VOICE RECOGNITION IR REMOTE

By

Chris Coolidge

Rob Haney

Dennis Rimington

A SENIOR THESIS PROPOSAL

Presented to the Faculty of

The Computer and Electronics Engineering Department

In Partial Fulfillment of Requirements

For CEEN 4980 Senior Thesis Proposal

Major: Computer/Electronics Engineering

The University of Nebraska-Lincoln, Omaha Campus

Spring, 2001

530 South 52nd Street
Omaha, NE 68106
January 11, 2001

Computer and Electronics Engineering Department
University of Nebraska-Lincoln, Omaha Campus
60th and Dodge St.
Omaha, NE 68182

The accompanying Senior Thesis Proposal, "Voice Recognition IR Remote," (V.R.I.R.)

is submitted in accordance with the requirements of CEEN 4980, Senior Thesis Proposal.

The project will be entirely funded by our group. We have begun the preliminary design

of the V.R.I.R. and have come to the conclusion that it is certainly applicable to our

chosen degrees in Computer Engineering and Electronics Engineering and the completion

of a working prototype is attainable by May of 2001. We submit to you, the faculty of

the Computer and Electronics Engineering Department of the University of Nebraska, the

selected thesis on the design of the Voice Recognition IR Remote

Respectfully yours,

Chris Coolidge
Rob Haney
Dennis Rimington

TABLE OF CONTENTS

BACKGROUND

Voice recognition utilities are found throughout the consumer electronics industry. From word processing software that translates spoken language into computer generated text, to smart home systems that process lighting controls through vocal commands, voice recognition is quickly becoming a standard interface between people and machines.

Universal remote controls are quickly becoming a near necessity in the home. With all the consumer electronics devices found in the modern household, including televisions, video cassette recorders, digital video disc players and numerous other remote controlled devices, the implementation of a universal remote capable of controlling all of these electronics reduces the clutter of numerous remotes and simplifies the operation these devices for the average user.

The Voice Recognition IR Remote (V.R.I.R.) device that we submit for consideration as our capstone senior thesis project combines these two technologies into a single device capable of controlling numerous remote controlled products without the need for any manual interaction with the products or another remote control device. The user will be able to control each selected device simply by issuing verbal commands. This technology will be of great use for people of any handicapped or impaired condition that would limit their ability to successfully control a device through manual interaction: i.e., pushing the correct buttons on a remote control device. Furthermore, this technology would greatly enhance the average household by expanding upon technology to simplify the consumer's lifestyle.

THESIS OVERVIEW / GENERAL DESCRIPTION

The V.R.I.R. will control at least three separate devices (example: TV, VCR, and CD player). It will be programmable for any combination of three devices that are common remote controlled consumer electronics. The initial programming for each device will be all verbal by the user. The control of all programmed devices will also be limited to verbal commands with no physical interaction. The V.R.I.R. may be initially programmed to respond to any chosen language. Language is not even necessary for those who have lost the ability to verbalize words, a series of grunts and whistles (as long as they can be repeated accurately) can be used in place of words.

To eliminate errors such as the V.R.I.R. responding to non-commands such as recognizing words simply from idle conversation, a master command must first be issued to tell V.R.I.R. that it should be listening for a command. The master command will be supplied by the designers and will be a word not found in everyday use (for example, snarphu). After hearing the master command, the V.R.I.R. will listen for further commands for up to 3 seconds.

For our project, we will be using speaker-dependent voice recognition technology. This means that whoever issues the verbal commands that initially program the voice recognition software will be the only person who will be able to use it. In our research, we have found this method to be over 95% accurate. For speaker-independent voice recognition, the accuracy rate falls below 50%, which we feel is not acceptable. Perhaps implementing speaker-independent software and hardware with a higher accuracy could be left for future graduate work.

MAJOR COMPONENTS

The basic components of the V.R.I.R. will be voice recognition modules from Sensory, Inc., a basic 25-30 button universal remote control, memory, an input microphone, an output speaker to verbalize a response to errors and a high-output infrared LED to communicate commands with the programmed devices. It will consist of a black box with no visible electronics or buttons with the exception of the infrared LED, the microphone and the output speaker. The unit will be battery powered to ensure portability.

