# Test and Integration plan

**Purpose**  
The purpose of the test and integration plan is to describe the necessary tests to verify that all the modules developed for this OGO Venus Exploration project works in a proper way.

**Boundary and cliff sensor**To test this subsystem we will use a sheet of paper or table (white) with black lines and circles in order to simulated the Venus area. The robot will then be put inside the boundaries at a random position and turned on to test if it avoids the black parts. This test will help to fine-tune the code and position of the sensors so everything can run smoothly.

**Identifying rocks**

To test if the robot can detect all the rocks in the search area, a route will be made with rocks at different locations. The robot will then drive this route and count the rocks. This will be done several times with the rocks at different locations. When the robot is successful in locating the rocks, the identifying of distance from a rock to the robot will be tested. This can be done in three steps starting with a basic test were the robot needs to calculate the distance from a standstill position with a rock placed in front of it. The second step would be to the same test but with a rock placed to the side so the robot needs to turn in order to have the rock right in front of its sensors. The last step would be to do test with all the rocks in the area at the same time.

**Grabbing the rocks**

The test to make sure that the robot can grab the rocks will be conducted in the same way as the test for locating the rocks with three different steps. First is to grab a rock located in front of the robot, the second and third test will be to grab a rock located to the left and to the right of the robot. If these tests are successful we can be certain that the robot will manage to grab any rock in the search area.

**Mountain detection**

In order to test the system for detecting mountains, the robot will have to perform several movements whenever it closes in on a mountain. By using serial communication showing the distance sensed by the robot and the true distance, the accuracy and any errors can be measured. Testing of the servos needs to be conducted in order to check if the robot uses them to look left and right and giving accurate numbers. As a final test, the robot need to move around a mountain by itself.

**Communication**

The communication part will only be implemented after the robot can identify and grab rocks, and avoid cliffs and mountains. The first part to be implemented is the communication between the two robots after they have grabbed a rock and are bringing it back to the lab. Only one robot can do this at one certain time. This can be tested by giving both robots a rock at the same time. The robot who gets the rock first should move to the lab, while the other one should wait.

**Navigation**

In this test a copy of the possible surface used in the final test will be used. The first test will only involve one of the two robots in order to see that it behaves as expected, which basically means that it need to move in the correct directions and return to the lab with the rocks. If the first robot succeeds, then the second robot will conduct the same test. If both of them perform as expected, the test will be conducted again, but this time with both robots placed in the testing area. These tests should also give an indication whether or not the robots follow the lines it is supposed to, if they notice any rocks they have already picked up and if they manage to get back to the lab with the rocks. If there is enough time, this test should be split up into several smaller test to check each aspect of the navigation.

**Integration and final test**

Once all subsystems are performing as planned (independently), all the systems will be combined. Then a test to check that everything works together as planned is to be conducted. There might be some unforeseen complications when all the different parts and codes are combined. Some extra time should be dedicated to the final integration in order to solve these potential complications.