Design Document for Communication System Design

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1 Introduction

The project's objective is to design a communication architecture for robot-to-station communication.

2 Communication Requirements

Robots will only communicate with the stations when a charging request is made. The handshake message will be 100 bytes while the real-time message will be 50 bytes sent at an interval of less than 100ms until the charging session concludes. Stations will provide status on their availability.

3 Docking Procedure

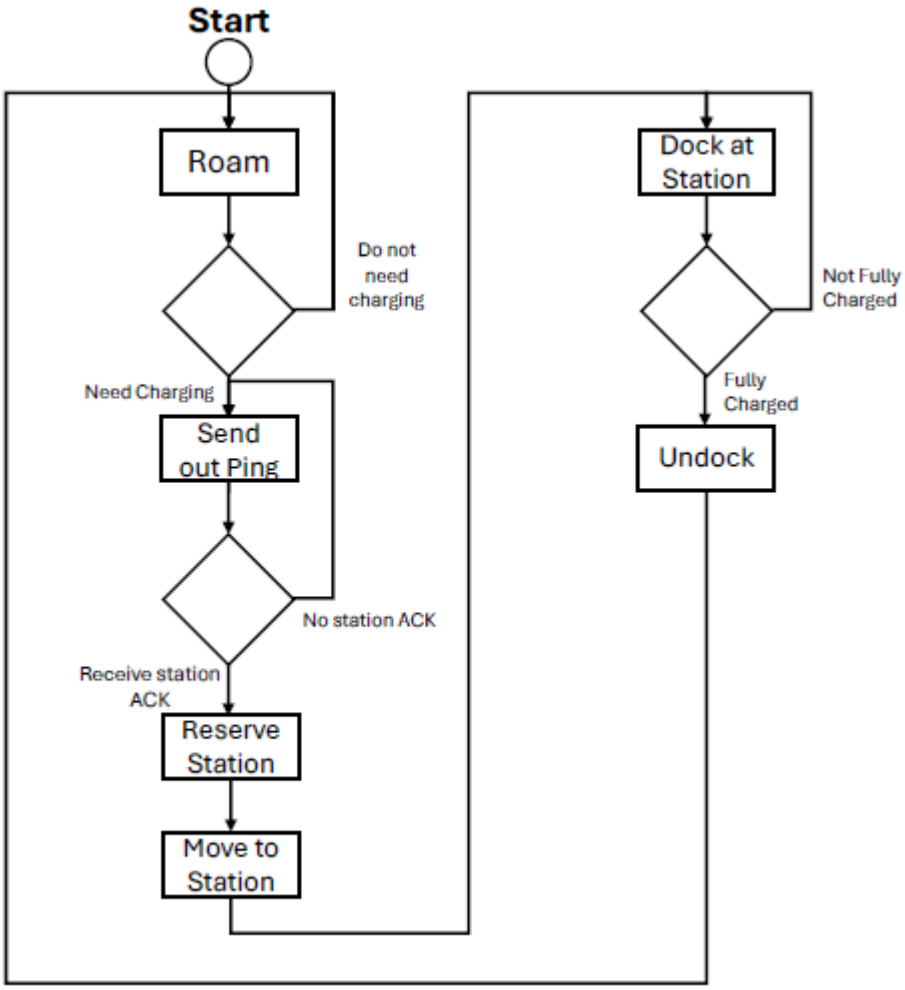

Figure 3-1: Flowchart of Docking Operation

Figure 3-1 shows the flowchart of docking procedure that the robot will function. The robot will roam until charging is needed. It will then broadcast a ping to nearby stations. The stations that are available will send an acknowledgement to the robot. The robot will move to the station to charge. Once the robot is fully charged, it will undock and return to its roaming state.

4 Data Flow Diagram

There are two data flow diagrams, one for confirming session and one for during session.

