

# Design of Remote Monitoring System for Household Appliances and Home Security Based on GMS Network

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**Abstract** - This paper introduces a SPCE061A MCU as the core of the system, it has remote control and remote alarm function. The system uses speech recognition technology and GSM communication network to control the state of the electrical equipment of indoor multi-channel. It also has real-time safety monitoring function and remote alarm function. If dangerous occurs, it can call by dialing. The instrument has a multi-function, versatility features.

**Index Terms** - Remote control. Remote alarm. GMS network. speech recognition.

## I. Introduction

With the gradual increase of the national standard of living and awareness of security, people began to be more and more concerned about their living environment. [1] Requires not only user-friendly and comfortable home environment, but also for the intelligence and security of a higher demand. The field of research and development have emerged, new technologies, new products and styles. The design will be introduced advanced GSM wireless communication network, appliance control system and safety monitoring system. GSM-based voice and voice recognition technology to remotely control home appliances control system has good scalability and value in use. [2] Intelligent appliance control system can go out during the entire residential home appliances for remote control, improve the utilization of the user time. Security monitoring can real-time monitor the living environment. The monitoring ranges indoor burglar alarm, fire alarm, gas leak, water pipe burst insecurity, protecting user's security of life and property. [3] Once the security incidents, intelligent monitoring through the GSM network will be immediately passed to the head of the household. Get the information, the head of the household, to take immediate and effective emergency measures, such as the call to the local property 110 center or 119 Fire Center.

## II. Design Ideas

In order to solve the problem of incompatible between different controllers, the system control objectives from the electrical equipment itself transferred to electrical equipment connected to the power outlet. The overall structure of the system is shown in Figure 1. The hardware structure of the monitoring module is divided into two parts, one part is based on of Sunplus SPCE061A microcontroller as the center of the monitor motherboard, including peripheral driver circuits. The other part includes a wireless phone and external circuit module. To the Remote control, the user call the mobile phone for monitoring through the GMS public wireless networks, it

received the voice messages and passed the voice messages to Sunplus SPCE061A MCU, The microcontroller uses voice recognition technology, It gets instruction content by analysis of the user's voice. Through the relay (Figure 1 switch driver circuit, followed by a circuit describes). The I/O respectively connected to respective electrical equipment. Users can control the electrical equipment' working condition by relay.

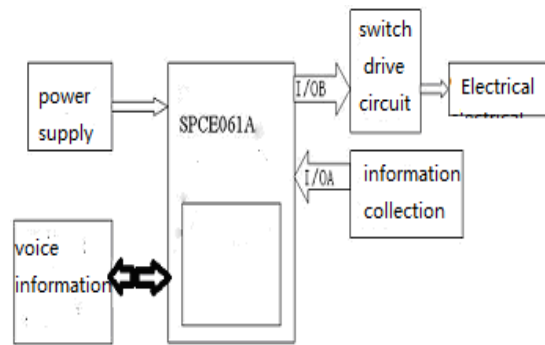


Fig. 1 The structure of the system

To the security aspects, When you turn on the alarm set, if there is any situation, The security signal generated by the information collection module, The security alarm system delivered it to SUNPLUS SPCE061A, Then the hardware interrupt is generated to control the monitoring phone to notify the user via the GSM network.

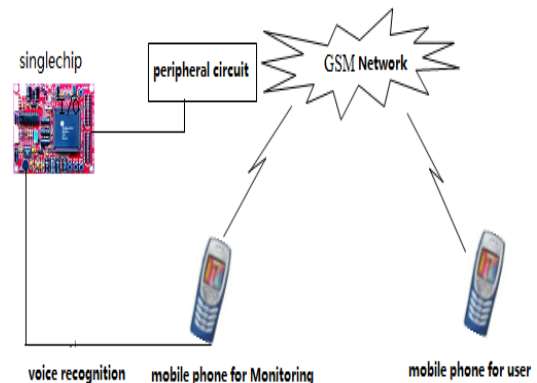


Fig. 2 Physical schematic diagram of the overall structure of the system

## III. Hardware Design

### A. Power module circuit

In figure 3 it is a circuit of the power supply module, The

## POWER

The diagram illustrates the power supply section of the PCB. It features a 5V input connected to a 10-pin header (J10). The input is filtered by capacitors C33 (220uF) and C34 (104) and protected by diode D3. The output of D3 is connected to the input of a voltage regulator U3 (SPY0029 SOT-89). The regulator's ground pin is connected to the common ground. The output of the regulator (VO) is connected to a second set of electrolytic capacitors, C35 (220uF) and C36 (104), followed by diode D4. The output of D4 is connected to a 4-pin header (R14-R17) with labels: R14 0 VDD\_A, R15 0 VDD\_P, R16 0 VDD, and R17 0 VDDH3. Another 4-pin header (R18-R22) is shown with labels: R18 0 VSS, R21 0 A/VSS1, and R22 0 A/VSS2. The common ground is connected to a ground symbol.

### B. The audio circuit

### DAC

The DAC circuit schematic shows a DAC block (CON3) with pins 1, 2, and 3. Pin 1 is connected to a resistor network consisting of R10 (1K) and R9 (1K). Pin 2 is connected to a buffer amplifier (U2) through a resistor network. The buffer amplifier (U2) is a 5-pin component with pins 1, 2, 3, 4, and 5. Pin 1 is connected to the output of the DAC (pin 2), pin 2 is connected to the output of the DAC (pin 2), pin 3 is connected to the output of the DAC (pin 2), pin 4 is connected to the output of the DAC (pin 2), and pin 5 is connected to the output of the DAC (pin 2). The output of the DAC (pin 2) is connected to a speaker (J12) and a phone jack (PHONEJACK). The circuit is powered by VDDH and AVSS2. Various capacitors (C20, C21, C23, C24, C25) are used for decoupling and timing.

