

Test Plan

Indoor mapping with autonomous vehicle

Version 1.0

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1 Introduction

This document gives an overview of how the autonomous mapping robot is going to be tested throughout the project. The purpose of the document is to provide information about how each requirement from the requirement specification should be tested. The original test plan only includes test for requirements with priority level one. When all requirements with priority level one are fulfilled the test plan will be extended to include tests for requirements with priority level higher than one.

1.1 Test Report

After each test is conducted a test report should be filled in and sent to the document responsible. A template for the test report is found in section 4. Each test has the same ID-number as the number of the requirement it is testing. When and who should perform and also audit the test are defined for each test in section 2. What functionality is required to perform the test and how the test should be evaluated is also described. The criterion for success of each test is that it fulfills the requirement associated with the test.

2 Tests Related to Requirements

This section describes the tests related to requirements in detail.

2.1 Test Requirement 1 and 3

The purpose of this test is to test requirement number 1 and 3.

The product should be able to generate a 2D map of an unknown environment with a small amount of objects

The distance between opposite walls in the generated map must not differ more than 20 percent compared to the real world

The test should be performed during week 45.

2.1.1 Staff

Martin Larsson is responsible for and will also conduct the test. The test will be audited by Johan Dahlin.

2.1.2 Required Functionality

To perform the test the following functionality is required

- SLAM system
- Manual control of the robot

2.1.3 Description

In this test the robot will be moved around manually while the SLAM system is keeping track of its pose and mapping the environment. The environment will be unknown for



the robot and contain a small amount of obstacles. The test will be repeated for the same environment and for other environments until the auditor is satisfied.

2.2 Test Requirement 2

The purpose of this test is to test requirement number 2.

The system should be able to detect when the reachable environment has been completely mapped and stopped thereafter

The test should be performed during week 45.

2.2.1 Staff

Martin Larsson is responsible for and will also conduct the test. The test will be audited by Martin Åbom.

2.2.2 Required Functionality

To perform the test the following functionality is required

- SLAM system
- Trajectory planning
- Path following

2.2.3 Description

In this test the robot will be moved around autonomously while the SLAM system is keeping track of its pose and mapping the environment. When the mapping is done the robot should stop and indicate to the user that it is done mapping. The test will be repeated for the same environment and for other environments until the auditor is satisfied.

2.3 Test Requirement 8

The purpose of this test is to test requirement number 8.

The product should be able to plan a trajectory in order to gather more information to fulfill the mapping requirements

The test should be performed during week 45.

2.3.1 Staff

Joel Wastesson is responsible for and will also conduct the test. The test will be audited by Patrik Önnegren.



2.3.2 Required Functionality

To perform the test the following functionality is required

- None

2.3.3 Description

Given an incomplete map and the robots pose, the robot should autonomously plan a new trajectory. The test will be repeated for different incomplete maps and poses until the auditor is satisfied.

2.4 Test Requirement 9

The purpose of this test is to test requirement number 9.

If the product can't follow a planned trajectory, a new trajectory should be calculated

The test should be performed during week 45.

2.4.1 Staff

Joel Wastesson is responsible for and will also conduct the test. The test will be audited by Martin Åbom.

2.4.2 Required Functionality

To perform the test the following functionality is required

- Communication with the LMS
- Estimation of orientation
- Estimation of position
- Path following

2.4.3 Description

In this test the robot will be given a trajectory which intersects with an obstacle, the robot should then indicate that a new trajectory should be calculated once the obstacle is found. The test will be repeated until the auditor is satisfied.

2.5 Test Requirement 13

The purpose of this test is to test requirement number 13.

The product should be able to orient itself when navigating through the area with a maximum error of ten degrees

The test should be performed during week 44.

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2.5.1 Staff

Johan Dahlin is responsible for and will also conduct the test. The test will be audited by Claes Hallström.

2.5.2 Required Functionality

To perform the test the following functionality is required

- Communication with IMU
- Communication with the LMS
- Manual control of the robot

2.5.3 Description

This test has three stages. In the first stage the robot will rotate 360 degrees around its axis, in the second stage the robot will move straight ahead and in the third stage the robot will move around freely in the environment. The test will be repeated until the auditor is satisfied.

2.6 Test Requirement 14

The purpose of this test is to test requirement number 14.

The product should be able to estimate its position when navigating through the area with a maximum error of 5 percent of traveled distance

The test should be performed during week 44.

2.6.1 Staff

Johan Dahlin is responsible for and will also conduct the test. The test will be audited by Claes Hallström.

2.6.2 Required Functionality

To perform the test the following functionality is required

- Communication with the IMU
- Communication with the LMS
- Manual control of the robot
- Estimation of orientation

2.6.3 Description

This test has three stages. In the first stage the robot will rotate around its axis, in the second stage the robot will move straight ahead and in the third stage the robot will move around freely in the environment. The test will be repeated until the auditor is satisfied.

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2.7 Test Requirement 15

The purpose of this test is to test requirement number 15.

The product should be able to follow a planned trajectory with a maximum error of 5 percent of traveled distance

The test should be performed during week 44.

2.7.1 Staff

Patrik Önnegren is responsible for and will also conduct the test. The test will be audited by Emil Torp.

2.7.2 Required Functionality

To perform the test the following functionality is required

- Estimation of orientation
- Estimation of position

2.7.3 Description

This test has two stages. In the first stage the robot will follow a straight line and in the second stage the robot will have a more complicated trajectory. The test will be repeated until the auditor is satisfied.

2.8 Test Requirement 30

The purpose of this test is to test requirement number 30.

The product should have a system which prevents the segway from hitting walls and obstacles, e.g. staircases

The test should be performed during week 42.

2.8.1 Staff

Emil Torp is responsible for and will also conduct the test. The test will be audited by Martin Åbom.

2.8.2 Required Functionality

To perform the test the following functionality is required

- Communication with the LMS



2.8.3 Description

In this test objects will be put in front of the LMS. Depending on the range to the object the safety system will give different outputs, which should be controlled. The test will be repeated until the auditor is satisfied.

3 System Tests

The purpose of this test is to test the whole system and all related requirements.

3.1 Staff

Martin Åbom is responsible for and will also conduct the test. The test will be audited by all other members of the project group.

3.2 Required Functionality

To perform the test the all subsystems of the robot must be fully developed.

3.3 Description

The robot will be placed in different environments and autonomously explore and map the environment while keeping track of its own position and avoiding obstacles.

4 Test Report

Date:.....

Test ID:.....

Attempts:.....

Test responsible:.....

Auditor:.....

Results:.....

Passed?:.....

Left to do:.....