NEW CDIO Course (16.82, 16.821) Fall 2003/Spring 2004 An Alternative To 16.62x

Building on the recent success of SPHERES and ARGOS, there will be a new, two-semester, CDIO class starting this Fall. The course will focus more on aeronautic applications, and it will draw heavily upon information technologies such as control, autonomy, software, communications, and networking. Various options are currently being considered, including:

- 1. A variation of the capture the flag game, called "Roboflag", which uses small rovers as the players. "Roboflag" has very simple rules, but is a very challenging problem and can lead to some very exciting action. Modifying the rules slightly, we will add small, autonomous flying vehicles to the team of ground rovers currently being used to play this game. The addition of the flying vehicles adds an additional strategic dimension to the game because they can do things like perform surveillance and/or jump over the opponent and capture the flag. But these strategies will be explored in more detail by the students taking the course. The project will involve both mechanical design of the flying vehicles and autonomous control of the coordinated team. The students will build on the current robot designs used at Cornell University (http://roboflag.mae.cornell.edu/).
- 2. The SAE sponsors a payload lifting competition every year. Using a stock engine (K&B 61, OS 60), student teams must predict a maximum payload, and lift off successfully. The team that designs the airplane and autopilot that can carry the heaviest payload wins the flight competition. SAE event rules are devised to challenge the engineering teams' creativity, as well as their analytical and planning skills on a real-world design project. (http://www.sae.org/students/aeroeast.htm)
- 3. Each year, the AIAA sponsors a design, build, and fly project. Student teams design, fabricate, and demonstrate the flight capabilities of an unmanned, electric-powered, radio-controlled aircraft that best meets a specified mission profile. The goal is a balanced design possessing good demonstrated flight-handling qualities and practical and affordable manufacturing requirements while providing a high vehicle performance. For example, in previous years the goal was to build an aircraft that could take-off, complete 2 laps, and land. When on the runway and stopped, the aircraft will self-deploy the simulated sensor package. The aircraft will then take-off and complete 2 additional laps and land. (http://www.aae.uiuc.edu/aiaadbf/)

A final decision on these three options will be made this Spring based on input from Faculty and the Students planning to take the course. Note that this course is an alternative to the 16.62x sequence, and thus Juniors may take this course in the Fall instead of taking 16.621 this Spring.

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The RoboFlag Website





BROWSE

- Home
- Overview
- Repository
- The Team
- Videos, Papers

RoboFlag is an experimental testbed with semi-autonomous, fast-moving teams of vehicles designed for games that are similar to "Capture the Flag." The objective of the RoboFlag competition is to venture into opponent territory, locate and capture the "flag," and return with the flag back to the "home base." The games are designed to allow researchers to explore basic and complex issues in several areas, including cooperative control and path planning, team strategizing and team dynamics, and operator interfaces and cognitive engineering. In addition, the system includes uncertainties such as incomplete information, latency, intelligent adversary, and neutral entities that require full, realistic solutions.

Previous generations of the robots have won the international <u>RoboCup</u> competition. The testbed itself is funded by the DARPA MICA program, while interdisciplinary team of researchers is investigating partial and full solutions to RoboFlag and a series of challenge problems/games. The researchers are funded by the DARPA MICA program and an AFOSR MURI.

Recent Events:

<u>SURF Competition (Aug 2002)</u>: Three sets of RoboFlag games based on a summer's worth of work by three students at Caltech and three students at Cornell. Excellent strategies and GUI's were developed and implemented. Full details of the developments and competitions will be available in an invited ACC session (papers will be placed on the web site Feb 2003).

<u>MICA Competion I (Sept 2002)</u>: The first round of DARPA MICA competitions involved using the SURF based GUI's and several MICA technologies such as streamline planners and set membership estimation. Operator interface issues were explored by interviewing players and stopping the competition to evaluate situation awareness. Two end users from the IA Air National Guard came to Cornell to participate.

Interface Data (on-going): Currently, RoboFlag games are being played on the simulator to evaluate cognitive engineering issues related to the speed of the vehicles, number of vehicles, number of operators, etc.

Future Events:

RoboFlag 1.0 Release (Dec 2002): A robust, downloadable simulator, interface, and base code will be released.

MICA Competion I (Jan 2003): A new set of games will be played, and include teaming concepts as well as heterogeneous vehicles.