

Capstone Proposal

Autonomous Robotics with Image Recognition and Movement Encoding

Objective

The goal of this Senior Capstone Project is to design a fully autonomous robot to perform the specific tasks described in the 2008 IEEE Region 5 Robotics Competition (attached) using Image Processing algorithms and movement encoding within its wheel design. This project will be broken into two semesters, which will each have specific objectives to ensure the completion of a well-performing autonomous robot for use in competition. The ultimate ending to the project will be to compete in the annual IEEE Region 5 Conference Robotics Competition.

The objective of the first semester (Fall) will be to design a robot to the specifications of the previous year's competition rules, until the official rules are released around the end of September, where adjustments to the project will be made if any of the rules change. Near the end of the first semester, most of the parts will be ordered and tested and all of the mechanical design of the robot will be completed and tested. The mechanics will include chassis, arm, storage system and wheel/roller design and placement.

The objective of the second semester (Spring) will be to add any sensory components and work on the programming and logic of the robot. This semester will include extensive testing to ensure that the robot is ready for competition and for a good placement.

Special Notes

- For all test subjects, all participating students must complete any special processes and documentation needed by the Klipsch School of Electrical and Computer Engineering and NMSU.
- The Klipsch School of Electrical and Computer Engineering will be asked to provide an adequate lab for this capstone.
- This capstone will be entirely run by students and will be supervised by a combination of Dr. Robert Paz and Dr. Charles Creusere.
- If needed, funding from previous donors to the NMSU IEEE Robotics team, may be asked, which include Dow Chemical Co. and Lockheed Martin.
- The Capstone Students who work on this project will not be required to compete with the robot, however, if they wish to do so they will be required to do up to 4 hours of community service to ensure funding from E-Council and ASNMSU, through IEEE Representation. This funding will provide more than half of the needed costs of the trip.
- If students wish to compete, they will be required to become a member of IEEE with a student fee of \$25 for an annual or \$15 for a 6-month membership before going on the conference trip.

- Many components can be used from previous IEEE Robotics Competitions.
- A student from the Mechanical Engineering Department may be chosen to be used on this team as support for the mechanical design of the robot, to be advised by the dynamics expertise of Dr. Ou Ma. If a student is not chosen, the supervision of Jesse McAvoy, a graduate student of dynamic systems, will be used.

This system will include

1. Two motors for driving.
2. An integrated motor driver, with PWM inputs, current sensing, and H-Bridge capabilities.
3. A very powerful mechanical arm capable of lifting 400 grams or more.
4. An image processing system (CMU Cam or small handheld computer capable of MATLAB processing with computer cam)
5. Spatial sensors, encoders, detectors in order to detect, weigh, and place a small metal can and recognize position of the playing field, according to the specifications of the 2008 IEEE Region 5 Robotics Competition.
6. A storage system capable of holding and sorting three small cans.

Budget

Minimum estimate \$500

Maximum estimate \$1500

Currently we have no (absolute) sponsors and would like assistance from the Klipsch School of Electrical and Computer Engineering.

As stated above, many components are purchased from previous competitions and entail close to \$1000 or more of electronics and other materials.

Time of the Capstone

6 credits – all to be completed in the Spring 2008

Current Team Members

Marcus Safar	EE	marcussafar@gmail.com
Chance McCoy	EE	cmccoy@nmsu.edu

Open to maximum of two other students for this specific robot, however, other teams may form to compete with another robot.

Scope of Work

Specific tasks are as follows:

1. Develop requirements and schedule
2. Develop system design and budget.
3. Build the main skeleton of the robot.

4. Design logic and test robot.
5. Demonstrate use of the robot at competition.

Electrical Engineering Content

Electronics
Digital Design
Digital Signal Processing
Systems Control
Power

Mechanical Engineering Content

Dynamics

Schedule/Milestones

Biweekly

Progress Report via email; include documentation of completed subtasks where appropriate

Fall Semester

Design of mechanics, purchase of more than 90 percent of components needed for total robot.

Spring Semester

Sensory components added, logic programmed, intensive testing performed.

End of Spring Semester

Final Interim report and presentation, Prototype Demonstration, Final Design Review, Compete in IEEE Robotics Competition

Evaluators

Dr. Robert Paz

rpaz@nmsu.edu

Dr. Charles Creusere

ccreuser@nmsu.edu