FLORIDA A&M UNIVERSITY - FLORIDA STATE UNIVERSITY
COLLEGE OF ENGINEERING

Team 11 – NASA/RASC-AL Robo-Ops

FAMU/FSU College of Engineering

Restated Project Scope and Project Plan

Faculty Advisors:

Jonathan Clark – Mechanical Engineering
Uwe H. Meyer-Baese – Electrical Engineering

Team Members:

Boris Barreto – Electrical and Computer Engineering
Jason Brown – Mechanical Engineering
Justin Hundeshell – Mechanical Engineering
Linus Nandati – Electrical Engineering
Tsung Lun Yang – Mechanical Engineering

Date: 01/17/2014

Contents

1.0 Work Statement

The teams goal is to develop a robot which will be controlled remotely, with the ability to extract rock samples from various surfaces and terrains, with the goal to participate in the 2014 Robo-Ops Competition. The team chose to maintain the previous competition rover platform as a base and set about improving three main areas. The control interface and the design of the control needed improvement from a step based input to a real time control system. The communication system needed to be upgraded to improve bandwidth and connection stability. Finally the extraction module needed to be redesigned to reduce the overall weight and the extraction speed of the system.

2.0 New Developments

Over winter break, the project proposal was submitted to NASA and unfortunately the FAMU/FSU Robo-Ops team was not selected to compete this year. The team will be providing the judge's feedback on our proposal as soon as the organizers of the competition are able to forward it to the team. This means that the rover will not be able to compete in the RASC-AL competition this year and therefore the group has no official goal to work towards. While this is a huge setback, a final design must be completed. Therefore the group will continue to modify the rover as it seems fit in order to better prepare next year's team for the same competition.

The NASA competition acceptance came with $10,000. Without the competition, the money will not be available and therefore the budget has been diminished to what is currently available. Without this extra money, the quality of materials for the design which was planned will have to be scaled back substantially, and any extraneous upgrades which aren't absolutely essential will have to be cut out of the design until next year.

The team will now focuses on the backup plan developed during the fall semester. The backup plan will address the issue of lack of funding by only building the most essential components of the platform. The team has decided that the only the development of the new extraction module, upgrading the networking equipment, and the improvement of locomotion control are possible under the strict budget. Many of the components of the project will be build using the least expensive material and equipment possible, such as using hard plastic for robotic arm instead of the originally proposed aluminum frame. The team plans to have by the end of the spring semester a robotic platform, capable of performing all of the tasks originally planned by the competition, which will be complete with the reduced budget.

Previously, we had calculated a few options depending on our financial situation. Unfortunately, we were not accepted into the competition, we will attempt to maintain our previous course of action and engineer a superior machine. Originally we intended to use aluminum and carbon fiber alongside high quality motors, but our advisor recommended we utilize some of the materials he has within his lab including ABS plastics and spare motors within the lab. To do this, we plan to construct an arm to the scale of an XRL sized platform, which should be the scale next year's team will attempt to use. It is certain that we will make our innovative gripping arm and program controls. Fortunately, controls and programming require little hardware so the xbox controller will still be implemented into operation. The wireless routers would have been nice to add as well as the two networks, but we will attempt to utilize the existing routers to construct the communications design. The chassis will not be augmented other than rearranging computer units. We are also leaving off the thermal controlling fans because to focus on developing systems next year's team will utilize.

