

VOICE CONTROLLED SWITCHING SYSTEM

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ABSTRACT

This research mainly focuses on how to use a person's voice to control a switching system. Specified voice commands are used as the inputs to the system. The designed system has been developed as a user dependent system. But in practice, accuracy of the system may decrease when another person who has not trained his voice with the Artificial Intelligence (AI) unit uses the system. Mainly this system consists of hardware and software implementation. The hardware implementation is used to control the switches in the system that is by using 'Controller circuit', which is the main part of the hardware implementation. Software implementation is to process the voice inputs and send signals to hardware implementation. Neural network concept in AI is used to classify the voice inputs in the software implementation. Specified voice commands were given to the system using microphone. Then light can be switched ON and OFF according to the given two different voice commands by the user. This system can be further minimizing limitations and maximizing the system performance as wireless system or applying by Graphical User Interface to the system or applying accurate technique for filtering.

Keywords: *Neural network, Automatic speech recognition, Power circuit switcher*

1.0 INTRODUCTION

Switching is one of the important operations in the electronics and electrical world. It gives the convenience to real world applications. Switching techniques mainly depend on the device/s which are controlled by the switches. And switching techniques can be changed due to safety, convenience, cost, space, distance etc. A Person has to interact with some switching technique to control the device/s. It may be a physical action or psychological action.

Speaking is probably the most efficient way to communicate with each other. This also means that voice could be a useful interface to interact with machines. For a long time research on how to improve this type of communication has been carried out. This system was going to implement by recognizing the specified words.

Mainly all research and development are focusing on invention of better solutions than currently used solutions. Therefore this solution should be adopted by considering safety of everyone. Remaining other factors are cost effectiveness, ease of control, user friendliness and power efficiencies. Those factors in a new solution may be better than those of a currently used system depending on the conditions and the purpose. As an example researchers and developers may not consider facts like initial cost, easy controlling etc. when developing a switching controller system for the high security purposes. It may depend only on the capability of system security.

In computer science, voice recognition is the translation of spoken words into text. It is also known as "Automatic Speech Recognition" (ASR), "computer speech recognition", "speech to text" (STT)⁶. This system is going to recognize the specified words. In this case specified voice commands are used as the inputs to the system. The current system has been developed as a user dependent system. But in practice, accuracy of the system may decrease when another person who is not train his voice with the AI unit are this system.

This research mainly focuses on how to use a person's voice to control a switching system. AI system was built to identify a person voice. And the command is given to controller circuit to do the task which is specified by AI. A Computer and a controller circuit were used in this system. Hardware implemented controller circuit was cost effective. System can be used to control specified devices from one place by using voice.

2.0 EXPERIMENTAL

2.1 Major components of the System and relationship between them.

2.1.1 Hardware

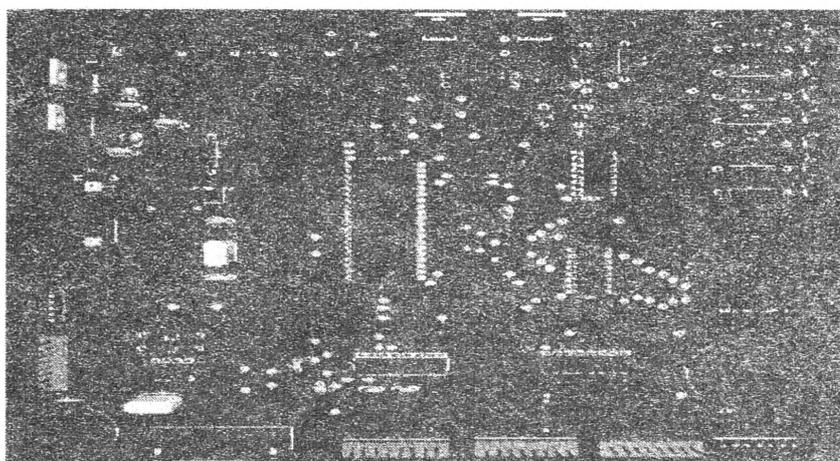


Figure 1: Controller circuit

In this switching controlling system a PIC microcontroller, Optoisolator Traic driver IC, a Traic, IRFZ44 FET and ULN2003 darlington transistor array are used as major components to build the system. Between PIC and computer data transmission was done in serial communication using RS232 protocol. Pin connection of data receive pin (RX), data transmit pin (TX) between them should be connected as the connection between Data communication Equipments(DCE)& Data Transmission Equipments(DTE)^{1,2,3}.

