

Wherehoo and Periscope: A Time & Place Server and Tangible Browser for the Real World

Jim Youll

MIT Media Laboratory
20 Ames Street
Cambridge, MA 02139 USA
+1 617 253 9603
jim@media.mit.edu

ABSTRACT

Periscope is a browsing device for exploring Internet-based representations of the physical world along time and location axes. By manipulating a digitally-augmented view camera, users find media and web pages “located” at the real places they represent, relative to the current time, the real-world location of the Periscope device, and the on-camera controls for range, search radius and time window. Periscope’s world view comes from queries of the Wherehoo server, a time-and-place storage system. Wherehoo supports embedded systems, human-exploration-assisting software agents, and other time- and location-based systems that query the physical world or record temporally- and spatially-situated data for use by others.

Keywords

Tangible interface, augmented reality, geolocation, time, software agents, exploration, wayfinding

INTRODUCTION

Where is the Internet? Is it really “everywhere”? or is it more like a point in space that merely has the unique property of “visibility everywhere?” An infrastructure-driven point of view – of routers, wires and hardware – would certainly support the opinion that the Internet is “everywhere.”

But the Internet user experience derives from access to *content*. Keyword-driven search engines and links from site to site suggest a point-sized Internet where movement from place to place requires only the click of the mouse. Search engines file web pages and Internet-borne media solely by electronic address and textual content. Searches find indexed material without regard to its time of existence or the location it represents.

The Internet’s ability to compress or remove distance is an interesting feature that brings otherwise-segregated private and commercial entities together in a single, common “place.” In this place, opportunities for interaction with

new trading partners and new sources of information exist. Often, however, needs and plans are strongly driven by a user’s current or destination location, and the resources available within some radius of that location.

When information about the physical world was primarily distributed by physical means (e.g. manual delivery of telephone directories), logistical constraints ensured that local information propagated only within those regions in which it was useful. In the distance-free Internet, all information is distributed universally, without regard to its utility to users everywhere. Geographically-undifferentiated data may dilute Internet-borne resources to the point that they are no longer useful, as a once-welcomed “wealth of information” swells to unmanageable proportions.

Our goal is to add dimension, distance and a sense of time-ordering to Internet-based media ranging from web pages representing restaurants to audio recordings of public concerts. We encourage exploration and learning about one’s physical surroundings, and facilitate the design and real-world testing of new interfaces for explorations of place and time through user- and agent-driven discovery of situated digital media.

INTERNET LOCATION SERVICES

Location-search capabilities now appearing on the Internet generally fall into one of four categories of underlying organization: by street address, by place name, through a binding graphical street map, or via a proprietary locator.

Street address locators

Yahoo maps [1] are an example of an address-based location service. Entry of a street address and zip code or city/state pair retrieves a map of that place, which may then be augmented with the locations of advertisers who pay to appear on the map.

Place-name locators

The Expedia maps site [2] offers named-based mapping of well-known places. For example, entering “Statue of Liberty” and selecting “Statue of Liberty [Statue of Liberty National Monument], New York” summons a map showing the New York Bay, New Jersey and Manhattan, centered around the Statue of Liberty.

Map-driven locators

Mapblast [3] is an example of a site at which map-based exploration creates a primary interface. Clicking, zooming

and panning allows a user to view streets on a map that may be augmented with the locations of commercial places such as gas stations and restaurants.

Proprietary locators

The web sites of large companies such as Starbucks now offer location services [4] to aid customers in search of a familiar brand in an unfamiliar place. Realty sites [5] help potential buyers to find homes for sale in neighborhoods rather than just at single addresses. These proprietary locators answer authoritatively, but do not enrich more broad-based, unfocused searches by agents that do not already know something about their surroundings.

