Debris in Space Autonomous Removal Mechanism (DISARM)

Milestone Three

Team Members

Project Manager: Kyle Watkins

Project Systems Engineer: Luca Rizza

Electronics System Lead: Michael Leard

Electronics System Supporting Engineers: Nouraldean El-Chariti, Ali Lebbar

Grappling System Lead: Daniel Soto

Grappling System Supporting Engineers: Laura Guziczek, Ali Lebbar, Davey Renoid

Control System Lead: Nouraldean El-Chariti

Control System Supporting Engineers: Laura Guziczek, Matthew Intriago, Michael Leard

Structure System Lead: Vincent Panichelli

Structure System Supporting Engineers: Davey Renoid, Ali Lebbar, Daniel Soto

Client: Dr. Markus Wilde (mwilde@fit.edu)

Faculty Advisor: Dr. Silaghi (msilaghi@fit.edu)

Current Milestone Progress

Task	Completion %	To do
1) Develop models for 27U CubeSat and 6U CubeSat debris	100%	None
2) Continue development of algorithm pseudocode alongside models	50%	Continue work on implementing sensor plugin
3) Implement pseudocode on Gazebo	50%	Using sensor data, calculate welding locations to show welding

Discussion

Task 1: The originally designed CubeSats were off dimensions. Instead of a 10U CubeSat, I designed a 6U since they are more common. The dimensions are as follows: 6U (12 kg, 12 x 24 x 36 cm), 27U (54Kg, 34 x 35 x 36 cm). The extrusions on the actual cubes change accordingly, since the original extrusions were made for larger cubes. I was also able to fix the issue of not being able to export the CubeSats' to Gazebo due to an error in the URDF converter plugin which was fixed by rolling back to a previous working version used specifically for solid parts instead of assemblies.

Task 2: The first step to creating the simulation was adding a distance LiDAR sensor to the DISARM model so that we can calculate the welding points and find debris in empty space. To do this a Gazebo sensor plugin was used which allows us to detect objects up to 30 meters. However, this plugin was originally designed for a small autonomous driving robot. While trying to implement the sensor onto my model, there were several compatibility issues faced, including having to turn URDF files into XACRO files and adding code to place the sensor correctly on the model. In the end I was able to add the sensor, however the plugin does not seem to work properly as the output does not show if the sensor is reading the objects properly. This was confirmed by an accompanying software of ROS called Rviz, which did not show correct readings of objects in the environment.

Task 3: If the previous issues is fixed, then I will be able to continue adding more functions to my DISARM simulation model, including the ability to use the collected data to begin locating welding points on objects and demonstrate an actual weld.

Plan for next Milestone

Task	Matthew
Continue working on simulation as we transition to building DISARM	Fix sensors not working properly when attacking to DISARM and once fixed test simulation with three test cases.

Discussion

Task 1: Learning ROS from scratch was a much tougher challenge than expected. I thought I would be able to produce a simulation in time while learning how to work ROS by myself during my initial self-given timeframe. However, like with every coding experience, I ran into many errors that delayed my progress. My plan here on forward is to continue learning more on ROS and fix the current issues I have with my simulation. This way when we come to the point of having to build DISARM, I will have the simulation completed before the start of this process next semester.

Date(s) of meeting(s) with Client during the current milestone

Client Meeting Log	
November 18, 2020	CDR Meeting
December 2, 2020	CDR Presentation

Client feedback on the current milestone

- Look into adverse effects from heating the stud.
- Time for spring to compress should be higher than discharge time of capacitors.
- Design a six-unit CubeSat instead of a ten-unit CubeSat.
- Test the electrical components individually before assembling everything.
- Look into material for prong assembly.
- Change the cylinders in the cad design.

Date(s) of meeting(s) with Faculty Advisor during the current milestone

Faculty Advisor Meeting Log	
November 23, 2020	Meeting to discuss milestone 3 progress

Faculty Advisor feedback on each task for the current Milestone

Use GitHub to manage your versions and return easily to a working version Apply unit tests after each step to verify your additions rather than large cut-paste from examples.

Faculty Advisor Signature: _____ Date: _____

Matthew Intriago	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

Faculty Advisor Signature: _____ Date: _____