

ESE 501 Digital System Specification and Modeling
Project 2: Robot Navigation in Confined Areas
Phase 1 (Initial Version) Requirement

Due on 3/26/2020

Total Points (10): No late submission (submit the file by midnight of the due date)

1. Initial Phase Specification

Robot

Proximity sensor detects an obstacle within 3m

GPS determines its own location

Communicate with the server (real signals)

Communicate with the environment (virtual signals)

A path (a sequence of grids) is given before the simulation (i.e., provided through parameters)

Operation 1:

- Send signal "CROSSING" to the server 0.5m before the boundary. Keeps moving.
- If "ACK" signal is not received from the server, it stops at the boundary. The robot moves again if the server sends "OK" signal

Operation 2:

- When it detects obstacles within 3m, the robot stops. Sends status "STOPPED" to the server.
- If obstacles are cleared, it moves again. Send status "MOVING" to the server.

Server

Monitors the data structure

Communicate with the robots

Update the data structure

Processing

Four loops of operations (executes every clock cycle)

Loop 1: each cycle, each robot updates the position

Loop 2: each cycle, each obstacle updates the position

Loop 3: for each robot, compare the distance from the boundary.

If close to the boundary, sends the signal to the robot, then the robot sends the signal to the server

Loop 4: for each robot, compare the distance from the obstacles

If the robot is close to the obstacle, stops the robot, sends robot the status and the robot sends the status to the server.

If the stopped robot is clear from the obstacles, resumes the robot, sends robot the status and the robot send the status to the server.

2. Verification and Simulation

- Simulation with 2 robots and 2 obstacles in 2-dimensional maps described in the Project Description.
- Grid size is 2m by 2m.
- Robots starts at the opposite corners of the map.
- Obstacles move (back-and-forth) with 4 m/s speed.
- Robots move with 2m/s speed.
- The path for the robots are parameterized.

3. Submission Requirements

- Source codes for robot, processing, server, top main and necessary test-bench codes
- Data base structures for robot, processing, server
- Description (pseudo codes) for handshaking mechanisms
- Verification/Simulation results: Handshake event activities (with time and event)
- Summary report (1-2 pages)

Submission through electronic files (zip version)

The report grading will be based on 1. Clarity of the report, 2. Completeness of the results.

4. Grading

1. Source Codes (3)
2. Datapath diagram (2)
3. Control Signal Table (2)
4. Correctness and Completeness (3)