

Senior Design Capstone Project Summary

Commented [FD1]: Just put this here. don't know if we need a cover sheet or if we do what to title this summary as.

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Wayward Navigation Project Summary

This section should explain the basic idea of your project (what you are designing), why it should be done, how much it will cost, and the expected outcome.

The Executive Summary is NOT an introduction. Rather, it's a stand-alone portion of the document that could be distributed apart from the rest of the document. The Executive summary reads as if the Introduction does not exist, and vice versa. It should be written at a high enough level as to be understood by non-technical people (i.e., management). Think of it as a document that the CEO of a company would read in place of the complete report. Basically, describe motivation, objective, approach, and results. This section should be 250-300 words in length, double-spaced.

Specifically, consider and address as applicable:

- a. What is the design problem and why it should be solved?
 - i. Design a mobile robot to remotely navigate a raised garden(Figure 1) bed environment, analyze soil temperature and moisture, examining plants for disease, and mapping problem areas in the plant beds.
 - ii. Our motivation for creating a remote navigation platform is to equip communities with the tools to efficiently and easily maintain a garden system remotely from any mobile device.
- b. What are the technical problems?
 - i. Robot needs a system to interface and control the rover motors remotely
 - ii. Robot must run on a rechargeable battery and be able to autonomously return and connect to a charging station(Figure 2)
- c. What is the overall design/technical/objective(s)?
 - i. Integration of Modern Radio GNC-Modem on JPL Rover
 - ii. Remotely navigate JPL Rover within a geofenced area.
 - iii. JPL rover power systems and recharging station.
 - iv. User Interface of JPL Rover (Using app to navigate vs game controller)
- d. What tools/methods are used to guide the work?
 - i. 3D Printers
 - ii. PCB circuit design software
 - iii. Soldering Equipment
 - iv. API library for use of Raspberry pi
- e. What is the selected design solution?

- i. Use open-source software from JPL to modify mobile robot features to monitor garden bed environment and examine soil/plants for diseases.
 - ii. Create UI application to interact with robot and gather data regarding soil and plant examinations.
 - f. How much will it cost?
 - i. Around \$2500
 - g. What are the key performance specifications?
 - i. JPL Rover must be able to navigate the garden using a remote connection to the raspberry pi and GNC module
 - ii. Rover must be able to return to the charging station on command
 - iii. Rover must have a battery life of (x) and a range of (y)
 - h. What is the proof of concept? What demonstrates that the solution works?
 - i. Our design is based on the Mars Rover which has proven effective in extraterrestrial environments.
 - ii. [The ability for a remote user to accurately navigate a garden system using the robot platform with a mobile device.]
 - i. What are the next steps/future work
 - i. In the future, the goal is to fully automate the rover and equip it with tools to analyze and maintain the garden.

Commented [FD2]: is this section "our" proof of concept, or previous proof of concept

Nomenclature

- a. Provide an alphabetical list of symbols/variables/parameters used and their definition/meaning. Include units used for each symbol or variable, as well.
 - a.

Attribute	Value [imperial]	Value [SI]
Weight	28 [lbs]	12.7 [kg]
Footprint	24x14 [in]	60.96x30.48 [cm]
Battery Capacity	5200 [mAh]	5200 [mAh]
Battery Discharge Rate	8 [A]	8 [A]
Nominal Current Draw	1.2 [A]	1.2 [A]
Operating time	5 [hrs] (continual use)	5 [hrs] (continual use)
Approximate Max speed	68.8 [in/s]	1.75 [m/s]
Maximum 90 deg vertical scale	12 [in]	30.48 [cm]
Maximum height differential between sides	14 [in]	35.56 [cm]

- b. Include acronyms and their meaning.
 - a. JPL – Jet Propulsion Laboratory
 - b. GNC – Guidance, Navigation, and Control
 - c. API – Application Programming Interface



Figure 1: Example Raised Garden Bed



Figure 2: Charging station to be utilized for JPL Rover