4.1 Confirming Session

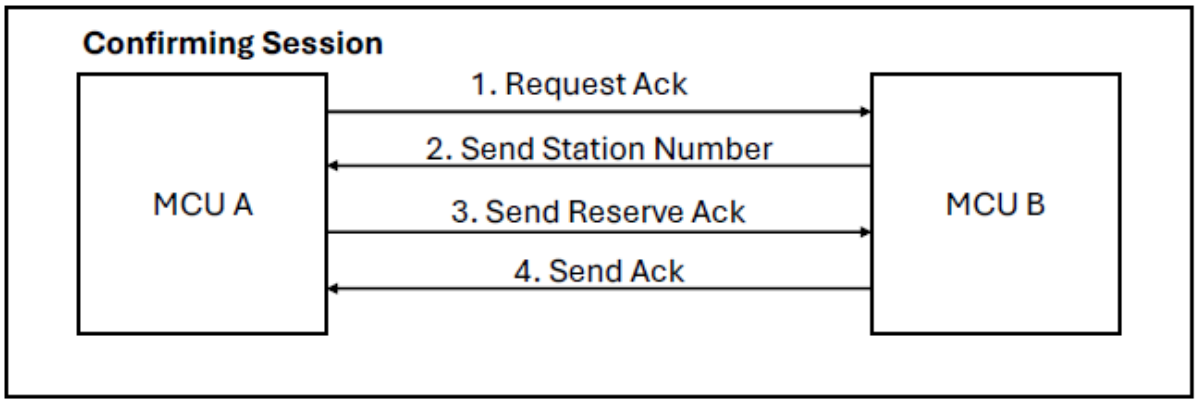

Figure 4-1: Data flow of Confirming Session

In Figure 4-1, MCU A represents the robot's MCU while MCU B represents the station's MCU. The robot will first send out a request acknowledgement. The station that is available will send the station number to it. The robot will reply with a reserve acknowledgement and the station will reply with another acknowledgement.

4.2 During Session

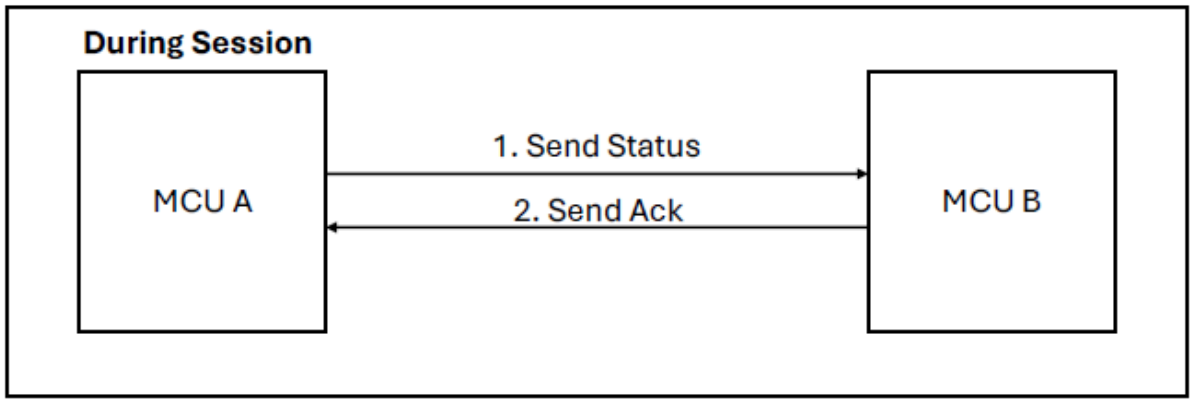

Figure 4-2: Data flow of During Session

In Figure 4-2, MCU A represents the robot's MCU while MCU B represents the station's MCU. The robot will keep sending its status to the station to inform it of its status. While the station will send acknowledgements to inform the robot of its status.

5 Pseudocode

Function RequestCharging()

Broadcast request to nearby stations

if receive stationID

```
{
send(reserveACK)
if (stationAck)
{
RobotMove(stationID)
#start real time message loop every 100ms
while charging
{
sendStatus(status)
}
}
}
```

6 Conclusion

This design ensures that the robot and station will only exchange data when necessary.