Individual Lab Report
Weekly Progress

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1. Individual Progress

For this week, I focused on two tasks, the adaptation of the GUI to our new mobility design, and determining a ROS version to begin development on. The GUI adaptations for our design were mostly simple and straightforward, simply requiring some changes in the "Joint Configuration" section to reflect the now-reduced set of degrees of freedom (See Figure 1).

I went on to give the entire GUI another pass to see what improvements might be desirable. Within the "Joint Configuration" section's "View" subsection, I added a "Save Image" button to capture the display pane to the right, and plan to use a file naming convention that will make it easy to associate such images with saved joint configurations. I also moved the "Show Target" button out to a checkbox, along with a "Show Home" checkbox, both of which I plan to make so that when checked the display pane will superimpose a faint image of the robot in a desired position that it's moving towards or a default reference configuration, respectively. I think these functions will prove helpful while we're composing and testing configurations, stances, and motions for the robot.

Additionally, the "Mission Control" tab (See Figure 2) was slightly reorganized and cleaned up, and I added buttons for saving and loading map information, as well as saving a simple image file of the map view. A "Save Image" button was also added for the camera view in the top-right pane. Some controls for mission related parameters were also added, such as speed limits for actuators.

I also revamped the entire "Log" pane (See Figure 3) to be more informative and also show information about ROS. All log information will now be displayed in tables that have columns describing such properties as the time they were received, their severity, and their ROS node of origin. Tables have also been added to track the current ROS environment and display tables of its nodes and message topics. I expect this to be useful as we begin integrating ROS into our system, and continue to be useful as we expand our software over the coming months.

The selection of a ROS version mainly entailed researching supported packages, observing the support forums, and talking to fellow students. I decided on Groovy over Fuerte and Hydro because it seemed to have the stability of an older version but still have many packages being actively developed for it. Additionally, a slight plurality of other student groups seem to have chosen it as well, and I found much more ROS forums activity pertaining to it than to the other versions.

2. Challenges/Issues

After designing GUI's with QTDesigner for two weeks now, there are almost no remaining challenges in using the software and I feel extremely comfortable with it. The main challenges are in finding intuitive and well-organized ways of arranging the information and widgets so that it'll be useful and efficient while we're developing and testing. Additionally, I was able to look at our Work Breakdown Structure and envision our validation experiments and try to predict what functionalities will be useful. At this stage, the various widgets and displays of the GUI represent a combination of a wishlist and to-do list. As a result, I was focused on our functional needs while composing it, and in composing it I now have what amounts to a list of functionalities to be fulfilled in the future. For these reasons, I'm glad it was taken as a first step, as I think the process has helped both to crystallize our software goals and partially illuminate the road ahead.

In selecting a ROS version, the main challenge was making a decision on such a major component of our system while we were still in very early stages of development, as the version will determine which packages we can expect to cooperate. Being so early in the project and in learning about ROS, however, we still know very little about what packages exist at all, let alone which ones we'll be incorporating. QTROS, a GUI package that would allow inclusion of our GUI, is stable in Groovy but has some issues in Hydro. RVis and ROSSerial seems to work in both Groovy and Hydro, and presumably work in Fuerte as well, but the amount of recent discussion on Fuerte was sparse and led me to believe it's fallen out of favor recently. Finally, consulting with other students, I found Groovy to be marginally favored. This is important since we'll be working alongside other teams for the duration of this project, and being able to share knowledge about common aspects of our systems will be helpful to all of us.

3. Team Work

Like my work with the GUI, much of the team's work this week was focused on fleshing out our new mobility design and adapting or creating mechanical and electrical systems from our prior work with the hexapod design.

Songie created a CAD model (See Figure 4) of one idea for the new design after working Nate to hammer out the basic idea behind its operation. He and Dipta also acquired some V-10 rubber materials for molding sticky feet. An initial test mold was done using a plastic bottle to get a sense for the process, and the result was impressively sticky but it seems that more thorough mixing might be necessary in the future.

Dipta and Nate worked on the Power Distribution board schematic (See Figure 5), which

