SPEAKER INDEPENDENT VOICE ACTIVATED REAL TIME HOME CONTROL SYSTEM

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ABSTRACT

The main objective of this project is serving the people by controlling any kind of electrical or electronic device through their voice command. This includes voice password locking/unlocking for main door, sending emergency SMS, switching the motor for garden and so on. This system can read any person voice regardless of their age and gender. It is more immune to ambient noise. The system receives the voice as input and processes it and executes the appropriate operation without a noticeable delay. The main beneficiaries of our system are elder and physically challenged people. It is simple, compact, cost effective, easy to design and install.

Keywords: Home automation, ZigBee transceivers, voice recognition.

1. INTRODUCTION

Home Automation industry is growing rapidly; this is fuelled by the need to provide supporting systems for the elderly and the disabled, especially those who live alone. Coupled with this, the world population is confirmed to be getting older. Home automation systems must comply with the household standards and convenience of usage. This paper details the overall design of a wireless home automation system (WHAS) which has been built and implemented. The automation centres on recognition of voice commands and uses low-power RF ZigBee wireless communication modules which are relatively cheap. The aim of the reported Wireless Home Automation System (WHAS) is to provide those with special needs with a system that can respond to voice commands and control the on/off status of electrical devices, such as lamps, fans, television etc, in the home. The system should be reasonably cheap, easy to configure, and easy to run. The system has been tested and verified. The verification tests included voice recognition response test and indoor ZigBee communication test.

2. SYSTEM OVERVIEW

The Wireless Home Automation System (WHAS) is an integrated system to facilitate elderly and disabled people with an easy-to-use home automation system that can be fully operated based on speech commands. The system is constructed in a way that is easy to install, configure, run, and maintain. The functional blocks of the overall system are shown in fig.1.

Fig 1. Overall system block

3. SYSTEM HARDWARE DESIGN

The access control system which base on the wireless network to transport vehicle by the equipment of access control master, user terminal, wireless route equipment, front end identification equipment, actuating equipment of electricity locks as well as the entrance guard manages the workstation. The entrance guard master control equipment is the core equipment of the entrance guard system, responsible for the input, the processing, memory and the control of whole system and so on. It confirms the validity of the feedback signal, and makes the corresponding movement according to the effective instruction. This article use the circuit base on the low power loss MEGA8 as the master control equipment of the system. The prominent characteristic of the chip, which develops by ATMEL corporation is the low power loss. It has many series and model, composes by functional module according to different application goal, and obtained the widespread application in the intelligent measuring appliance for its high, medical equipment and so on for its high performance-to-price ratio.
4. HARDWARE DESIGN

Hardware design consists of two blocks: 1. Transmitter block and 2. Receiver block.

4.1 Handheld Microphone Module (MM):

The components of the microphone module are shown in Figure 4. The system captures human voice using a sampling rate (fs) of 8 kHz. It is known that the highest frequency component of the human voice is 20 kHz, however the most significant parts of the information is encoded in frequencies between 6 Hz and 3.5 kHz [6]. To meet Nyquist sampling criteria, an anti-aliasing filter is used to block all the frequencies above the Nyquist frequency (Fn). The incoming speech wave goes through a low pass filter. A 3-pole Butterworth low pass filter is used as an anti-aliasing filter.

The signal is then amplified in order to utilise the full range of the ADC. A voltage divider and a DC blocking capacitor provide a voltage translation from the filters to the ADC. In the microcontroller, data is first converted to digital format using the in-built ADC, and then compressed using Differential Pulse Code Modulation (DPCM) algorithm. The data is compressed from 12 bits to 6 bits. Data are sent serially from the microcontroller to the ZigBee RF module at the baud rate of 115200 bits/s. This is the maximum configurable baud rate provided by ZigBee.

4.2 Voice Recognition:

The module could recognize our voice. It receives configuration commands or responds through serial port interface. With this module, we can control the car or other electrical devices by voice. This module can store up to 15 pieces of voice instruction. Those 15 pieces are divided into 3 groups, with 5 in each group. First should train the module with voice instructions group by group. After that, should import one group before it could recognize the 5 voice instructions within that group. If need to implement instructions in other groups, we should import the group first. This module is speaker dependent. If we trained the module, others might not be able to make it work. Digital Interface is 5V TTL level UART interface and GPIO and Analog Interface is 3.5mm mono-channel microphone connector + microphone pin interface. This module can be configured by sending commands via serial port. Configuration will be not erased after powered off. Its interface is 5V TTL. The serial data format: 8 data bits, no parity, 1 stop bit. The default baud rate is 9600 and baud rate can be changed.

4.3 Master Microcontroller with zigbee interface Z1 for reception of voice command transmitted from PC end:

In Zigbee Z1 is interfaced with microcontroller for reception of voice commands transmitter from PC end. AVR 8-bit microcontroller is used as master microcontroller with XBEE pro 2.5 GHz as Zigbee Z1. The microcontroller does not require separate burner kit for burning the program into the kit.
4.4 The Hardware Design of ZigBee Wireless Transmission Module:

In transmitting module, input of our voice signal is recognized by voice recognition kit. The respective data is transmitted by ZigBee RF module. It is based on AVR Atmega8 with serial output which can be interfaced directly to PC. The LCD display shows command. For example, the command room 2 radio ON is displayed shown that in fig 6.

4.5 The Hardware Design of ZigBee Wireless Receiving Module:

Receiving module is shown that in fig 7. In this module, ZigBee is received the respective data from transmitting block. Fig 7 shows the output using LEDs. Each LED is assigned for each appliance.

CONCLUSIONS

The Intelligent Home System is a voice-controlled home automation system which controls home appliances over a ZigBee wireless network. Voice controlling enables users a sense of comfort as no direct operation with the home automation system is required. ZigBee helps in achieving a rapid rate, low power consumption and low cost network for the server to communicate with the devices.

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REFERENCES