Remote Control
Home Sprinkler Automation
&
Security System

<table>
<thead>
<tr>
<th>Low Group Frequencies</th>
<th>241 Hz</th>
<th>316 Hz</th>
<th>372 Hz</th>
<th>456 Hz</th>
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<tr>
<td>High Group Frequencies</td>
<td>1208 Hz</td>
<td>1472 Hz</td>
<td>1633 Hz</td>
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Project Proposal
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Western Washington University
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Introduction

Over the decades, human beings have been striving towards higher efficiency in everyday applications. From gasoline saving hybrid electric cars to energy saving light bulbs, there is always a way to improve on an existing design. This type of thinking can also be applied to household appliances. Home appliances should not be limited to only local control. For instance, if the sprinkler system is left on during a rainstorm, it not only wastes water but it also is a waste of electricity. The same is true for many appliances left running when the house is empty. Shouldn’t there be a way for remote access to control such utilities?

With this in mind, my partner Justin Klumpp and I propose to build a remote control home automation system with security monitoring. It will allow the end user to be at ease knowing they have full control over their sprinkler system and household appliances. With cellular phones becoming more of a standard to the public, this system will integrate the mobility of a cellular phone to allow remote access from anywhere. This control system will also feature an automatic voice alert, signaling the user that an alarm sensor has been tripped in their house. This will give the user instant notification of any intrusion in their home. In the development of this system, I and Justin will split up the project where my main responsibility will be on the home automation and sprinkler system, while Justin will take on the security system.

Description

The main controlling unit in this home automation system will be the microcontroller. This microcontroller will be interfaced directly to the phone line through the Data Access Arrangement IC. The microcontroller will have full control of the DAA chip acting like a digital telephone system as a whole. The microcontroller will rely on the use of a touch tone controlling scheme. This tone system uses a technology known in the technical world as Dual Tone Multi-Frequency (DTMF), which allows each numbers and characters to be represented by certain preset mixed frequencies. When the control system picks up an incoming call, it will prompt for a password before the user has the control of the system. This password will be sent through a DTMF decode circuit to allow only authorized access to the home control module. Once logged in, the user will be able to communicate with the microcontroller. A voice output IC with prerecorded messages will be used for the menu control interface. These messages will inform the user with different options and instructions. With the sprinkler system connected directly to the controller, a user will be able to communicate with the controller to turn the sprinkler on or off instantly. Similar to the current sprinkler control systems in the market, the microcontroller will have the ability to keep a daily on/off schedule depending on the user’s preference. A wireless transceiver is also linked to the microcontroller. It can transmit signals to the remote wall-plug receiver, and switch the output module from off to on or vice versa. The other purpose of the wireless transceiver, will be receiving signals from the security sensors once they go off.

The following is the preliminary block diagram:
**Benefits**

The end user can be benefited from this control system in many ways. User can control the automation system to turn lights on and off at a random rate or time, to confuse any potential burglar’s plan of action. A feel of secure that the user will get from knowing their home is being monitored as soon as the security system is armed. User can be away from their home for months and don’t have to be concerned about over watering or de-hydrating their plants.

**Product Comparison**

I was able to find a few home security and automation combos on the market. This particular one that I am comparing to is a lower end model which is manufactured by ELK (http://www.elkproducts.com/). This system has very similar functions as my proposed project. For instance, it has wireless capability for all security sensors, prerecorded words to playback alarm notice with audio signal, home automation to turn lights on and off. But instead of controlling with a telephone, the user has to either use the ELK provided keypad or a RS/232 serial cable to communicate with this system via their personal computer. At the price of $499, this system might not be the solution for the lower budget consumers. Although this ELK system can support up to 205 outputs, but for the consumers who are not computer or technical oriented, it might become rather difficult to install this system correctly.

My control system’s user interface will use the familiar telephone keypad, which will shirk the learning curve for this system to minimal for most consumers. Also with the unique idea of a build-in sprinkler controller, and the mobility feature of this system, this system will stands out among the others in the market.

**Project Development and Demonstration**

This project will be developed at the ET 340 research laboratory. My partner Justin Klumpp and I will be working together for the telephone interface, along with the voice feedback control. While my part of the project will be focusing on the home automation as well as the sprinkler controller and interface, Justin will mainly focus on the security system.
For the demonstration during spring quarter of 2006, I will set my project up at one of the north end stations. Then I will have access to the phone line for demonstrating the remote control functionalities. Also, a lamp will be connected to the output of the wireless receiver wall plug, to show the home automation functionality.