

# *Nasa Robotics mining*

1.0

Test Plan

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## Introduction:

Every year A Nasa Lunabotics engineering competition is held. Our mission as the computer science students is to program the required code in order to run a robot that will be engineered by the aerospace students that will be competing in the Nasa competition. During the first semester we will implement code for manually controlling the robot while in the second semester we will be implementing a code that would be for the autonomy of the robot.

## Scope:

This document will be applied to all software requirements, which are, to work and understand the previous year's code which was used to control the robot, testing the robot controls on a simulated level on a virtual environment, implementing a controller for the robot which would be used as backup if full autonomy is not reached, implementing an arm/conveyor belt that would be used to collect minerals, and the last milestone of this semester would be to implements sensors to detect obstacles, mining site and deposit site, this will allow us and to robot to make the correct actions once atonominity is implemented

## Purpose:

The purpose of this document would be to guide and simplify our testing strategy for our audience and clients including the aerospace team and our professor Dr. Phillip Chan and our Advisor Dr. Marius Silaghi

## Required test:

## 1. Navigations tests

| test                             | action          | Success                                                | failure                                                              |
|----------------------------------|-----------------|--------------------------------------------------------|----------------------------------------------------------------------|
| Wheels turning<br>left and right | Manual Input    | Wheels Turn<br>when Navigated<br>to do so              | Wheels do not<br>turn or turn but<br>not as required<br>input        |
| Robot going<br>forward           | Manual input    | Robot moves<br>forward when<br>navigated to do<br>so   | Robot does not<br>move forward or<br>does but not as<br>instructed   |
| Robot going<br>Backwards         | Manual input    | Robot moves<br>Backwards when<br>navigated to do<br>so | Robot does not<br>move Backwards<br>or does but not<br>as instructed |
| Wheels turning<br>left and right | automated Input | Wheels Turn<br>when Navigated<br>to do so              | Wheels do not<br>turn or turn but<br>not as required<br>input        |

|                       |                 |                                               |                                                             |
|-----------------------|-----------------|-----------------------------------------------|-------------------------------------------------------------|
| Robot going forward   | automated input | Robot moves forward when navigated to do so   | Robot does not move forward or does but not as instructed   |
| Robot going Backwards | automated input | Robot moves Backwards when navigated to do so | Robot does not move Backwards or does but not as instructed |

Table 1: Navigation tests

## 2. Bucket/conveyor belt tests

| test                                                       | action       | Success                                                                    | failure                                            |
|------------------------------------------------------------|--------------|----------------------------------------------------------------------------|----------------------------------------------------|
| Arms are lowered and raised while being in the mining area | Manual Input | Arms are functioning correctly and are able to move according to the input | Arms do not work or are not responding accordingly |
| Collecting samples                                         | Manual Input | Wanted sample is collected using the                                       | Bucket/conveyor belt does not function or is not   |

|                                                               |                 |                                                                                           |                                                                                     |
|---------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                               |                 | bucket/conveyor<br>belt                                                                   | responding<br>accordingly                                                           |
| Arms are<br>lowered and<br>raised while in<br>the mining area | automated Input | Arms are<br>functioning<br>correctly and are<br>able to move<br>according to the<br>input | Arms do not<br>work or are not<br>responding<br>accordingly                         |
| Collecting<br>samples                                         | automated Input | Wanted sample is<br>collected using<br>the<br>bucket/conveyor<br>belt                     | Bucket/conveyor<br>belt does not<br>function or is not<br>responding<br>accordingly |

Table 2: Bucket/conveyor belt tests

### 3. sensor tests

| test                                                    | action                                    | Success                         | failure                             |
|---------------------------------------------------------|-------------------------------------------|---------------------------------|-------------------------------------|
| Sensor can detect<br>objects that need<br>to be avoided | Sensor is turned<br>on and is<br>scanning | Sensor detects<br>obstacles and | Sensor does not<br>detect obstacles |

|                                                     |                                     |                             |                                                                            |
|-----------------------------------------------------|-------------------------------------|-----------------------------|----------------------------------------------------------------------------|
|                                                     |                                     | reports back the obstacles  | and robot gets stuck                                                       |
| Sensor can detect objects that need to be collected | Sensor is turned on and is scanning | Sensor detects collectables | Sensor does not detect collectables and the robot does not know what to do |

Table 3: Sensor tests

#### 4. Arduino tests

| test                 | action                    | Success                   | failure                                                         |
|----------------------|---------------------------|---------------------------|-----------------------------------------------------------------|
| Turn on/off motor    | Manual or automated input | Motor is turned on or off | Motor does not respond to input or does not respond accordingly |
| Move arms up or down | Manual or automated input | Arms move up or down      | Arms does not respond to input or does not                      |

|                                                    |                                            |                                                                     |                                                                                 |
|----------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------|
|                                                    |                                            |                                                                     | respond<br>accordingly                                                          |
| Robot operates<br>partially or fully<br>on its own | Turn the<br>automation<br>option on or off | Robot responds<br>to the automation<br>code and acts<br>accordingly | Robot does not<br>respond well to<br>the automation<br>code and glitches<br>out |
| Robot can use<br>the local wifi                    | Manual input<br>from terminal              | Robot sends<br>feedback through<br>the wifi and<br>debug terminal   | Robot does not<br>detect signal and<br>therefore could<br>not be controlled     |

Table 4: Arduino tests