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RMC - CSE Project Plan

Liam Sapper

NASA

EX LUNA, SCIENTIA

RMC: LUNABOTICS

The Who

- CSE Project Member: Liam Sapper - lsapper2020@my.fit.edu
- Faculty Advisor: Dr. Marius Silaghi - msilaghi@fit.edu
- Client: FIT's Robotic Mining Competition team (RMC), and by extension, NASA (the host of the Robotic Mining Competition).
- Head of RMC project:
  - Sidney Causey (scausey2021@my.fit.edu) - Aerospace Engineering

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Project Goals

- The goal of this project is to provide the client, RMC, with working software subsystems that will guide the movement and mining of their robot, both manually and autonomously.
- As the rest of the team is made up of aerospace and engineering students, they do not have the same depth of knowledge in implementing the software needed, specifically for the autonomous movements of the robot. I will help bring Software systems to ensure stable traversal over lunar terrain, both manually and autonomously.
- Software systems to ensure stable mining of lunar material, both manually and autonomously. This software should also be able to communicate how and when lunar material should be excavated and deposited.

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Features

- Base software allowing for manual use of traversal and mining capabilities.
- A graphical user interface to allow convenient navigation.
- (Novel) Automated maneuvering software, allowing waypoints to be set manually before moving automatically along that set path.
- (Novel) Automated mining software, which should be able to determine when material should be mined, how much has been mined, and when to stop mining.

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Technical Challenges

- While I am not entirely unfamiliar with working with hardware or machine programming thanks to classes taken, I do not have a lot of experience outside of that, nor am I as experienced with autonomous programming.
- Lack of ability to work with a proper model of the robot until the model is in a more completed state
- Challenges with the chosen simulation software; The simulation has been freezing despite several attempts to get the robot to turn on its own within the simulation (something wrong with my loops)

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Tools

- Math
- PyQt5
- Webots
- Inputs
- Logitech Controller + Packages

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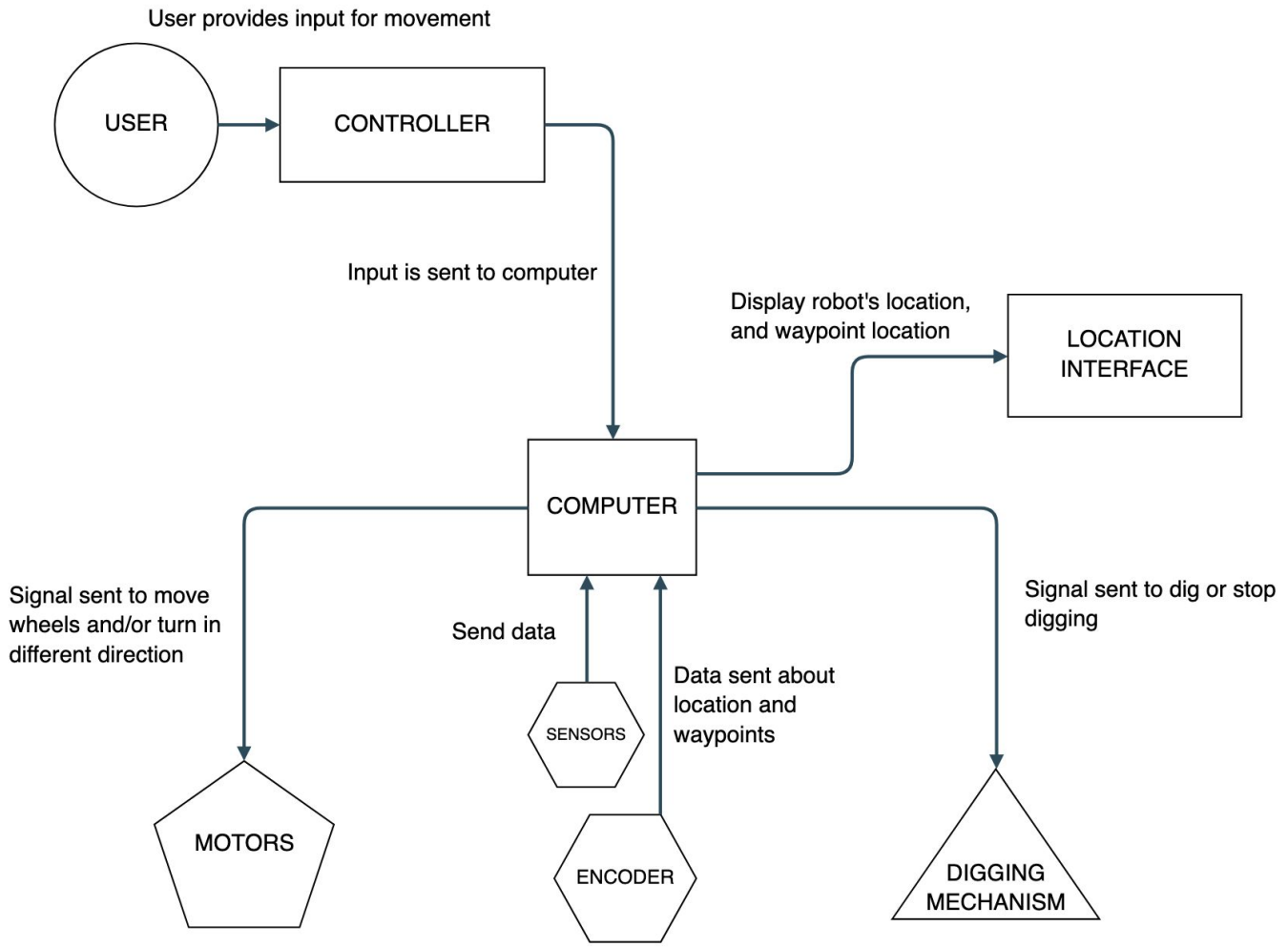
System Design



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Evaluation

How will the success of this software be measured?

- Button inputs are properly read
- Successfully and accurately retrieving waypoint data
- Successfully storing waypoint data
- Robot properly angles itself within a small margin of error
- Robot approaches and stops at correct waypoint coordinates
- Use minimal amount of data when computer is communicating with other hardware
- Robot successfully follows entire waypoint path given
- Robot can replicate these results with both similar and varying waypoints set

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Milestone 4 - (Feb 19): Tasks

- Test, debug, and demo current simulated software
- Achieve proper autonomous movement within the simulated environment
- Develop navigation GUI
- Research connecting/managing multiple computers
  - Look into using a multiplexer before this
- Research solutions to allow more autonomy in navigation

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Milestone 5 - (Mar 18): Tasks

- Implement, test, and demo automated simulation
- Work on translating code from simulation to physical robot
- Develop navigation GUI
- Conduct evaluation and analyze results
- Create poster and ebook page for Senior Design showcase

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Milestone 6 - (Apr 15): Tasks

- Implement, test, and demo entire system on built robot
- Conduct evaluation and analyze results
- Create user/developer manual
- Create demo video

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RMC Team Contact

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