

General Firmware Testing

The candidate can choose either question 1 or question 2. Manage the project by git and upload the answer to github as public repo.

Question 1 Communication System Design

Robot 1

Station 1

Robot 2

Station 2

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Robot N

Station N

Background

We have a charging network that includes multiple **robots**, which are equipped with RF MCU A moving around and **stations**, which are equipped with RF MCU B staying on the ground.

The procedure steps are stated below.

1. Robot and Station have no info exchanged if no charging requested.
2. If charging is required, robots need to find the unoccupied station.
3. A robot moves to a station and tries to establish communication with it.
4. They exchange **handshake message**(payload 100 bytes) to confirm the session.
5. They must continuously exchange **real-time messages** (each with a payload of 50 bytes) at intervals of less than 100 ms until the session concludes.
6. Robot finishes the session and the Station becomes available again.

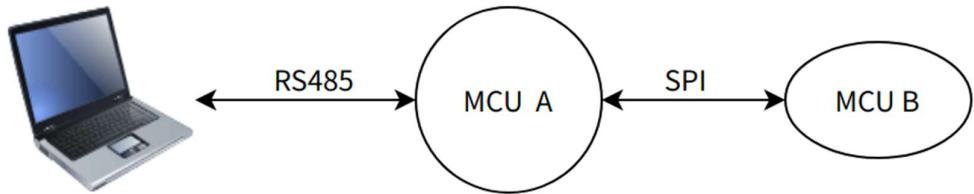
Tasks

1. Create communication architecture by utilizing data flow diagrams and design documents. Including pseudo code will be considered added points.
2. Design the data structure between MCU A and MCU B using C/C++

Tips

- RF modules use 802.15.4 as the basic communication standard.
- Multiple stations may be located only one meter away from each other.

Question 2 Bootloader Design



Background

We have MCU A and MCU B communicate with each other using SPI. Application on MCU A has MODBUS support and RS485 as the physical layer. To facilitate the seamless updating of both MCU A and MCU B, a custom-made bootloader application is required. Hence, both of them can be updated based on the RS485 interface on MCU A.

Task

1. Design communication architecture using data flow diagrams and design documents. Including pseudo code will be considered added points.
2. Design the data structure between MCU A and MCU B using C/C++

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