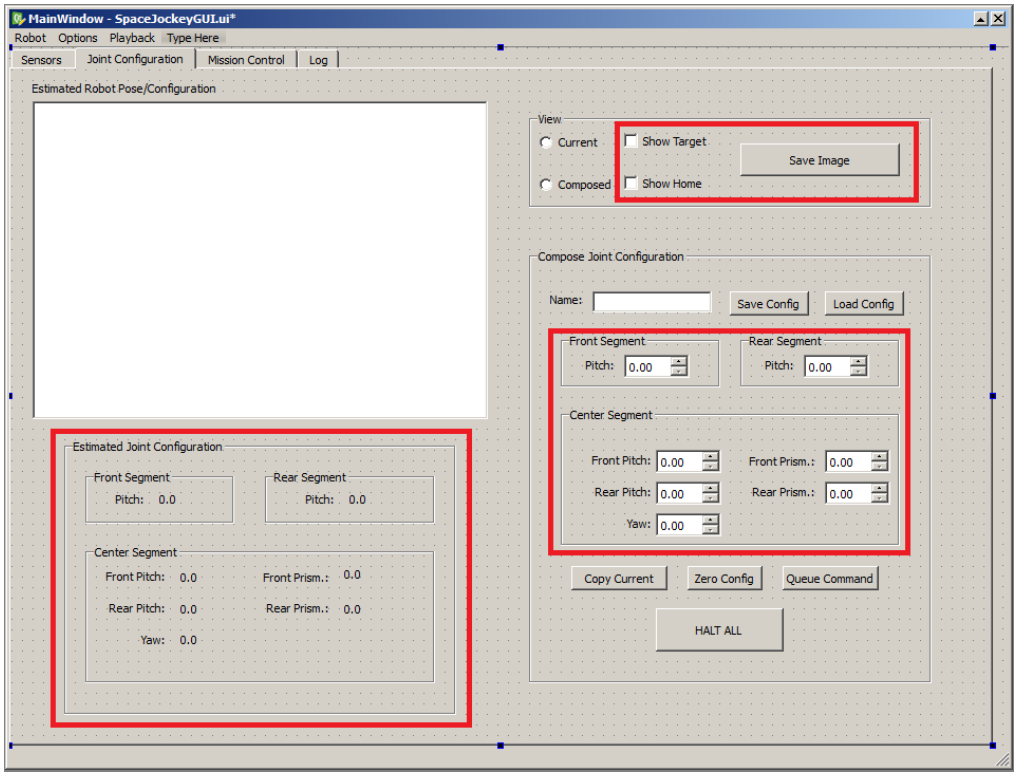
also had to be re-approached given that our needs had changed drastically with the new design. Additionally, the Arduino Due and servos we ordered last week arrived in the mail and Nate was able to test them together using some software provided by the servo manufacturers. I looked over his shoulder for much of this, since I'll soon be integrating these motors in the GUI controls.

4. Future Work

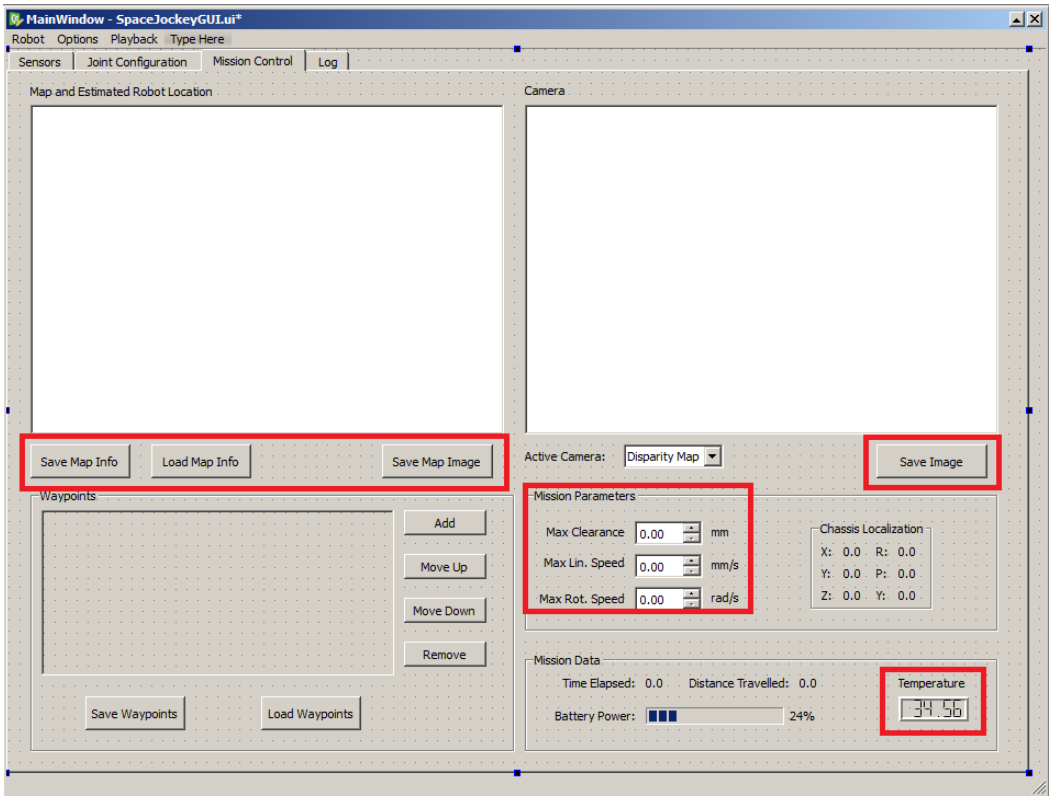
For our next progress report, I would like to have ROS up and running and begin integrating the GUI and Arduino into a software package. The particular features of the GUI I'd like to get operational are the message logging and ROS monitoring in the "Log" tab, and get some control of our servo motors through the "Joint Configuration" tab. I also want to start working with RVis to get a wire model of our robot into the display pane and get as far as I can in making it respond to configuration changes in the "Compose" subsection.

