

Low-Cost Outdoor Robot Platform for the Penn State Abington Mini Grand Challenge

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A low-cost, autonomous, outdoor mobile robot platform has been designed to facilitate student participation in the Penn State Abington "Mini Grand Challenge" contest. The robot platform consists of a modified PowerWheels™ robot base, servo-controlled steering and drive, vision system, GPS interface, sonar, and text-to-speech engine with a speaker for interaction with the contest spectators. Control of the robot is accomplished by a laptop running Windows XP operating system, and MATLAB™ software.

The Abington Mini Grand Challenge requires autonomous robots (traveling at a speed between 2 and 5 mph) to follow unmarked sections of pathways throughout the campus, and take off-road detours. Robots are also encouraged to interact with, and entertain, spectators who may be present observing the robots. The contest is partly inspired by the DARPA Grand Challenge, and promotes advances in robot technology. However, the availability of a low-cost hardware and software platform will allow participants in the Mini Grand Challenge to focus on vision, navigation, and intelligent software solutions

and reduce overall development and operation costs.

This strategy has allowed lower-division undergraduate students to participate in the challenge at a level that would be impractical in the past. The ability to prototype and deploy algorithms directly in the MATLAB environment is a key element to this design solution.

The expected applications and outcomes of the robot platform and Mini Grand Challenge include curriculum enhancement, increased interest in undergraduate research, recruitment and retention, and K-12 outreach. The Mini Grand Challenge experience can also serve as an effective and practical first step towards preparation for the DARPA Grand Challenge. More information on the Penn State Mini Grand Challenge can be found at the website: www.ecsel.psu.edu/~avanzato/robots/contests/outdoor/contest05

Figure 1 depicts the block diagram of the key components of the robot design, and figure 2 shows the Penn State Abington outdoor robot platform on a campus path.

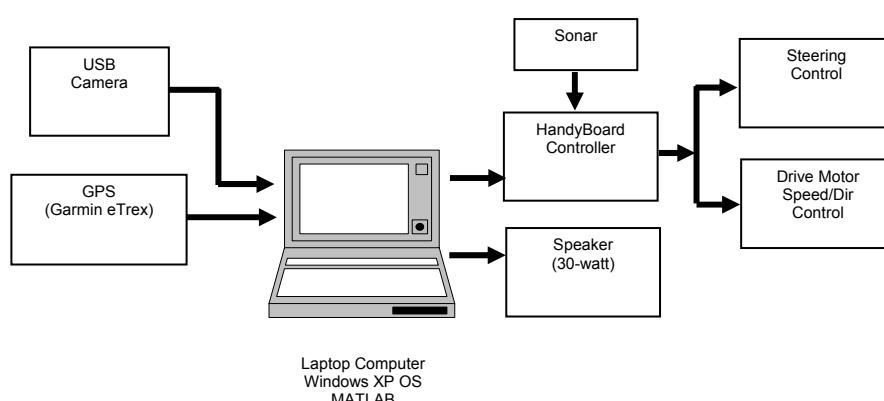


Figure 1: Block Diagram



Figure 2: Penn State Abington robot on campus path