Table1: DTE and DCE pin connection

DTE Device (Computer)		DB9	DTE to DCE Connections	(Controller cct)	DB9
Pin#	DB9	RS-232 Signal Names	Signal Direction	Pin#	DB9
#1	Carrier Detector (DCD)	CD	←	#1	Carrier Detector (DCD)
#2	Receive Data (Rx)	RD	←	#2	Receive Data (Rx)
#3	Transmit Data (Tx)	TD	→	#3	Transmit Data (Tx)
#4	Data Terminal Ready	DTR	→	#4	Data Terminal Ready
#5	Signal Ground/Common (SG)	GND	↔	#5	Signal Ground/Common (SG)
#6	Data Set Ready	DSR	←	#6	Data Set Ready
#7	Request to Send	RTS	→	#7	Request to Send
#8	Clear to Send	CTS	←	#8	Clear to Send
#9	Ring Indicator	RI	←	#9	Ring Indicator
Soldered to DB9 Metal - Shield		FGND	↔	Soldered to DB9 Metal - Shield	

Enough current should be supplied to the controller circuit. Power circuit switchers were connected with PORTD of the PIC. MOC3041 and BT10 Traic IC were used in the power circuit switchers to control the power circuit such as lights⁵.

2.1.2 Software

Program in PIC microcontroller was coded using MicroC compiler. And the code was programmed to PIC using pickit2 software. Matlab was used to build AI using neural network concept.

2.2 Methodology & Operation of the system.

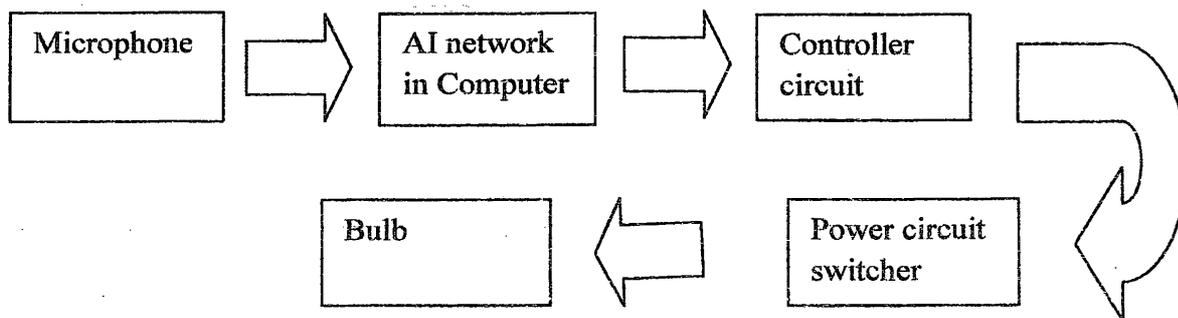


Figure 2 :Block diagram of the system

User voice command was given to the computer using microphone. Sound was recorded and recorded voice was given to the AI network. Then voice was classified by the AI. Controller circuit was given signal by AI through the D9 UART port according to the classified voice command. Received signal was checked in PIC program and specified task was done by the controller circuit. As a demonstration of the system IRFZ44 FET may be driven to a light ON or OFF a bulb by the controller circuit interface with DC. Further, power circuits that are connected with AC can be controlled using traic and optoisolator IC. Controller circuit has the facility to connect that kind of power circuit switchers. PORTD can be connected with power circuit switcher.

3.0 RESULTS AND DISCUSSION

Complexities of this system occurred due to voice inputs. Those can be categorized as follows.

- i. Speech variation
Age, sex, automatic variation speed of speech, emotional conditions of the speaker
- ii. Noises in the environment

Noise environment can add noise to the signal. Even the speaker himself can add noise by the way he speaks

iii. Continues characters

When we speak, seldom there is a break between words

iv. Other external factors

Position of the microphone in respect to the speaker, direction of the microphone and many others.

Therefore researchers had to reduce those affect of the speech. In this research Neural Network concept is used to classify the voice inputs. Simple technique was used to overcome background noises in the input voice. That is shown in Figure 2. Remaining next three reasons can be reduced by training the network⁴.

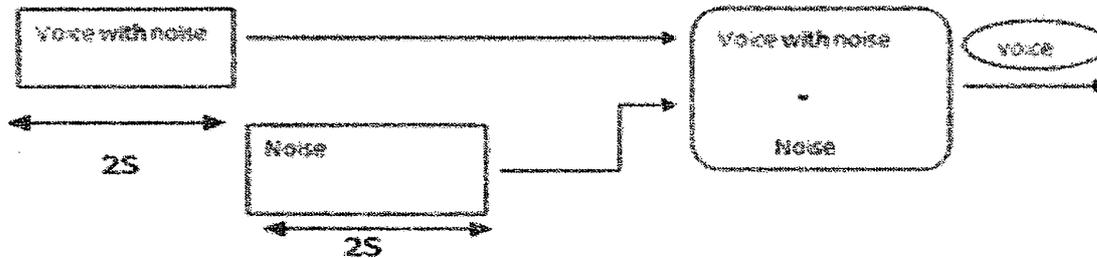


Figure 3:Noise Filtering

System accuracy can be increased by training the network in the place where the system is going to be established. Also can be used more recorded voice command in training data sheet. A light was used to indicate switching operation of the system. Controller circuit received the precise command according to voice and light was switched according to that command. Results are shown below.

Table 2: Results

Voice Command	Light State
ONE	Light is On
TWO	Light is Off

4.0 CONCLUSION

This system implementation is trying to touch some research areas of modern technology. System accuracy can be increased by training the network in the place where the system is going to be established. Also it can use more data in data sheet. System can be implemented practically and problems can be overcome during the troubleshooting.

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