In the mechanical area, we'd like to move as quickly as possible to prototyping. Nate plans to work with Songjie to do a second pass over his CAD model, and hopefully we can begin fabricating as soon as possible. We'll also need to select and acquire linear actuators and start testing them as soon as possible, and try to obtain the foot molds from the AWIMR project from Mettin Siti. In electronics, Dipta and Nate shall hopefully finalize a Power Distribution board and send the design to be fabricated. I also hope to continue having regular meetings with Dimi, who's become somewhat of a de facto sponsor, given his expressed interest and enthusiasm in our project and his prior work in similar systems.

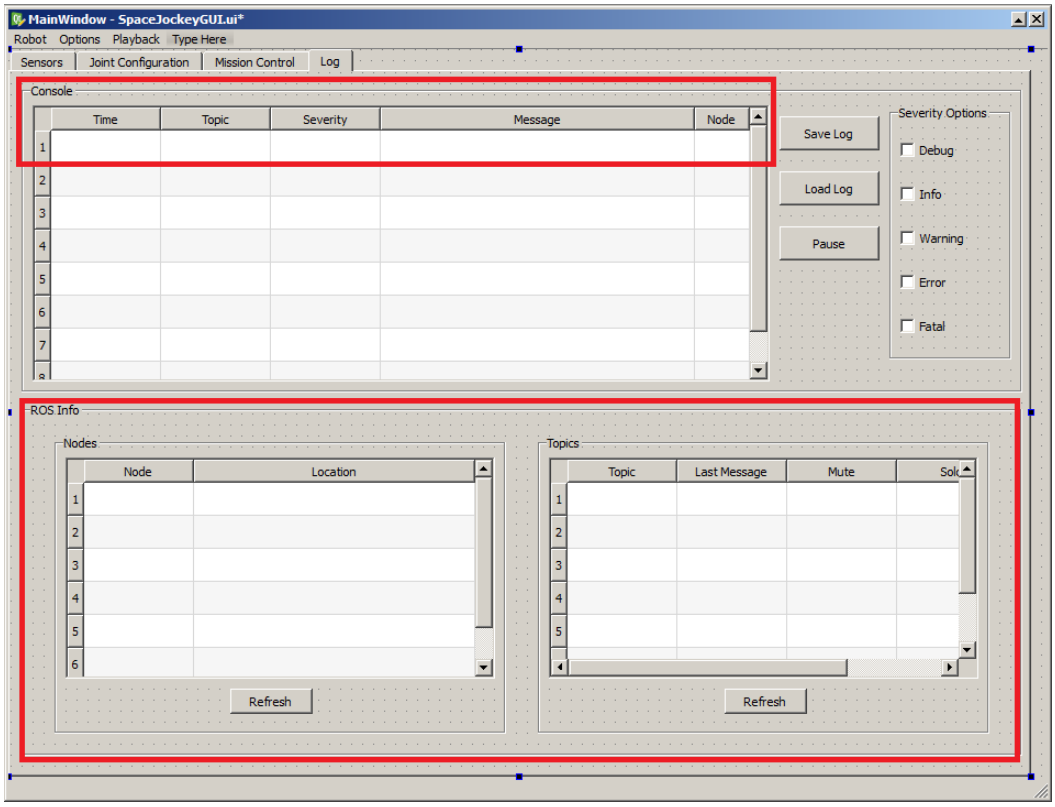
5. Figures



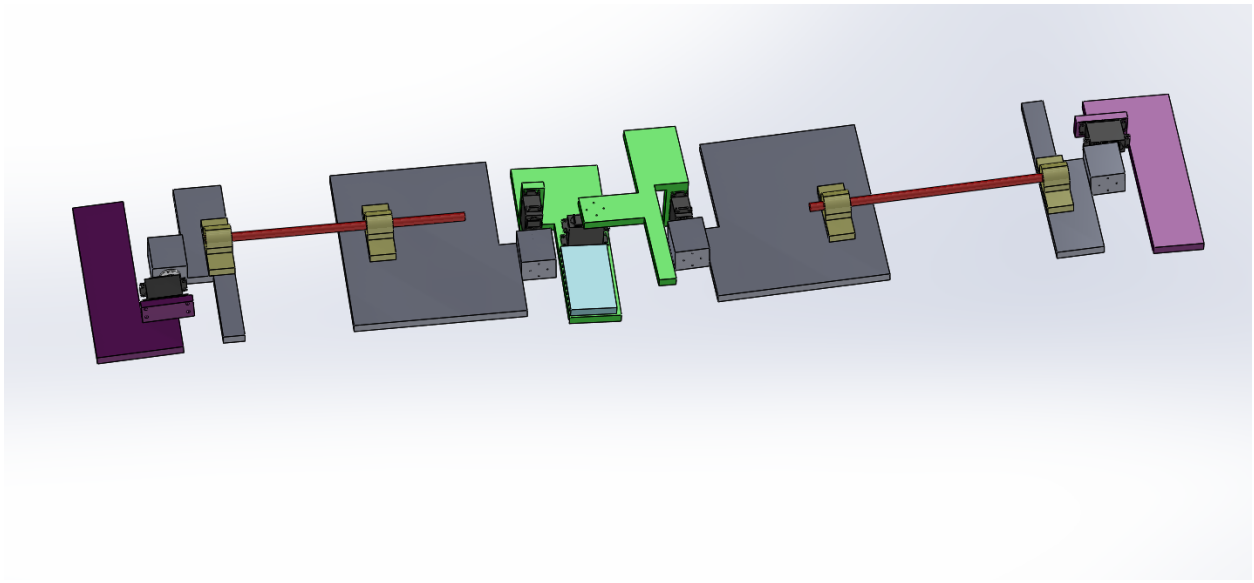
(Figure 1: "Joint Configuration" Pane with changes outlined in red)



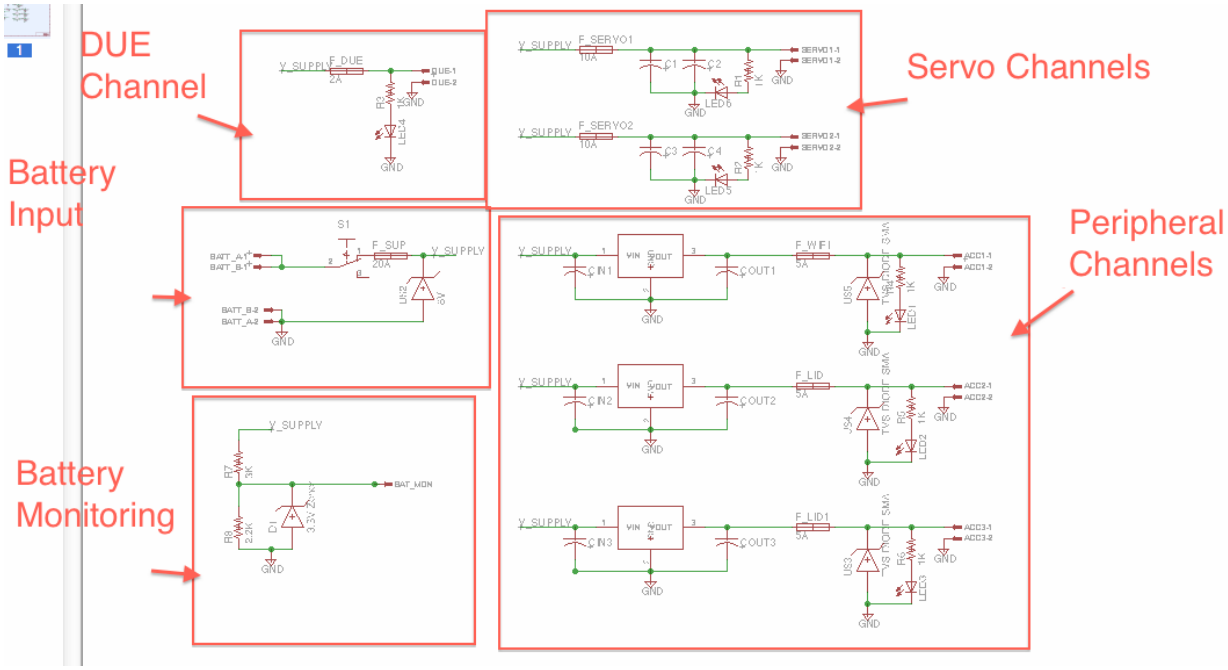
(Figure 2: "Mission Control" Pane with changes outlined in red)



(Figure 3: "Log" Pane with changes outlined in red)



(Figure 4: CAD Design of new "Inchworm" mechanism. Figure prepared by Songjie)



(Figure 5: Power Distribution Board Schematic. Figure prepared by Dipta)