**MIDDLESEX PLATFORM MEASURING SYSTEM**

**TEST PLAN DOCUMENT**

**Introduction**

This is a test plan document for the Middlesex platform measuring system, which is done to test the functionalities of the system, hardware and codes associated with the system itself. The purpose of this test plan is to verify that the system performs as described in the functional specification and captures the necessary things that need to undergo testing while the project is going on so that at the end of the project we can decide whether the project is a success according to the successes of the test that are to be conducted. The test plan is to be conducted in parts, where each module created will be tested separately, and then finally we will have the testing for the whole system. The testing plan will be divided into these three test plans; Sensor server test plan, Monitor test plan and the final system test plan.

**Sensor Server Test Plan**

**Introduction**

For this test plan, the sensor server module will undergo testing where the different functionalities will be tested, to see if the outcome results gotten are what were expected. The sensor server is divided into different parts which are; the sensors for reading Actuator length values, a mega Arduino board which is used to get the readings from the sensors and the central Arduino board which reads angular values raw, yaw and pitch which will also be used to send the read data to the monitor module.

**Type of tests to be done**

Functionality testing in which we will test if the sensors are working and reading the data required, also if the Arduino boards are working meaning that they are reading and sending data as instructed by the python codes associated with it.

Performance testing in which we will observe if the module is getting the desired results as expected without fail.

Environmental testing in which we will test how the environment affects the sensors and the Arduino boards.

**Risks associated**

The risks that are associated with the sensor server module are; the sensors not working in that case we will need to have spare sensors all the time, the next risk is interference between the sensors and in that case we will have to position the sensors in such a way that they do not cause any interference with each other if not then we can find card boards and place them in between the sensors to separate them thus preventing the interference, the other risk is Arduino boards not working therefore we should always have extra board if it’s possible and the final risk will be of the codes created for the sensor server were to be lost or the Arduino software crashes down and we lose all the codes, to prevent this we will need to have a backup of all the scripts created somewhere.

**Equipment needed**

To do a test plan for the sensor server module we will need the hardware involved which will be the sensors, the Arduino boards and the roller coaster chair itself. The sensors will be placed on the chair accordingly. Obviously, a PC to run the scripts associated with the sensor server.

**Location**

The testing should be done in the Ritterman building basement floor lab.

**Date and Total time**

The testing date and time is according to the deliverables set for each week.

**Personnel**

All the members involved in this project.

**Test Approach**

To test the sensor server module first set up the sensors on the roller coaster chair accordingly, then do the wire connections to the Arduino mega board and connect it to the software platform on a PC. Upload the Arduino sketch on to the two boards where the distance server sketch is for the Mega board and the sensor server sketch is for the Uno board. Once the sketches have been uploaded and the connections done, use the console to check the output results which must be as specified in the functional specification.

**Test Objective**

The objective of this test is first to make sure the sensors are working and the Arduino boards are also working and the Arduino sketches are obtaining what is required for the sensor server.

**Criteria for success**

For the sensor server test to be a success we must be able to observe sensor readings on the console window for both the Actuator lengths and the angle values. These readings should be displayed in the following format H, xxxx, xxxx, xxxx, xxxx, xxxx, xxxx, yyyy, yyyy, yyyy where the H represents the header and the xxx represents the ASCI digits for the actuator lengths and the yyyy represents floating point values for the angles, also the other criteria would be to be able to send the format to the monitor, if none of this takes place then the test will be considered as a fail.

**Monitor Test Plan**

**Introduction**

This test plan is intended to test the functionality and performance of the monitor module and if the results obtained are the expected ones. The monitor module is divided into different parts which are; a module used to move the roller coaster according to the set values for the actuator lengths and angles, the other module is to receive sensor values from the sensor server module and compare it with the set values to estimate the system error.

**Type of tests to be done**

Functionality test which will test functions intended for the module, Performance test that will test whether the chair will move in accordance to the commanded values and environmental test to test and see if the environment affects the readings in a way that if there is any movement or sound around the sensors will there be a different reading to avoid it anything that interferes needs to be removed.

Connectivity testing which will test whether the monitor can receive data from the middleware through UDP and if the data can be receive from the sensor server. If the data received for the actuator lengths is less than 300mm or more than 600mm then it will imply that there is an error in the readings.

Testing whether the chair moves according to the commanded steps given by the monitor is done by checking on the python script which is ran on the terminal and we can see if the chair moves according to the steps that are displayed on the command terminal.

**Risks associated**

The risks in this module will be the roller coaster chair does not move according to the set values or the chair does not move at all maybe due to network problems, the mitigation is that we will need to check the roller coaster movement before we do the testing.

If the monitor does not receive any data from the middleware or the sensor server, the mitigation will be to check all the connectivity is working accordingly either if it serially or the network.

**Equipment needed**

Python platform, ethernet connection and a PC.

**Location**

The testing should be done in the Ritterman building basement floor lab.

**Date and Total time**

The testing date and time is according to the deliverables set for each week.

**Personnel**

All the members involved in this project.

**Test Approach**

Set up the PC with a python platform on it and with an ethernet connectivity. Run the python script and observe the results.

**Test Objective**

The objective of this test is to ensure that the monitor receives data from the middleware and from the sensor server. Once the data is received it should compare them and display the results and store it in a csv extension file.

**Criteria for success**

The plan test to be successful the monitor needs to be able to display the error results and store it.

**Final system test plan**

For the final test plan, the approach taken will be to do all the steps done for the sensor server and the monitor. The final thing will be to run the system, capture the data in a spreadsheet which is a file with an extension of a csv file called error.csv. After that view the output of the spreadsheet to determine the errors.

But before saving the output values we need to calibrate the chair by measuring the actuator lengths and the angles, so that we can make sure that what the monitor receives from the middleware are the correct lengths and angles.

To do so first measure the lengths of the actuators when the chair has no air pressure within the actuator, second measure while the chair is in neutral position that is when the actuators have 50% air pressure. After doing that we need to take the readings from the distance sensors when the actuators have no air pressure and when they have 50% air pressure and record all the readings. A comparison of the two data must be done where we compare the two readings done with no air pressure and the ones done with 50% air pressure and see if the difference between the distance sensor reading and the measured reading when there is no air in the actuators is the same as the difference between the distance sensor reading and the measured reading when the actuators have 50% air pressure.

The same procedure will be done for calibrating the Roll, pitch and yaw measurements.

The difference read between the measured reading and what the sensors are reading will be used as a compensations value for the final output results where we take the output data and minus the compensation value to get the actual error reading.