Research Proposal

For my work in the MSL (Motions Strategy Lab) I am hoping to pursue academic research, further my education as an engineer, and build up on my knowledge of robotics. I hope to achieve these goals by diving deep into the mathematics and computer science roles in the group. So far I have been able to read research papers, and started learning how to use Haskell to gain a background for what needs to be done on the software side. For my project in the group I will be working under Alexandra Nilles in developing graph grammar rules for a multi-bot system. Ideally my responsibilities in the group would be able to both develop skills, and bring my previous robotics knowledge to the group.

The use of applying graph grammars to robots will allow for arrangements of robots to be formed. For example it may be useful for a group of robots to hold a skid and move it across a factory floor. These graph grammar rules can be proved through induction as seen in the paper “Programmable Self-Assembly” by Eric Klavins.

After doing research through academic papers, and reviews it was evident that we would need to use physical robots to also test our graph grammar applications. For this reason, our group has started CADing and designing these robots.

The first part of this project that interests me is the development of the solution for the problem we are trying to solve. More specifically I have really enjoyed learning about the different mathematics, and computer science theories that are related to the research such as topologies, and consensus. My understanding of the topics that are researched are better understood through reading research papers as well. I have enjoyed working as a group to try to build a prototype robot for the experiments in testing graph grammar rules.

Next, I am interested in learning about new solutions to solve problems in the group. For example, ROS, Haskell, and the ESP8266 are all solutions that I have never used in personal projects before, and I hope to keep learning new development solutions in the group.

In order to succeed in this group I’d like to always set short term goals and keep long term goals in mind. This has been done successfully in the group so far by having weekly meetings and assignments. However, I can become more successful in the long run if I have time to gain an understanding of fundamental ideas to build up to very complex ones.

I have so far been very excited to work in the MSL group, and look forward to continue to work on projects within the group.

Thank you,
Justin Wasserman