Telios: Low-Cost Bridging of Telehomecare and the Home Media Center

Hector Parra
California Institute for Telecommunications and Information Technology
University of California, Irvine
hparra@uci.edu

Abstract. We present a low-cost Web 2.0-based home media center that implements teleconsulting and remote health monitoring alongside traditional television programming and movie viewing. The flexibility and standards of Web 2.0 may make it possible for telehomecare and multimedia to merge and produce novel applications in chronic disease management and preventative healthcare.

Problem. The benefits of telehomecare are well documented and supported [1]. However, numerous studies have documented an increase in costs associated with software licensing and the purchase, installation, support, and maintenance of telehomecare equipment [2]. Little is documented on whether a patient would be willing to participate in research or consumer telehomecare should they be responsible for the initial technology purchase. Telios immediately addresses this concern by minimizing cost of development and deployment.

Methods. We used Web 2.0, a combination of web standards and practices that include HTML5, CSS, JavaScript, JSON, and REST, to create the Telios web application. By including free web browser plug-ins such as Adobe Flash and VLC, we were able to cover the necessary multimedia abilities expected from a home media center. These technologies do not require non-free licensing for either deployment or development [3, 4], and their ubiquity and design make them accessible to many software developers. Open-sourcing Telios itself would make it freely available to patients.

To enable remote monitoring we developed an installable, cross-platform web server capable of delivering serial device data to the web browser in real-time. While many medical devices are designed to interact with a computer, older models may not have been designed with telehealth in mind. The device server extends the scope of these devices by allowing them to communicate through the Internet.

We focused on the familiar television remote control as the primary method of input. By designing user interfaces common to televisions, and using the full-screen ability available to many web browsers, we discourage traditional web browsing patterns and hide the underlying operating system.

Results. The home screen, shown in Figure 1, utilizes an icon matrix interface. Using the remote control, the patient can navigate to the application of their choice. Though designed to be a stepping-stone, the home screen itself can serve additional purposes. This model plays ambient bird sounds and displays the current time. Future models could present news headlines, weather reports, or social network updates.

Figure 2 introduces the videophone. Like many commercial telepresence systems, the initial view shows input from the local camera. Using the remote control, the patient can initiate a call from a list of defined users, including their friends, family, and, potentially, healthcare providers.

A medical weight scale and its corresponding application on both the television and a mobile device are shown in Figure 3. The device server allows for multiple clients, so both the patient and the doctor can simultaneously view data as it is collected.

Lastly, a movie viewing application is shown in Figure 4. Like the home screen, the patient uses the remote control to navigate through a collection of DVD and HD movies and selects one to play.

Discussion. Using a web-enabled device such as a laptop or desktop PC, one can navigate to Telios and begin using it immediately. Though Telios itself does not affect the cost of medical devices, it does expand options by extending the abilities of older models.

We have introduced Telios-based applications as separate entities, but it's the combination of these that could result in novel technology. For example, Telios could pause a television show to remind a patient to take a medication or initiate a blood glucose measurement, all while utilizing DVR functionality to ensure these interruptions do not lessen the media experience. It is the study of these applications, and how they affect chronic disease management and preventative health care that will drive future Telios development.

References.

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Figure 1. The Home Screen

Figure 2. The Videophone before a call

Figure 3. The Weight Scale Interface

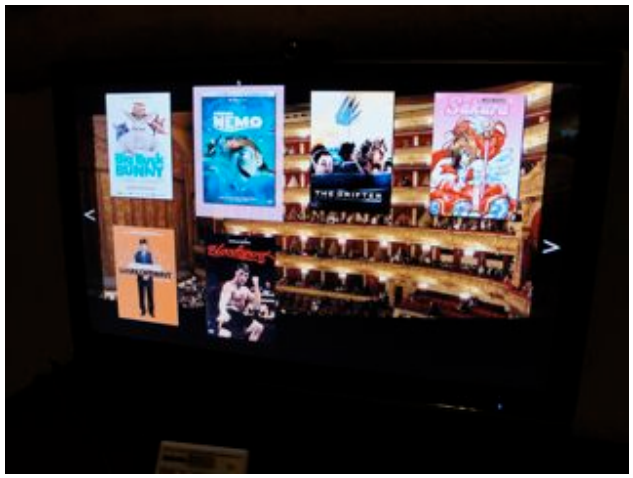

Figure 4. The Movie Player