Weekly reports are to be emailed to atbecker@uh.edu by 5:00pm on Tuesdays. The purpose of a weekly report is to: (1) give you text and images for your papers, thesis, and dissertation, (2) document progress, (3) identify if you are stuck or need resources.

Weekly report

1. **My *Goals* from last week**
   - ROS Controller
   - Find better Particles
   - Better MATLAB control of the coils

2. **My *Accomplishments* this week**
   a. Better particles
      i. You have the web link from Arun, they are less dense but just heavier in water to make it close to neutrally buoyant.
      ii. Arun tried denser fluids (honey and water/dish soap); the particles floated but they didn't move in the field because of the high viscosity
      iii. I hope these new (better) particles work!
   b. ROS Controller
      i. I found out you can run ROS on MATLAB
         1. I have found the code and am partially done with modifying it to support multiple robots and sensors.
            a. https://www.mathworks.com/help/robotics/examples/mapping-with-known-poses.html
            b. You can run the demo at home on your computer!
         2. I chose this route because it is much more simpler to run ROS from MATLAB due to its Windows compatibility, better compilation (due to no CMake and other things), and simple interface.
         3. A draft is available on my Github at
            a. https://github.com/danielbao/Miscellaneous
      ii. I found many articles and packages that relate to frontier exploration on ROS using both Stage and Gazebo (They are both developed by Player and someone has done very similar stuff to us before)
         1. Here is a list of relevant literature and packages; The Youtube videos are very promising but I can't make them work on our hardware setups which is weird because ROS is supposed to be very compatible.
            a. http://ieeexplore.ieee.org/document/7063639/
               i. Very cool package with map merging support found on ROS wiki here
                  1. http://wiki.ros.org/explorer
               ii. Ultimately it was on Indigo and I tried the lab laptop, nothing was running on the launch files even after twiddling with the simulation settings.
               iii. Very good Youtube videos
                  1. https://www.youtube.com/watch?v=md29t2Xbdug
            b. http://ieeexplore.ieee.org/document/7276723/
               i. No available code online
               ii. Good description provided though
               iii. Only applies to one robot
            c. http://wiki.ros.org/explore
               i. Old ROS code that is unsupported in the current distro
               ii. However, I think the previous two packages used many of the same things that this package introduces
            d. http://wiki.ros.org/frontier_exploration
               i. Very aptly named
               ii. Easy usage, I can use it!
               iii. Not automated; it works by you choosing a polygonal area and then the robot explores it; albeit very slowly
         2. I think that a good way to model the boundary interaction we have on our setup is to use a laser range finder with a very low range. Thus we can build our map using an occupancy grid and the range readings from the robot
   c. MonteCarlo Simulation of the 1D Bicriteria problem

- I tested 1000 trials of finding scans based on the moves required to explore a 1D line mentioned in III.A.3 of Arun's Paper
- I generated a figure or plot that is shown below
- I'm not sure I'm right, but I think we can discuss it in our meeting.
- Code is available on the same Github posted above

Moves vs. Scans for a 1D length of + 1000
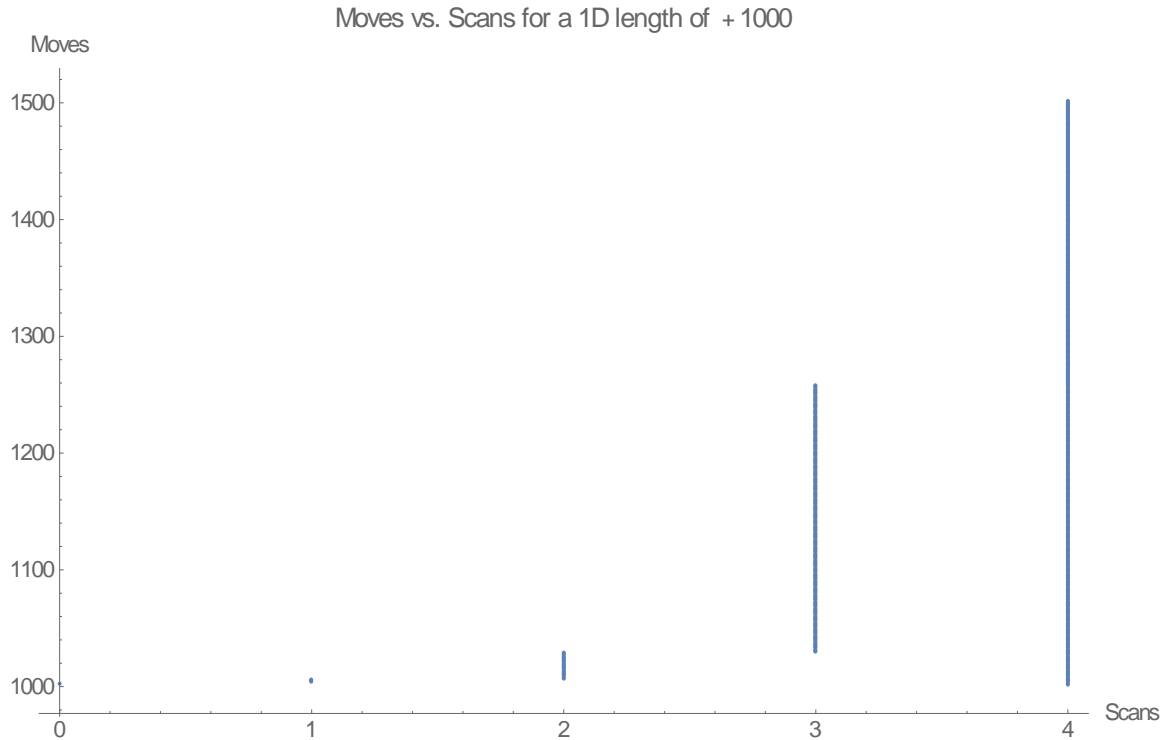
Figure 1: The length of the line is 1000. As expected, the majority of the particles require 4 scans to completely map the line based on the hyperexponential rule we set. 4^4 is 256 and the maximum number of moves required to map is 2000. Since 5^5>2000 it will never take more than 4 scans.

3. My *Goals* for next week
- Make MATLABROS great again! This is a breakthrough in my opinion because MATLAB is much more user friendly
- Revise the poster abstract
- Revise the MonteCarlo simulation; This is my first time doing something like that
    a. Meet with Dr. Becker on Wednesday afternoon after the lab meeting but before the

4. What I need Dr. Becker to do:
    a. Meet with me!
    b. Figure out conference registration fees
    c. Help me on the abstract submission once I revise it again