WHEREHOO

The Wherehoo Server [6] is a time-and-place read-write storage system for digital media. Whereas the location services surveyed above are read-only search engines that primarily index web pages, Wherehoo encourages read-write client interaction. Its protocol and behaviors support software agents and small *things that think* through conservative use of bandwidth, a lightweight TCP socket-based protocol, and delivery of meaningful metadata to help clients identify potentially useful records within large query results. Wherehoo binds any digital artifact to a real-world location and time interval. *Long-lived* records (buildings and permanent features) and *transient* records (short-lived events and objects in motion such as subway trains) are supported.

Other location services discussed here bind data to maps, street addresses and place names. In contrast, Wherehoo supports free exploration of the world by utilizing the most basic descriptors of place: latitude, longitude and height – the data provided by ordinary GPS receivers. Through optional query controls, explorations may be constrained to the world “ahead” of a user, for example, or limited to data of a single MIME type or accessible via a specific protocol.

PERISCOPE



Fig. 1: Periscope

The Periscope (Fig. 1) is a tangible browsing device [7] for exploration of the situated virtual world. Through a combination of pointing, range selection and media filtering, Periscope helps users find geo-located digital information, presenting it with schematics showing the range and nature of the discovered information.

Built into a Rembrandt Model II 5x7 view camera mounted on a tripod with pan head, the Periscope is an intuitive pointing device for navigation of the electronic world recorded in Wherehoo. When the camera is turned, or the range or search width changed via on-camera controls, the

LCD “viewfinder” presents a real-time view of the digital world at that heading and range.

Implementation

The camera is instrumented with an electronic compass, Java-based CPU, I/O and power backplane, several one- and eight-bit input and output channels, potentiometers for range and search-width control (Fig. 2), a pendant-style “shutter button” and a flat-panel LCD.

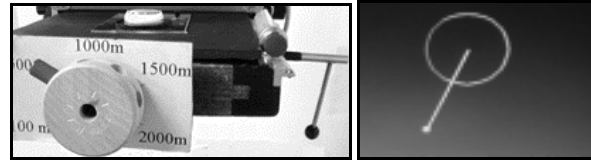


Fig. 2: Range controls, shutter button Fig. 3: Search schematic

CONCLUSIONS AND FUTURE WORK

As an augmented view camera, the Periscope is immediately understood as a device for finding web pages, images and other media by “aiming the camera” into the world. The latest version incorporates several enhancements based on feedback from user trials: a control for search radius, front and side-mounted levels to replace the original joystick range selector, and a “shutter button” for user control of the pace of exploration. A new schematic (Fig. 3) of the search distance and radius, relative to the Periscope's location, helps users visualize the search area.

Future work

We are building the Weariscope, a portable system for on-foot exploration of the world's virtual shadow. The device will incorporate new navigation tools for locating time-based Wherehoo records such as news stories and recorded audio, potentially turning the world into a virtual museum.

We anticipate alternative interfaces to Wherehoo, such as audio-only clients, non-GUI tangible interfaces supporting exploration and *urban navigation*, and collaborative tools for travel following *trails* and *paths* left by others.

ACKNOWLEDGMENTS

Lee Lin, Pauline K. Hsu and Ralph Harik worked tirelessly to make the Periscope a reality. Thanks for encouragement, inspiration and support to Professor Hiroshi Ishii, Professor Pattie Maes, Ted Selker, Aileen Kawabe, Joe Paradiso, Sybil Shearin, British Telecom, Etak.com, and the Software Agents Group at the Media Laboratory.

REFERENCES

1. Yahoo Maps, <http://maps.yahoo.com>
2. Expedia Maps, <http://maps.expedia.com>
3. MapBlast, <http://mapblast.com>
4. <http://starbucks.com/retail/default.asp>
5. <http://www.realtor.com/FindHome/default.asp>
6. Wherehoo Server, <http://wherehoo.media.mit.edu>
7. Ishii H., Ullmer, B. (1997). Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms. Proceedings of CHI '97 (March 1997), ACM Press, 234-241.