

A Web Interface for a Pioneer 3-AT Mobile Robot

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A Pioneer 3-AT mobile robot is a highly versatile all-terrain robotic platform, produced by ActivMedia Robotics. It is equipped with an onboard PC (linux) and a microcontroller based low level drive control. Benefits of the system are different sensor systems like ultrasonic, laser scanner and a CCD camera system together with an application programmers interface (Aria and Saphira-API) for autonomous behavior. The onboard PC is able to communicate via wireless LAN (WLAN) with connected computers over the Internet. Since a proprietary remote control software is provided by ActivMedia, users with a special client are able to control the robot from distance. To avoid the download and installation of commercial software for the remote clients, a web-based solution is highly demanded. We developed a client/server (Java application/Java applet) based solution for remote control of the robot and video streaming to the web-based client. The remote control server application is a Java application which uses the Aria-API (a linux library binary, with C++ sourcecode) with autogenerated Java wrapper classes (from C++ source by SWIG[1]) for low level control of the drives. A linux-videostreaming application and a webserver are running directly on the robot's onboard PC. On the client side, only a Java-enabled webbrowser is required. A live video stream for viewing the robot's camera view helps to remotely control the behaviour. Special requirements for remote control restrict live video streaming technologies to methods with no or only minimal delay. The Java Media Framework [2] was chosen to display the media streams in the browser. JMF is an API for incorporating media data types into Java applications and applets.

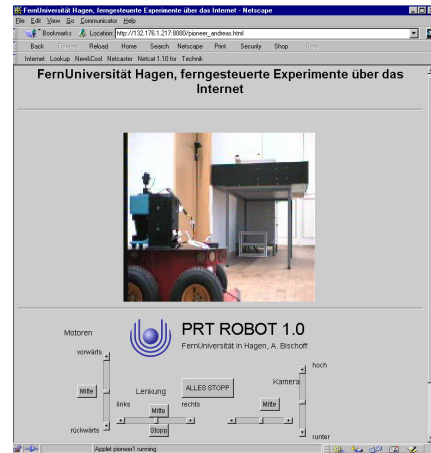


Figure 1: Web interface, Robot

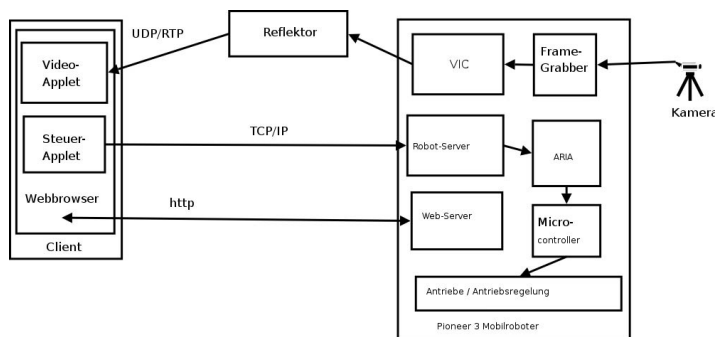


Figure 2: Communication structure

The JMF API is a cross-platform solution written entirely in the Java programming language. Just one single applet is needed to receive the video and audio stream from the server. The video-stream itself is based on the Internet-UDP-protocol. The UDP is very usable for streaming applications, because of its performance (UDP does not provide sequencing of data packets).

[1] SWIG, <http://www.swig.org/>, 2004.

[2] SUN Microsystems, <http://java.sun.com/products/java-media/jmf/index.jsp>

[3] I. Masár, A. Bischoff, M. Gerke. Remote Experimentation in Distance Education for Control Engineers. In: Proceedings of Virtual University 2004, Bratislava, Slovakia 2004.