Test Sheet – Ad Hoc Network Communication for Disaster Relief Movement Algorithm Sub-System Test

Location	EE Building Design Studio
Date	20 December 2023
Time	18:00
Description	This test document is designed for an ad hoc network communication by TechBatch to test movement algorithm sub-system, collect the results and publish them.
Aim	The purpose of the testing is to determine whether the first design of the movement algorithm sub-system has the capability to meet the project requirements and to prevent radical design change problems that will arise from not meeting these requirements when the project takes on a more complex structure in the later stages. Therefore, this guide aims to show if this sub-subsystem can correctly perform movement commands in various conditions.
Expected Outcome	It is expected to show that the mobile unit is able to move in different paths. The aim is to test the reliability of the movement algorithm by using mobile unit. For this, we utilize RFID reader and tags located on 8x8 square map. We are expecting correct movements on different path schemes such as direct path and square path.
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Test Devices & Tools

1. Ruler

Ground truth/Calibration: The distance between the end position of the mobile unit and the center of the target tile is measured with a ruler. In order to meet the movement requirement, the mobile unit must stand in the middle of the tile with a side of 12.5 cm.

2. Map

Ground truth/Calibration: The mobile unit is required to navigate a predefined path and come to a halt precisely at the designated target tile. The map is instrumental in verifying that the mobile unit traverses the correct path and does not overshoot the target tile by more than half of its intended position.

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Test Environment

The test environment for this subsystem was determined to be the engineering design studio, as the test area needed to be large enough to accommodate the grid. The area of the grid is 1 x 1 m2, and the grid is divided into 8 x 8 square tiles.

