1. Project title, names and email addresses of team members

NASA LEC Robotic Mining

Taylor Ertrachter - tertrachter2017@my.fit.edu

Bailey Hamant - bhamant2017@my.fit.edu

James Spies - jspies2017@my.fit.edu

Nathaniel Bouchie - nbouchie2017@my.fit.edu

Michael Foster - mfoster2017@my.fit.edu

Delanie Glock - dglock2017@my.fit.edu

Eric Hu - ehu2017@my.fit.edu

Kevin Landers - klanders2017@my.fit.edu

Steven Pazienza - spazienza2017@my.fit.edu

Alex Perez - aperez2017@my.fit.edu

Youpeng Xu - yxu2017@my.fit.edu

2. Faculty Advisor: name and email address

Dr. Marius Silaghi - msilaghi@fit.edu

3. Client: name and affiliation

Aerospace NASA Lunabotics Engineering Competition (LEC) and
Dr. Kimberly Demoret, FIT Aerospace Department

4. Progress of current Milestone (progress matrix)

Task	Completion %	Bailey	James	Taylor	To do
1. Investigate tools	100%	33%	33%	33%	none
2. Hello World demos	100%	33%	33%	33%	none
3. Implement, test & demo *Transfer the full CAD model to Gazebo*	100%	75%	15%	10%	none
4. Implement, test & demo *Make the CAD model move in Gazebo*	100%	10%	80%	10%	Figure out how to add friction so the model doesn't slide as much
5. Implement, test & demo *Create example programs to get a feel of Zed camera's features for later implementation*	100%	10%	10%	80%	Plan on how to integrate features into later automation

5. Discussion (at least a few sentences, ie a paragraph) of each accomplished task (and obstacles) for the current Milestone:

- Task 1: The CAD model of the physical robot was transferred from CREO to Gazebo. This process was difficult because most of the file types that can be exported from CREO are not supported in Gazebo. We were eventually able to get the file into a .dae file format, which can then be used directly in Gazebo or linked to a .sdf and .urdf file format which is more supported in Gazebo.
- Task 2: Once we got the full CAD model into Gazebo we then had to make it move like our basic box robot. This was done in a similar manner, except the model is now considered an "actor" in the .world file. This allows for further animation and movement, but currently it can only move forward, backward, left, and right.
- Task 3: The Jetson TX 2 is now completely ready to be installed and connected to the hardware provided by the appropriate aerospace subteams. The computer was wiped via the Nvidia Software Manager program and installed with a custom version of Nvidia's graphics library, CUDA. CUDA will be needed for the Zed camera to access the Jetson's advanced GPU backed camera processing features. Finally, the Zed camera SDK was installed and quick example programs were

built to calibrate the camera. We began to research its features and planned how we would integrate this into our ultimate goal of automation.

6. **Discussion (at least a few sentences, ie a paragraph) of contribution of each team member to the current Milestone:**
    - Bailey Hamant: Converted the CAD model from CREO to a file type Gazebo can use. This process was not clear how to do because there were several videos and tutorials explaining how to use a community made Github program to do it, but then the program only worked with an older version of Gazebo or CREO.
    - James Spies: Once the CAD model was a .dae file, he got it working in Gazebo so that it can move. The .world file used to spawn the model in Gazebo uses the CAD model as an "actor" which allows it to be animated and move more in the future.
    - Taylor Ertrachter: Now that we have access to the Nvidia Jetson TX 2 (the onboard microcomputer we will be using as the brian of the robot), Taylor completely wiped and installed all of the appropriate Nvidia, ROS, and Zed camera software needed. In addition to setting up the Jetson, Taylor was also able to start configuring the Zed camera and built some examples utilizing the camera's real time 360° room mapping along with color and depth recognition.

7. **Plan for the next Milestone (task matrix)**

Task	Bailey	James	Taylor
Further testing with ZED camera code	Find and use more tutorials as a basis	Understand how the physical camera works with the machine	Start making new code for use of the robot
Use camera with physical robot	Attach camera	Hook up camera to the Jetson	Use our written code to implement camera in real simulation

8. **Discussion (at least a few sentences, ie a paragraph) of each planned task for the next Milestone**
    - Task 1: We currently have code that demonstrates how the ZED camera operates. It is able to take a full 360 degree view of a room and create a mapping of that room. We wish to further this code to identify possible obstacles so that in the future the robot can use this information to move accordingly.

- Task 2: If possible, we would like to start using our code in conjunction with the actual physical robot. We are not sure if this is possible yet because of the other hardware subteams, but if possible we would like to get the basics going with that.

9. **Date(s) of meeting(s) with Client during the current milestone**:
    - November 2
    - November 9
10. **Client feedback on the current milestone**
    - Still doing a good job. Likes how we were able to get the CAD model into Gazebo so we can animate and move it. This model can be used to showcase our work in the Aerospace Team's reports.
11. **Date(s) of meeting(s) with Faculty Advisor during the current milestone:** .
    - November 21 via email

12. Faculty Advisor feedback on each task for the current Milestone

- Task 1: ...
- Task 2: …
- Task 3: ...

Faculty Advisor Signature: DocuSigned by: Marius Silaghi 4C78522EF27840A... **Date:** 11/21/2020

Email me a video recorded demo

13. Evaluation by Faculty Advisor

- Faculty Advisor: detach and return this page to Dr. Chan (HC 214) or email the scores to pkc@cs.fit.edu

- Score (0-10) for each member: circle a score (or circle two adjacent scores for .25 or write down a real number between 0 and 10)

Taylor Ertrachter	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Bailey Hamant	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
James Spies	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

Faculty Advisor Signature: DocuSigned by: Marius Silaghi 4C78522EF27840A... Date: 11/21/2020