SIRI®on your wrist: Making your home smart

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ABSTRACT

The adoption of smart devices in the homes is on the increase. There are tangible benefits for those making the leap, such as increased independence and improved quality of life. This project addresses these issues with the development of a two-part proof-of-concept system for smart home dwellers, consisting of a flexible wearable wristband device that communicates wirelessly with a voice-activated home hub, which, in a future version of this project, would increase accessibility in the home at a low cost.

Keywords

Smart Homes, wearable technology, Raspberry Pi, Arduino, XBee, flexible electronics, inkjet printing, voice recognition.

1. INTRODUCTION

Smart homes dwellers may wish to control them via wearable devices [1], however, the limited accesibility of wearable devices for older adults [2] is still an open challenge. "SIRI®on your wrist" enables interaction with smart home devices, for users of any age, technical ability or mobility. The system is composed of a flexible-electronic wearable device and a data-processing hub wireless system, built to assist smart home dwellers to control lights, locks, and receive personal notifications about their daily activity, via voice.

2. METHODOLOGY

The project was divided into three sections: voice recognition (VR), wireless communication (WC), and printed electronics (PE). **VR**: A Raspberry Pi running the Jasper VR software detected spoken commands to control one external light. This light would illuminate red, green, or blue to represent the detection of a light-, lock-, or notification-command from the user. This illumination would be user feedback to show their command was processed. **WC**: Each voice command triggers a WC between two XBee radio frequency module chips. One module was connected to the Raspberry Pi (on the hub) and another to a LilyPad Arduino (on the wearable). A handshake protocol was coded in Python to ensure collected data about the command was successfully exchanged and tracked between these two computers first, before the external light illuminated. **PE**: An inkjet printer was used to create the flexible circuit to develop the wearable device, a wristband made from Kapton film and surface mounted components (SMTs) secured onto it to allow the circuit to be flexible. The circuit design on the flexible circuit was pre-tested on a PCB using electronic components. The inkjet printer used silver conductive proxy to create the wires on a Kapton substrate (see figure 1). Although the SMTs were secured onto the flexible circuit, the Arduino components were too heavy and rigid to be secured, making the device uncomfortable to wear.

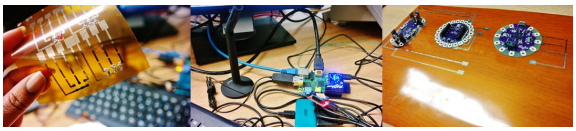

Figure 1: Kapton film with SMTs (l), Raspberry Pi setup (m), Kapton film with Arduino components (r)

3. RESULTS AND CONCLUSIONS

The developed handshake wireless communication protocol using the XBees was cheap and efficient, and external lights wirelessly illuminated to different tasks accurately. Unfortunately the wearable device was too fragile, the VR inconsistent, and there were circuit sizing problems in the PE. Despite these drawbacks, users testing the system expressed they would use it. Future development on this prototype would overcome the current limitations of the prototype to make it into a deployable product for smart homes.

4. REFERENCES

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