Pervasive Systems for Elder Care

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Introduction

The purpose of this paper is to describe the Pervasive Systems for Elder Care project. This research will attempt to enable senior citizens to live for a longer period of time in their homes. The elderly have been shown to have better health when they reside in their own homes rather than in a nursing or retirement home. For one, there is less chance of them catching a communicable disease. Secondly, the emotional toll of having to leave your home and way of life can be very stressful. Elderly patients and caregivers will benefit most from this research. Currently, retirement/nursing homes, assisted living, at home health care, and family members provide care for the seniors. Unfortunately, this can be negligent and expensive. By automating most basic home tasks, this can cut down on the need for exterior assistance as well as reduce the stress of the elderly. This research differs from current research because it includes a voice-activated app. This app will be able to learn from the person's requests and behaviors and over time operate nearly autonomously. The app features one simple button to press in order to speak. The app then recognizes and processes the command. The elderly typically have a broader learning curve with technology, but this approach is exceptionally simple.

Related Work

A. R. Al-Ali and M. Al-Rousan. 2004. Java-based home automation system. *IEEE Trans. onConsum. Electron.* 50, 2 (May 2004), 498-504.

This project uses an E-board connected to each device to communicate with a home-based server using Java Beans and Java Server Pages (JSP). The system may be accessed via the internet. They successfully created a wireless home automation system using Java. Since this language was chosen, the the software can run on any PC with Java installed. This approach assumes that sufficient effort is available to complete the wiring. The E-board must be directly connected to the home server. It may not be possible or affordable to connect all devices. Some devices (perhaps window coverings) do not have compatibility with an E-board. This problem was not acknowledged. A simulation was setup using 3 devices: an oven, a fan, and a light. A web interface was used to login to the system and test each device successfully. It may sometimes be difficult for an elderly person to access a computer or website. This requires typing on a keyboard and using a mouse, which may be difficult to grasp. It is not a mobile solution.

Humaid AlShu'eili, Gourab Sen Gupta, Subhas Mukhopadhyay. 2011. Voice Recognition Based Wireless Home Automation System. *2011 4th International Conference on Mechatronics (ICOM), Kuala Lumpur, Malaysia* (May 17-19 2011).

This project uses ZigBee modules to connect devices to the home automation system. The

system is controlled using a portable control panel and microphone. Touch or voice commands are received and passed through to the appropriate device. This project successfully created a wireless home automation system. This approach assumes that the user is able to hold and interact with the device using fine motor skills and/or their voice. There are many instances of disabilities or the elderly where they may not be able to see, hear, or touch the interface. The project incorporates a visual and vocal element, but does not solve every accessibility issue. This approach may be too complex for the elderly or disabled to operate.

Approach
One unaddressed issue with the current approaches is that there is no solution provided for the elderly's typical aversion towards technology. The new approach comprises of using a voice-activated Windows phone app to control a home automation system. The user simply presses a button, speaks their command, and waits for the action to be performed. With the elderly population growing, there is a greater need for elderly assistance. Technology is a solution to this problem. There are currently devices that enable someone to simply press a button and 911 is automatically called. It has saved thousands of lives. The new approach will work because it is easily expandable, simple to use, and virtually no maintenance is required to maintain it. The software that was created during this project is a Windows phone app using C# and XAML. Using Microsoft's voice commands with Cortana, the user is able to communicate in a natural manner with the app in order to instruct their home to perform in the desired manner. This app will eventually learn from the user's habits and perform certain tasks automatically at the expected times.

Experiments
No experiments were performed as the project is not complete.

Analysis
No analysis is provided as the project is not complete.

Conclusion
The initial problem is that the elderly need assistance with routine activities in their home. This approach asserts that by using a mobile device setup with a home automation system, the elderly may extend their residency in their homes over moving to an alternative living facility. The system will replace the need for assistance with certain tasks, such as adjusting the thermostat, locking doors, or opening window coverings. When implemented completely, this will revolutionize elder care by providing an affordable, accessibly solution to home assistance.