**School of Aerospace Systems**
**COLLEGE OF ENGINEERING AND APPLIED SCIENCE**

**SUMMER RESEARCH OPPORTUNITIES**
**FOR UNDERGRADUATE WOMEN**

**APPLICATION DEADLINE: March 1, 2011**

*The School of Aerospace Systems is pleased to offer the following research project for the summer of 2011. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and, if possible, develop a timetable for the twelve-week research period.*

# Title: Linguistic Reasoning for Collaborative Mobile Robots

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## Project Description

In recent times, there have been substantial advances in the capability of mobile robots in several application areas including Aerospace. Robonaut 2, an astronaut helper, is a joint NASA/GM development set to launch to the space station aboard space shuttle Discovery. It will be the first humanoid robot in space and the hope is that through upgrades and advancements, it could one day venture outside the station to help spacewalkers make repairs or additions to the station or perform scientific work. R2, as the robot is called, will launch inside the Leonardo Permanent Multipurpose Module. There are no plans to return R2 to Earth.

Given the above trends and the vision to have a group mobile robots colonize the Moon or Mars, one of the technological barriers is the introduction of "Intelligence". The question of what is an Intelligent System has been the subject of much discussion and debate. According to AIAA's Intelligent Systems Technical Committee, some characteristics of intelligent systems that are commonly agreed to are:

- Learning – capability to learn new behaviors based on past experience
- Adaptability – capability to adapt the response to changing environment or internal condition
- Robustness – consistency of response across a broad set of circumstances
- Information Compression – capability to turn data into information and then into actionable knowledge

- Extrapolation – capability to act reasonably when faced with a set of new (not previously experienced) circumstances

In this WISE project, we target the ALL of the above five features of an "Intelligent System" by introducing bio-inspired linguistic reasoning using the principles of Lofti Zadeh's "fuzzy logic" for a collaborative effort between a few mobile robots. A MATLAB based simulation environment will be utilized to investigate the architecture and algorithmic aspects of the bio-inspired cooperative system. At a later stage, the plan is to transition from simulation to a proof-of-concept laboratory experiment.

**References:**

1. http://www.nasa.gov/mission_pages/station/main/robonaut.html
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3.https://info.aiaa.org/tac/isg/ISTC/Web%20Pages/What%20Is%20An%20Intelligent%20System.aspx
4. http://plato.stanford.edu/entries/logic-fuzzy/