

Robotic Mining Competition – Milestone 4

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

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

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

Milestone 4 Progress:

Task	Completion %	To Do
1. Test, debug, and demo current simulated software	100%	
2. Achieve proper autonomous movement within simulation	80%	Fix accuracy of angling and accuracy of forward movement
3. Complete software portion of Mech/Aero Engineering CDR report and presentation	100%	
4. Research possible addition of radar to use for autonomous movement Research on image processing	10%	Gathering more resources for studying
5. Start development of Navigation GUI	10%	Create drawn-up layout design within python code, program working map and waypoint list

Task 1 and 2:

A lot of this milestone was fighting with the simulation software to work properly. Every time I thought I had found a solution to my problem, the code still wouldn't work properly within Webots. My assumption was that it was how I was going about the code itself, and it didn't necessarily have anything to do with Webots. But after many failed attempts, I figured out what the problem was. In simulations, time is often simulated through steps. Webots runs this way. However, apparently when you reach a while loop within code running in Webots, it blocks outside functions, i.e. the time step, so you have to restate the time step at the start of the while loop before you can continue. Otherwise the program freezes up or glitches out. This was not something I could find looking through the documentation, but it's an issue I should have figured out much sooner than I did.

I was able to develop enough of the navigation system where it can go through the waypoint list and traverse to each one—however, it is still not very accurate. Next semester will be focused on improving the accuracy of the robot's angling before it moves onto the next waypoint.

Task 3:

A chunk of this milestone has been spent helping the RMC team with their Critical Design Review, or CDR. This included creating a presentation, as well as completing a section of their report document. We have also had days booked for practicing our presentation. It's

virtually complete, the due date for the report isn't until the 26th, I will be working this week to finish up my part of it, making sure to keep it updated.

Task 4:

Because of limitations set by the NASA competition (which the team is still working on following), using anything radar or radar-adjacent was out of the question. The one solution the team could come up with was possibly using image processing- essentially, using our satellite snapshot from above to give the robot all the details it needs to be able to make its decisions on movement. However, not much progress has been made, since the focus had been on the CDR and fixing the Webots simulation. If nothing else, we plan on being able to create a sort of drag and drop map of sorts, and as the robot moves, as our map shows where it's supposed to be at that point of time, it can determine if it needs to stop and move around something. The biggest limiting factor is the hardware involved.

Task 5:

As with the task above, because so much time was used fighting with Webots, not much progress was made on actual GUI development besides having the layout drawn up. With less focus needed on the navigation software itself now, we can start development of the GUI, which should not be very difficult.

Milestone 5 Plan:

Task
1. Implement, test, and demo current simulated software
2. Work on translating code from simulation to hardware
3. Develop navigation GUI
4. Conduct evaluation and analyze results
5. Create poster and ebook page for Senior Design Showcase

Meetings with Client:

- 1/17/2024
- 1/19/2024
- 1/24/2024
- 1/26/2024
- 1/31/2024
- 2/2/2024
- 2/5/2024
- 2/7/2024
- 2/9/2024
- 2/14/2024
- 2/16/2024
- 2/19/2024

Feedback – Milestone 4

Liam has done a good job helping with the mech and aero engineering documents, we are extremely happy to have the software working to an extent. He contributed well to our CDR 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:

- 1/17/2024

Feedback – Milestone4

Looking good. Make adjustments to the accuracy and get started with the GUI.

- 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: _____