do not copy the problems/descriptions) Please ensure the answers/screenshot is readable and clear enough.
2. Only one report is required for a group. Although discussion is permitted, the solution must be written by yourself. Plagiarism will not be tolerated. Otherwise, you will get zero mark.
3. Due at 17:30pm, May 3, 2024. Late submission is capped at 70% of the original marks. It will be zero mark if it lates 48 hours or above.

Note:

1. If you are facing a problem, please try to deal it by yourself first. Debugging, problem-solving skill and self-learning are the most important learning points. Take the chance, do not give up easily. Otherwise, you learn nothing!
2. Do not forget that Google, Stack overflow, GitHub are your friends. Try it before you give up or ask someone.

Software tools:

1. Visual Studio Code (VS code)
2. PlatformIO IDE (an extension of VS code)
3. Node-RED
4. Mosquitto (MQTT)

Hardware tools:

1. ESP32 x1
2. MFRC-522 RFID card reader x1
3. RC522 RFID card x3
4. QRE1113 reflective object sensor x5
5. 74HC165 module x1
6. 0.96” OLED monitor x1
7. Servo driver module x1
8. Servo x1
9. Router x1

Task:

a) Draw the whole circuit which can fulfil below functions. (Total: 20%)
   i. Connect 5 reflective object sensors to 74HC165 module. (5%)
   ii. Connect 74HC165 module to ESP32. (5%)
   iii. Connect RFID card reader, 74HC165 module, OLED monitor and servo driver to ESP32. (5%)
   iv. Connect servo to servo driver. (5%)

b) Build the record system. (Code a program which includes below functions) (Total: 55%)
   i. Display the live time and date on OLED. (10%)
   ii. The default parking spaces are 5. Display the remaining spaces on the OLED screen. (10%)
   iii. When identifying a new ID, it should be decremented by one. When a duplicate ID is recognized, it means the car has left. Then, add one. (15%)
   iv. If the number of remaining spaces is zero, show “FULL” on the OLED. (5%)
   v. When user tap the card, print the card ID on serial monitor and OLED. (5%)
   vi. Open or close the gate (servo) when cars enter or exit. (10%)

c) Using Node-RED to build a website. It should fulfil below functions or requirements. (Total: 25%)
   i. Communication with ESP32 by MQTT.
   ii. Display the live remaining spaces number on website. (5%)
   iii. Display each space situation based on object sensors. (10%)
   iv. Display the live time and date on website. (5%)
   v. Nice outlook of website (5%)

d) Complete and sign the form. All team members need to agree the weighting and sign.

Name	1.	2.	3.	4.
ID	1.	2.	3.	4.
Workload				
Weighting (Amount is 100%)				
Signature				
Remark				
Adjustment (For faculty use)				

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