TIME SCHEDULE

Research Design and Submittal	November 5, 2000 → January 23, 2001
Design	January 18, 2001 → February 17, 2001
Test / Problem Solving	January 23, 2001 → April 22, 2001
Construction	January 31, 2001 → March 11, 2001
Project Documentation	February 17, 2001 → May 1, 2001
Approval of Project	April 1, 2001 → May 13, 2001

	2000		2001				
	NOV	DEC	JAN	FEB	MAR	APR	MAY
Research / Approval	|-------	--------	----X				
Design			|---	-----X			
Testing / Problem Solving			|--	--------	--------	----X	
Construction			|-	--------	--X		
Project Documentation				|--	--------	------	X
Approval of Project						|-----	---X
KEY	|---- Start of Event			-----X Scheduled Completion			

ACCEPTANCE TESTING

The testing parameters for the V.R.I.R. will consist of programming and controlling three separate remote-controlled consumer electronic devices. For our test we intend on using a TV, VCR and a CD player. The V.R.I.R. will be pre-programmed to recognize a maximum of thirty separate words (or phrases) pertaining to remote control functions. Each word or phrase that is recognized represents a button from a basic universal remote control. It will respond correctly only to the voice of the designer who supplied the vocal commands for programming. So that the V.R.I.R. does not respond to idle conversation or unintentional commands, the master command must first be vocalized to tell it when to listen for commands. For example, using the master command 'snarphu' the following vocal commands: "SNARPHU, CODE, SNARPHU, TV, SNARPHU, EIGHT, SNARPHU TWO, SNARPHU, ZERO, SNARPHU, CODE" would program the universal commands for a particular television with a universal programming code of 820. Then by issuing vocal commands such as "SNARPHU, TV, SNARPHU, ON", the television would turn on. The testing procedure will involve programming the universal command codes of the three testing devices into the V.R.I.R. using only verbal commands. We will then issue the basic commands for each device that is programmed and verify the selected device's reaction to each command. These commands will consist of the basic control functions for each device that is programmed. For a television, the V.R.I.R. will be able to turn it on and off, turn the volume up and down and turn the channels up and down. For VCRs and CD players, the V.R.I.R. will be able to turn them on and off, play, stop, rewind and fast-forward. The command sequences for controlling all major functions of the devices will be pre-defined for the user. No physical interaction with the unit is necessary, only verbal interaction by the

user who supplied the vocal commands within a 6-foot diameter. The user must speak clearly and in the same tone and inflection that the unit was programmed with. The V.R.I.R. will be powered by batteries to ensure portability.

Demonstration

1.   Programming 3 separate consumer electronic devices (TV, VCR, CD player) using only vocal commands.

2.   Verifying the reaction to specified verbalized commands for each device

   a. TV: on, off, volume up, volume down, channel up, channel down

   b. VCR: on, off, play, stop, rewind, fast forward

   c. CD player: on, off, play, stop, skip forward, skip back

TEAM MEMBERS

Chris Coolidge, Senior, Electronics Engineering, May 2001 Graduation

Rob Haney, Senior, Electronics Engineering, May 2001 Graduation

Dennis Rimington, Senior, Computer Engineering, May 2001 Graduation

DIVISION OF LABOR

As opposed to splitting the work up into initial tasks for each person in the group, we intend to work together as a group so as to help eliminate troubleshooting dilemmas, labor division problems and to provide mutual support. If our group deems a division of labor necessary, we will deal with it on a case-by-case basis. As a preliminary assignment on whom will work on what, Chris will concentrate on parts, physical design and implementation. Rob will concentrate on power conversions and interdevice communication. Dennis will concentrate on memory allocation and processor programming. In actuality, we will all be working on these aforementioned assignments and more.

SUMMARY

The Voice Recognition IR Remote (V.R.I.R.) device that we submit for consideration as our capstone senior thesis project combines the technologies of voice recognition and universal remote controls into a single device capable of controlling products without the need for any manual interaction with the products or another remote control device. The control of all programmed devices will be limited to verbal commands with no physical interaction. The user will be able to control each selected device simply by issuing specific verbal commands. This technology will be of great use for people of any handicapped or impaired condition that would limit their ability to successfully control a device through manual interaction: i.e., pushing the correct buttons on a remote control device. Furthermore, this technology would greatly enhance the average household by expanding upon technology to simplify the consumer's lifestyle.