As shown in figure 5 is a peripheral circuit of the audio input module. The way of the voice signal from monitoring phone transfer is: the mobile phone outputs a voice signal which is an analog signal, The sound received by the audio

**MIC**

AVSS1 C1 220f

R1 1K VMC

VCM

R4 3K R5 10K R6 10K C9 104 +C6 22u AVSS1

X1 1 2 MICROPHONE

C11 224 MCP

C13 224 MICN

R8 3K

AGC

R3 470K C2 4.7u AVSS1

C12 104 MICOUT

R7 5.1K C16 502

500mA

### C. Switch driver circuit design

## IV. Software Design

### A. The main program flow chart

### B. The speech recognition program flow chart

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number is corresponding to a name or corresponding to a action. If the ID number is for the name, then it enters to the the program of movement to and from . If the ID number is for the action, the voice informs action to be perform, and performs the action. The main program of voice recognition, is divided into four parts: initialization part, the training component, identification of parts, re-training part.

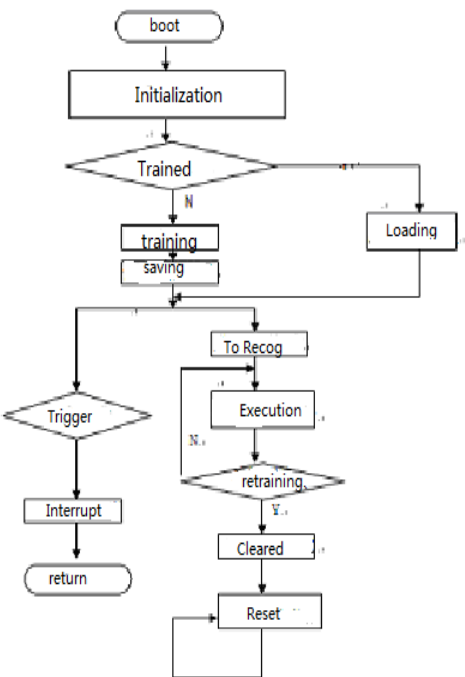


Fig.7 Main program flow chart.

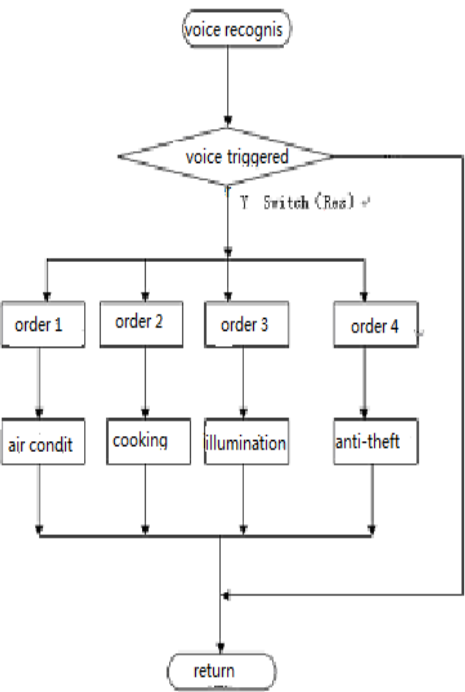


Fig.8 Speech recognition program flow chart

### C . The voice playback program flow chart

The initialization mode of the voice player is SACM\_S480 mode. SPCE061A is a voice product, Sunplus company provides a variety of audio codec algorithm and its API library, the SACM-LIB (file name SACMV26e.lib 26e is the version number). The library is made of A/D module, encoding module , decoding module, storage module , and D/A module, Each module has its own application program interface namely API, The users only need to understand the function and its parameters to each module. The flow chart of the voice player is shown in fig.9.

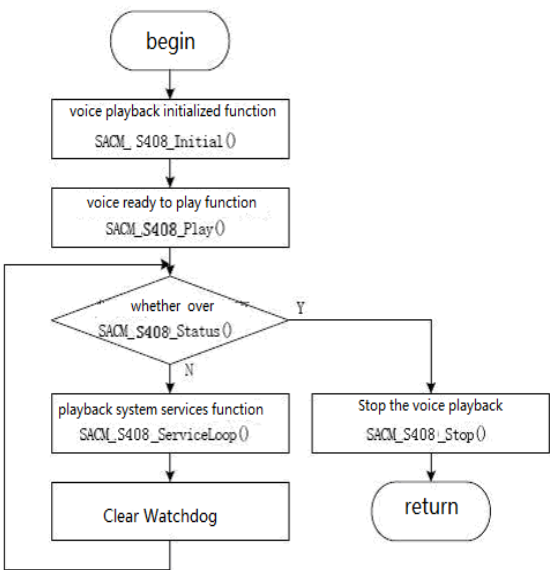


Fig.9 The voice player's flowchart

### V . Acknowledgment

The system uses speech recognition technology and GSM communication network to control the state of the electrical equipment of indoor multi-channel. It also has real-time safety monitoring function and remote alarm function. If dangerous occurs, it can call by dialing. The instrument has a multi-function, versatility features.

### References

- [1] Xu Aijun, *The Intelligent Measurement and Control Principle and Design of Instrument* . Beijing: Beihang University press, 1995
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