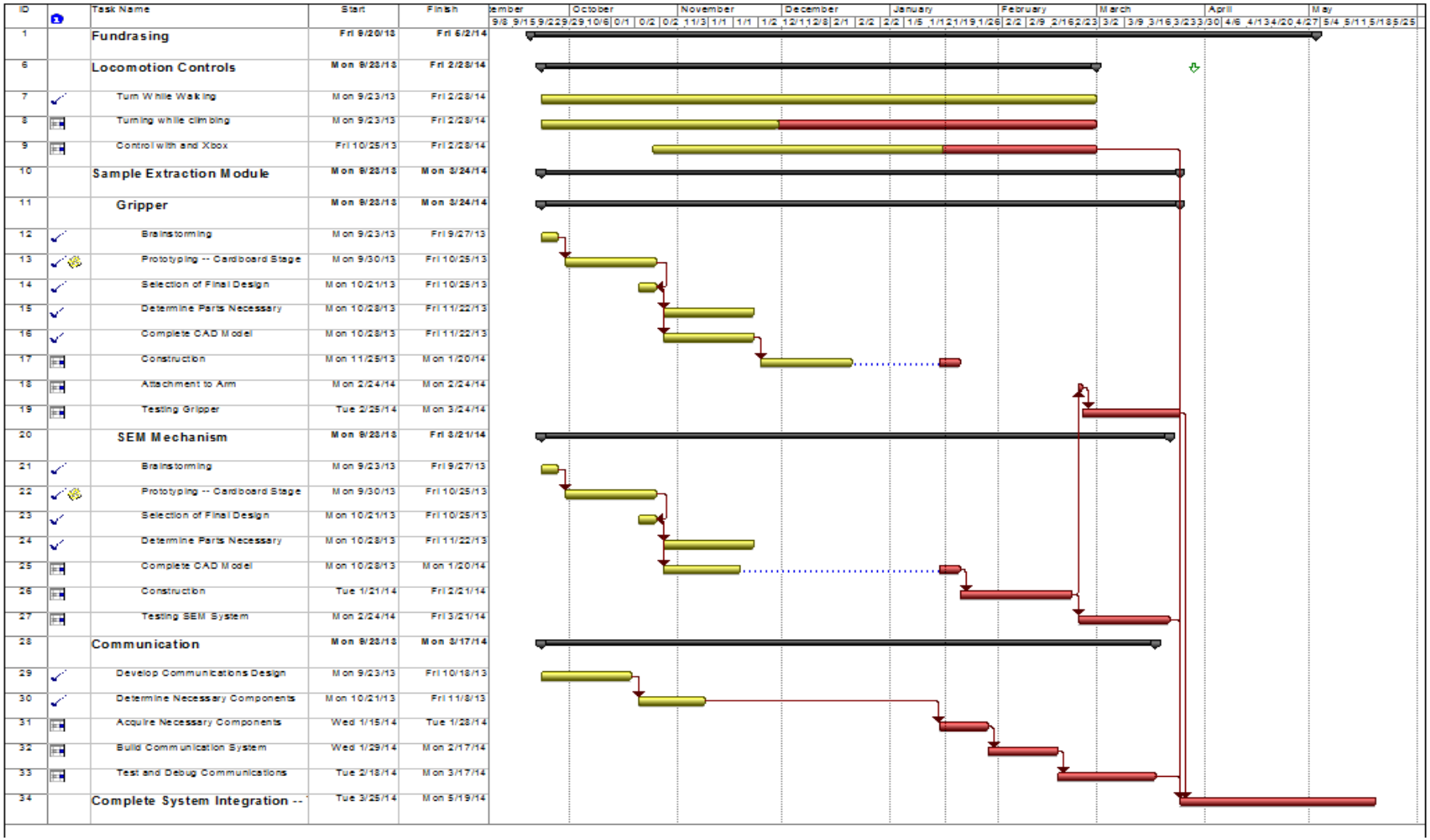
3.0 Project Plans

With the team not being selected to participate in the competition, our back-up was put into place. Our Advisor and mentor has stated he secured a $1,000 grant from the Florida Space Grant Consortium. However, he has not finalized the grant process. However, he has offered the team to utilize some of the resources the Stride Lab has, including a significant supply of ABS plastic and spare motors. The team has also been given permission to use the laser cutter within the lab, which will allow for rapid construction of the various components of the design. With our plan to scale down the arm to a size fit for our original plan of creating XRL sized mobile platforms, we will be able to utilize the ABS to construct our robotic arm. With the $1,000 grant, we will purchase the communications equipment necessary to develop a more robust connection. According to our advisor, he should be securing the grant sometime next week.

The milestones for the project will be to completing the conversion from step based to real time control of the locomotion, constructing an extraction arm from ABS plastic, and developing communications protocols to increase bandwidth. Since the team is no longer competing in the 2014 Robo-Ops competition, our goals shifted slightly, requiring the team to redesign and reconsider certain aspects. This has shifted our schedule a little back, but with the use of rapid prototyping techniques, we should be able to construct our design relatively quickly.

Appendix

Gantt Chart



ID	Task Name	Start	Finish
1	**Fundrasing**	Fri 9/20/13	Fri 5/2/14
6	**Locomotion Controls**	Mon 9/23/13	Fri 2/28/14
7	Turn While Walking	Mon 9/23/13	Fri 2/28/14
8	Turning while climbing	Mon 9/23/13	Fri 2/28/14
9	Control with and Xbox	Fri 10/25/13	Fri 2/28/14
10	**Sample Extraction Module**	Mon 9/23/13	Mon 3/24/14
11	**Gripper**	Mon 9/23/13	Mon 3/24/14
12	Brainstorming	Mon 9/23/13	Fri 9/27/13
13	Prototyping -- Cardboard Stage	Mon 9/30/13	Fri 10/25/13
14	Selection of Final Design	Mon 10/21/13	Fri 10/25/13
15	Determine Parts Necessary	Mon 10/28/13	Fri 11/22/13
16	Complete CAD Model	Mon 10/28/13	Fri 11/22/13
17	Construction	Mon 11/25/13	Mon 1/20/14
18	Attachment to Arm	Mon 2/24/14	Mon 2/24/14
19	Testing Gripper	Tue 2/25/14	Mon 3/24/14
20	**SEM Mechanism**	Mon 9/23/13	Fri 3/21/14
21	Brainstorming	Mon 9/23/13	Fri 9/27/13
22	Prototyping -- Cardboard Stage	Mon 9/30/13	Fri 10/25/13
23	Selection of Final Design	Mon 10/21/13	Fri 10/25/13
24	Determine Parts Necessary	Mon 10/28/13	Fri 11/22/13
25	Complete CAD Model	Mon 10/28/13	Mon 1/20/14
26	Construction	Tue 1/21/14	Fri 2/21/14
27	Testing SEM System	Mon 2/24/14	Fri 3/21/14
28	**Communication**	Mon 9/23/13	Mon 3/17/14
29	Develop Communications Design	Mon 9/23/13	Fri 10/18/13
30	Determine Necessary Components	Mon 10/21/13	Fri 11/8/13
31	Acquire Necessary Components	Wed 1/15/14	Tue 1/28/14
32	Build Communication System	Wed 1/29/14	Mon 2/17/14
33	Test and Debug Communications	Tue 2/18/14	Mon 3/17/14
34	**Complete System Integration --**	Tue 3/25/14	Mon 5/19/14