

WebBot

A Networked Control System for Multiple Heterogeneous Robots

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Abstract

This project presents the design and implementation of a networked control system for multiple heterogeneous robotic platforms. By using small embedded microprocessors, we can control and connect various platforms through an existing wireless infrastructure and implement semi-autonomous capabilities for obstacle detection and avoidance. Our approach uses a standardized control system that connects to existing robots in a plug-and-play manner. The controller can interface with popular platforms such as the iRobot® Roomba® or even larger unmanned ground vehicles (UGV) such as the Mesa Matilda. All of the robotic platforms are wirelessly networked through a virtual server where a user can log on via an Internet based graphical user interface (GUI). The control hardware also incorporates an 8-bit microcontroller for all of the low-level sensor data, motor functions and servo movement. The platform sensor package prevents the user from hitting obstacles by overriding movement commands and taking control if the connection is lost. The control commands and data are transmitted between the embedded processor and microcontroller through a RS-232 serial port. For video, we utilize a low-cost web camera to provide an adequate live video stream through a UDP (User Datagram Protocol) socket connection. Upon connecting to the WebBot website, the user is provided with a list of available robots to control or to watch the video feed if a particular robot is already in use. Network security and latency considerations are also factored into the design to prevent unauthorized users and to avoid obstacles. This project has many uses in both the civilian and military sectors to include search and rescue, building clearing and mapping, surveillance and bomb detection. The completion of this project represents two semesters of combined work from Electrical Engineering and Computer Science majors at the United States Military Academy at West Point.

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