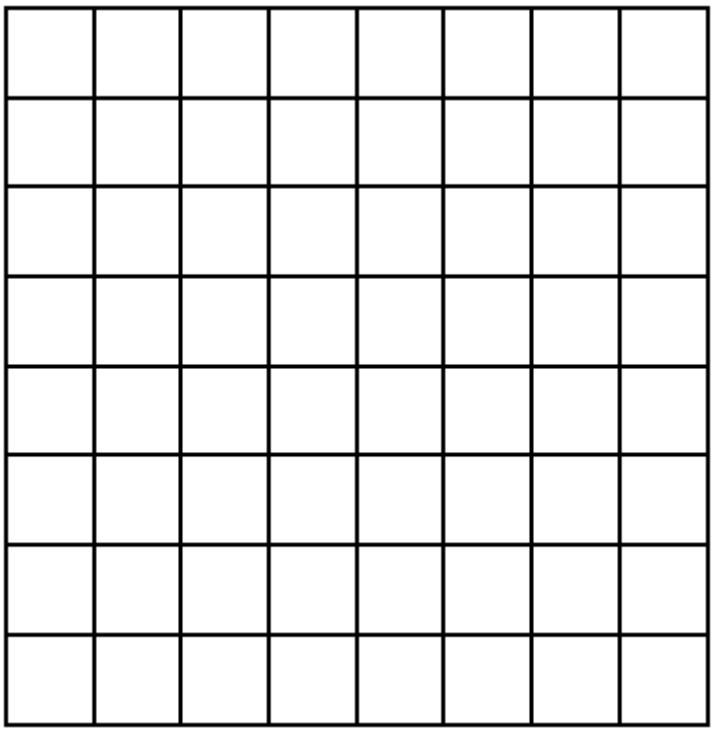

Figure 1: 8x8 square map sketch

Figure 2a: Test environment

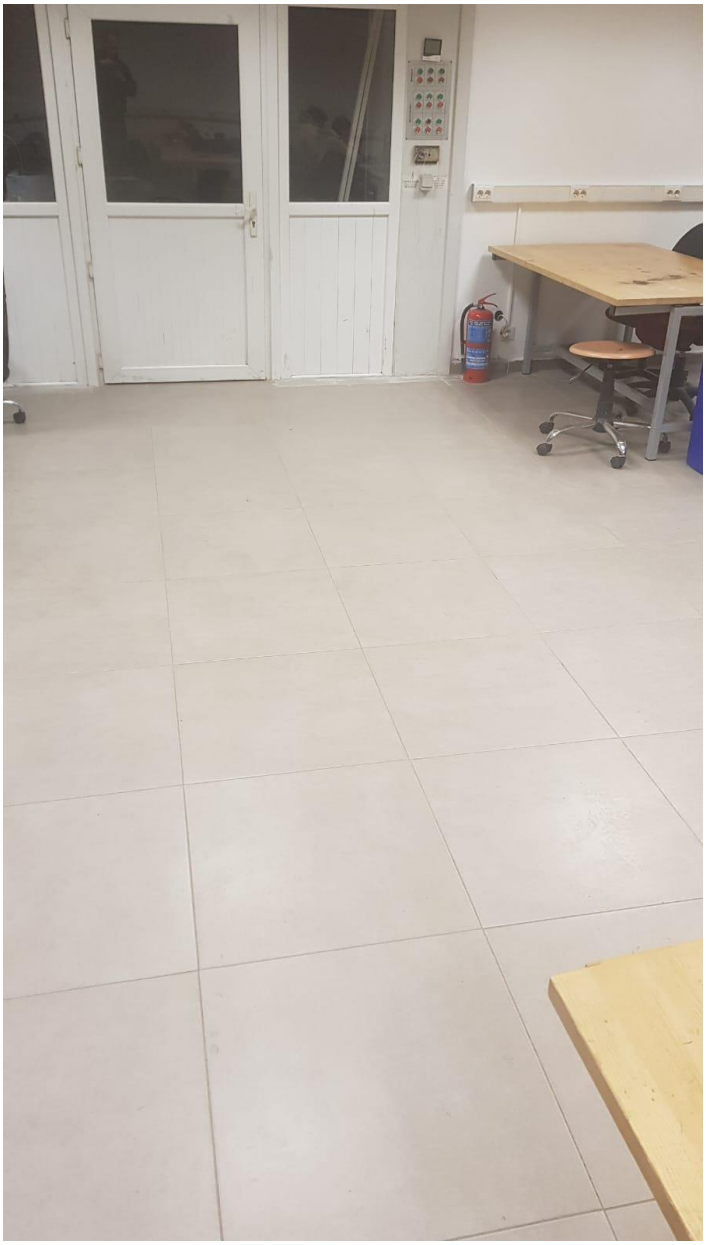

Figure 2b: Test environment

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Test Parameters

Parameter	Range	Step Size	Number of Measurements
# of tiles MU traverses in direct path	1-7	2	4
# of tiles in a side of the square MU traverses in square path	2-4	1	3

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1. Test Procedure

1. **Movement algorithm test for direct path in different distances is planned. The procedure is as follows:**

    1. The ESP32 on the mobile unit is connected to the computer.
    2. The file named "direct.ino" is opened and the program in the file is loaded to ESP32.
    3. The ESP32 is removed from the computer and connected to a power source on mobile unit.
    4. Mobile unit is placed on a predetermined tile which is indicated on the program.
    5. The reset button is pressed, and the movement starts.
    6. The mobile unit should traverse 1 tile and stop.
    7. At the end, error between the expected and actual position is measured by a ruler from the center of mobile unit to the center of target tile.
    8. The same steps are repeated for paths with number of tiles equal to 3,5 and 7.

2. **Movement algorithm test for square path in different distances is planned. The procedure is as follows:**

    1. The ESP32 on the mobile unit is connected to the computer.
    2. The file named "square.ino" is opened and the program in the file is loaded to ESP32.
    3. The ESP32 is removed from the computer and connected to a power source on mobile unit.
    4. Mobile unit is placed on a predetermined tile which is indicated on the program.
    5. The reset button is pressed, and the movement starts.
    6. The mobile unit must traverse a square path with 2 tiles on the side.
    7. At the end, error between the expected and actual position is measured by a ruler from the center of mobile unit to the center of target tile.
    8. The same steps are repeated for square paths with 3 and 4 tiles on the side.

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Test Data

Table 1: # of tiles MU traverses in direct path

Parameter Value	Actual Performance	Expected Performance	Error
1		Less than 4 cm error	
3		Less than 4 cm error	
5		Less than 4 cm error	
7		Less than 4 cm error	

Table 2: # of tiles in a side of the square MU traverses in square path

Parameter Value	Actual Performance	Expected Performance	Error
2		Less than 4 cm error	
4		Less than 4 cm error	

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Data Analysis

(To be filled after the test)

Determine appropriate methods for analyzing and presenting the test data (plots, diagrams, tables, etc.). Provide meaningful statistical analysis.

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Results and Discussion

(To be filled after the test)

Interpret the results of your test by providing a detailed assessment of the performance and data analysis. Determine whether your tests are successful or not. Deduce meaningful conclusions and determine the next steps.