Online Remote Control of a Wireless Home Automation Network

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ABSTRACT

Embedded systems within home appliances are not usually manufactured to operate in a networked environment; connecting supplementary hardware/software systems through a wireless, PC-controlled medium is necessary to enable full, efficient control of their functions from a remote location. Access to the home's central PC may be gained via a local web server, giving Internet-based control from almost anywhere in the world. The proposed system constitutes a significant improvement over those discussed in the literature to date, and reviewed here. It enables complex-appliance control in a secure and reliable portable-wireless environment, and was developed using ASP.Net. The system was assessed for Received Signal Strength (RSS) in an environment more radio-hostile than that found in a typical household. The minimum RF level found at a transfer rate of 9.6 kbps was 8 dB above the receiver's quoted sensitivity of -103 dBm; this fading margin will increase in a normal household environment. [Article copies are available for purchase from InfoSci-on-Demand.com]

Keywords: Home Automation Network; Microcontrollers; Wireless Sensor Network

INTRODUCTION

As the cost of electronics components and microprocessors decrease, they are embedded increasingly into every day household items, e.g. microwave ovens, toasters, televisions and washing machines. Unfortunately it is still

not possible to communicate with these appliances via a network, be that from within or outside the home. Although the appliances have embedded microprocessors to help control their onboard systems, they do not have the capability to communicate with a network of any kind. This is because there are no communication devices pre-installed and as yet no clear leader exists in home automation network protocols. Until this happens, true home automation networks cannot be fully realised. This, however, does not limit the ability to remotely control appliances in the home. To do this, domestic appliances can be grouped as:

1. Appliances that can only be turned on and off (Group 1).
2. Appliances that can be controlled in a more functional manner, such as televisions, DVD players and HiFi equipment (Group 2).

There are many reasons why the ability to remotely control the home is an advantage. In modern times, security and time management have become important issues. Houses may give an impression of occupation through controlled lighting and have their alarm system monitored; kitchen tasks may be started remotely from a work location, saving time after the daily commute. A control network could also give the elderly and disabled a more independent way of life.

In section two, a background review of previous research into this topic is presented. Section three discusses the hardware design for the system investigated. Section four explores the software design for both the Internet interface and the firmware for the microprocessors. Section five discusses the testing protocol and results obtained from the system. Finally, section six presents conclusions and suggestions for future work.

COMPUTER CONTROLLED HOME AUTOMATION

There have been several approaches to computer controlled home automation: what follows is a review of the most significant and recent contributions.

Al-Ali A.R. & Al-Rousan M. (2004) developed a system built from a Java based user interface that was accessible through the World Wide Web. The system allowed the user to turn a cooker, light bulb or a fan on and off. This system used direct wiring from the computer to the appliances to exercise control over them: this approach is very costly due to the amount of cable needed to connect all the appliances found in a modern house. Also, appliances that fall into Group 2 could not be implemented in this system and introduction of new appliances into the household will result in further integration costs.

Sriskanthan N., (2002), proposed a system that controlled home appliances from a PC using Bluetooth as the communications technology. As before, there was no consideration for

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