Periscope: A virtual browser for the real world

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Abstract
The Wherehoo Server developed in the Software Agents Group at the MIT Media Laboratory binds digital representations of physical entities to the coordinates of their locations on Earth. An infrastructure component of the Agents Group's Impulse vision, the server facilitates software agents that either *provide* or *query* geographically-situated data. Accessible through a TCP socket connection, the Wherehoo service accommodates long-lived records (representing buildings or other permanent features) and transient records (representing short-lived events and objects in motion such as subway trains, travelers, or vehicles).

Periscope is a browsing device for Wherehoo that allows a user to explore the physical world by navigating its digital shadow - in this case, web pages physically situated at the places they represent,

As a portrait camera is turned on a tripod, the camera's viewscreen provides a real-time analog view of the physical world at the chosen heading. Simultaneously, a computer screen displays a real-time view of the digital world at that same heading, adding a range component to allow the camera to "see" things out of visual range. For example, we may point the camera toward the corner of Newbury Street and Massachusetts Ave. in Boston, and set the range control to 1200 meters. In most cases the optical camera has an obstructed view of this place from the camera's current location in the Media Laboratory. The digital view, however, can see through obstructions. After scanning the Wherehoo server for digital artifacts near that place, the computer screen begins to display web pages of Tower Records, JP Lick's and other attractions near that place which have a representation in Wherehoo.

In this way, a user can explore the physical world through a virtual window. The exploration is controlled in near-real time by a tangible interface consisting of the camera and joystick range-controller.

Future versions of the browser will detect and display messages, audio, video, applications, and other rich media on a variety of devices ranging from mobile telephones to Palm devices, PDAs and wearable technologies.

Technical information
The most striking feature of the Periscope is its pointing device, a Rembrandt Portrait Camera Model II 5x7 view camera. Mounted on a tripod with pan head, the camera serves as a pointing device, and is used to select a "heading" to explore for digital content.

A joystick mounted on the camera acts as a "zoom", allowing the user to select the range at which exploration should begin. Using the Wherehoo server's ability to project a user to another place, explorations may begin at points far from the Periscope's current location, as if the user were physically at that place. An analog digital compass mounted in line with the camera's lens senses absolute heading.

Analog voltages from the compass and joystick are run through an A/D converter. A microprocessor bound to the A/D converter calculates relative range and absolute heading values from the raw sensor inputs, then sends the processed data to the Wherehoo Media Player, a dedicated browsing application running on an adjacent personal computer, via a hardwired serial connection.

For more information
A Web interface to the Wherehoo server, and technical documentation are available at
http://wherehoo.media.mit.edu

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