

Robotic Mining Competition – Milestone 3

Liam Sapper (lsapper2020@my.fit.edu)

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

Client: Robotic Drilling team (Previously the Robotic Mining Competition team), NASA

Meeting Times: Wednesdays, 4:00pm - 5:00pm; Fridays, 3:00pm - 3:30pm

Milestone 3 Progress:

Task	Completion %	To Do
1. Implement code in simulator that passes test vectors	45%	Get automatic movement working, have robot send correct signals at each waypoint
2. Implement unit tests for verifying simulated code	45%	Get automatic movement working, have robot send correct signals at each waypoint
3. Continue researching algorithms for autonomous tasks, look up libraries for selected algorithms.	50%	Halted, as this may not be relevant anymore without needed sensors
4. Implement/adjust any missing/existing techniques and tasks.	70%	Finish development of the nav system

Task 1 and 2:

Unit tests are done for each part of the code that gets developed, so task 2 goes hand in hand with task 1. The waypoint data structure has been built, and the functions for creating that list, initialization, and storing waypoints are working successfully, and accurately. The next thing to do is to actually get the robot moving to those waypoints on its own. The plan is to have the software tell the robot to turn until it reaches a specific angle, and then start moving forward while simultaneously calculating its current x and y position.

Task 3:

While I had started this earlier in the semester, further research has been paused indefinitely for now. The team is not currently planning on putting in the sensors needed for determining surroundings. The biggest problem is that the lunar material does not reflect the same way, so the usual sensors to detect surroundings would not work very effectively. The only information that would be gathered about the surrounding area is coming from an initial overhead photograph of the arena to simulate a passing satellite. Research would have to be directed into a new direction of image analyzation. I have made suggestions about alternatives; one being creating a software, in which using the picture given, we could set markers ourselves, and if the robot moves within the calculated distance of them, receives a signal to stop and/or head in some other direction. However, the team does not want me to work on this all by myself, and has urged me to wait on this and just focus on the current waypoint navigation system being developed.

Task 4:

There were several unfinished tasks from the last milestone that I have been working on completing during this milestone. The first was finishing up the test vectors. This has been completed. The next was looking up documentation and familiarizing myself with the involved hardware. I have become more familiar with the encoders, IMU, and the Raspberry Pi thanks to the electrical portion of the team, however my understanding isn't quite at its fullest. The last task was developing the navigation software. The details of this are explained in Task 1 and 2. Progress was slowed due to various reasons; Helping the team with their PDR review and presentation, which took about a week of focus; One week, since Veterans Day was at the end of the week, none of the teams ended up meeting, and I fell behind; Thanksgiving Break came. I was not as productive as I wanted to be during Thanksgiving Break, and was not able to meet with my advisor before the break due to my busy schedule and previous setbacks.

Discussion; Lessons Learned

I have a tendency to over complicate problems and worry about things that aren't really related to getting my part of the project completed. That was very clear over the last two milestones. I tried my best to steer myself in the direction per the advice of Dr. Silaghi and Dr. Chan. I'm happy I was able to get a fully functioning data structure implemented for the waypoint system, that's accurate. However, I'm disappointed I wasn't able to complete the automatic navigation portion by the deadline on the 27th. While I have a plan for it, and I know what I need to do to implement, I've been taking my time with actually implementing it. Although the team's PDR presentation took precedence for a chunk of time, and Thanksgiving Break did not turn out very productive, I feel like I could have done more.

I just don't have a lot of confidence in my own abilities, and end up not managing my time as well as I should. It gets a bit difficult paired with the extra work for the Engineering project class as well as long term projects I was working on in 3 other classes. I want to improve on this next semester.

Meetings with Client:

- 11/1/2023
- 11/3/2023
- 11/15/2023
- 11/17/2023
- 11/20/2023
- 11/29/2023

Feedback – Milestone 2

Liam has done a good job helping with the mech and aero engineering documents. He contributed well to our PDR document and presentation, and joined us in presenting in our project class. There has been better communication and while progress with the whole team has been slow, we are content with what Liam has contributed so far software-wise.

Meetings with Faculty Advisor:

- 10/28/2023

Feedback – Milestone 2

Still focusing a little too much on the lower levels of the project. Don't worry so much about the details of the variables and just try to work on developing code that runs and can be put into the simulator. It is good to see that there is now working code to confirm within the simulation. It looks good.

- Faculty Advisor Signature: _____ Date: _____

Faculty Advisor Evaluation

Liam	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
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- Faculty Advisor Signature: _____ Date: _____