Voice Activated Universal Infrared Remote Control

The “Voice Activated Universal Remote Control” is a prototype product that will increase the convenience of controlling entertainment devices. The purpose of this prototype is to develop a voice activated solution that will enable the user(s) to control up to four devices such as a TV, VCR or DVD player through spoken voice commands. After training the user’s voice commands to map to specific functions such as play, the voice recognition micro-controller will attempt to recognize the command given. If the command is recognized, the micro-controller will send the trained command to the infrared engine for transmission to the specified device being controlled.

Our objective is to focus on a tangible problem with a product that will be practical, inexpensive, and easy to use while simplifying user interaction. This led us to the design for the “Voice Activated Universal Remote Control.” Many people have multiple remote controls and would like to have only one remote that will control their electronic devices. Currently, there are many universal remotes to choose from, but most do not implement voice recognition technology. This feature will enable a broad range of people, including the handicapped or impaired, to use this type of device, providing an alternative to having to hold the remote and pushing buttons. Also if the room is dark, the user may control the devices without having to turn on the light to find the correct buttons to push. The "Voice-Activated Universal Remote Control" is a device, which will greatly simplify our lives. Now, a single remote, which will control up to four different electronic receivers, is all that is necessary. The user will simply say an easy to remember user-defined phrase, one that makes sense, (like "channel up"), and this device will recognize it and act accordingly.

Our device is composed of a speech recognition micro-controller, an infrared (IR) engine to generate the corresponding IR signals, and a parallel interface to allow the micro-controller to communicate to the IR engine. The micro-controller will try to decipher the command issued via on-chip speech recognition technology. If successful, this command will be mapped to a function that will generate an 8-bit code. This code will be written to the IR engine via a parallel interface. An IR light emitting diode (LED) will then transmit the corresponding IR signal to the target device. The micro-controller will then wait for a status byte from the IR engine, informing the micro-controller if the transmission has been completed or an error occurred. To avoid interference from ambient light and other sources, the IR signal is modulated with a frequency in the range of 10KHz to 100KHz. To enable control to multiple devices such as a TV, VCR, and cable box without interference, the protocol utilizes a header as well as an address to synchronize the receiver and identify the source (and destination) of the infrared signal. The header alerts all infrared receivers in the area to await an incoming command. Then, once the address is acknowledged, the device can start receiving the actual command from the data section of the message. The target device will demodulate the carrier and decode the appropriate command.

There were many challenges involved in this project. There is no standard method of encoding for IR protocols and manufacturers use their own proprietary schemes, however most use one of three common methods to encode data. These methods include pulse-width modulation, pulse-space modulation, and shift coding. To overcome this inconsistency and to increase the reliability and compatibility or our device, we decided to use the PP4001 IR engine from Innotech Systems, which has an on-board protocol library for more than 5000 devices. Another challenge was programming the micro-controller. We had to figure out how the I/O pins and ports were being accessed and configured as well as the conversion of the spoken command to the actual bits being mapped to the IR engine. Also the micro-controller has it’s own built-in functions and commands that we needed to learn to correctly implement our design. We decided to use the Sensory Voice Extreme Toolkit to increase the speech recognition accuracy involved in our product. Our team encountered other challenges but the majority were the programming and interface circuitry. The “Voice Activated Universal Remote Control” is a practical and useful product that will help people enjoy using their entertainment devices.