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A combat robotics course: programming meets computer-aided design and fabrication (abstract only)

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I report on experiences teaching a Senior-level Special Topics course in Combat Robotics during the Fall 2012 semester. The surface goal of the course was for student teams to design and build a three-pound remote-control combat robot conforming to the Robot Battles rules (http://robotbattles.com/rules) and then to compete against their peer teams at semester's end. The higher-level goal was to expose students to physical design and fabrication techniques -- topics well outside our regular Computer Science curriculum -- and integrate those techniques with software development. Students were required to:

Design their robot using 3D Computer-Aided Design (CAD) software. The CAD model allowed students to experiment with design trade-offs, ensure proper fit and placement of parts, and to estimate the weight of the robot prior to build to ensure their design was under the limit.

Fabricate parts for their robot using a Computer Numerical Control (CNC) milling machine (similar to that used by machinists and product designers in industry).

Understand tool, machine, and workshop safety.

Build and program a custom remote-control system using Arduino microcontrollers and Xbee wireless modules. This included soldering, obeying voltage and current limitations, serial communication, servo and motor control, and interfacing with other hardware (such as a Wii Nunchuck video game controller).

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