A Research in the Tele-Working of the Intelligent Device for Anti-Disaster Security

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Abstract: - In this paper, the 'An Intelligent Device for Anti-Disaster Security' is designed by the following micro-computer hardware interface rules: the temperature combination sensor, the smoke inductor, the humidity sensor, the gas inductor, the infrared radiation sensor, A/D converter. While the disaster occurs, the 'An Intelligent Device for Anti-Disaster Security' will start the security protection installation and start the dialing system to notify the house owner and the police station. We can monitor the entire status of the house by the computer video-monitoring system. The strengths of the 'An Intelligent Device for Anti-Disaster Security' are: Easy Installation, easy maintenance、Complete functions, anti-disaster and alarm-security are focused and Free monthly rent, cost saving.

Key words: micro-computer hardware interface, sensor, dialing system, A/D converter

1 Introduction

1.1 Research Background

Many huge buildings are built recently. The usage of these buildings is complicate and the residents are seldom known each other. Once the fire or gas disaster occurs, how could these people help each other?

In fact, those disasters can be reduced once there required methods are used properly in the beginning of the disaster. Such as, the beginning 2 or 3 minutes are the key time to extinct the fire. If some devices can work out before the fire spreads, the disaster would decrease. The traditional fire alarm [1] belongs to the mechanical resister attach switch [2]. While the fire occurs, the increasing temperature flatters the two pieces of the bimetals inside the alarm device. Those two pieces of bimetals own different material, therefore, the difference of the flattering index make the difference of their length, then the alarm device would be enabled. But this kind of alarm device owns the following shortcomings: it is set up in the ceiling and it is difficult to check its function.

Carbon monoxide poisoned is the following disaster issue [3]. This kind of disaster is the intangible killer during the winter and all the family members might be poisoned without any notifying. There is a carbon monoxide detecting device [4] provided in the market. This device is settled on the gas cask or inside the natural gas master switch [5]. Once the gas floats, the alarm of the carbon monoxide detecting device rings. But the carbon monoxide detecting devices lacks the auto-shut-down function and can't reach the contact person immediately.

1.2 Research Purpose

We would like to apply the computer hardware interface [6]-[9], combining with the temperature detecting device, infrared detecting device, temperature detecting device [9] and A/D transferring device [10] to design an Intelligent Anti-Disaster Security System (IADSS) to protect the families away from the following disasters: fire, gas and thief.

The Intelligent Anti-Disaster Security System overcomes the traditional alarm defects, such as: the difficult of maintenance and the high expenses. Our Intelligent Anti-Disaster Security System would own the following strengths: i. Easy settlement and easy maintenance. ii. Complete functions, both of anti-disaster and security. iii. Low cost.

The paper is arranged in the following: Section 2 presents the system function. The design principles are stated in Section 3. We would like to make a detailed test of the hardware and software of this research in Section 4. Finally, we make a brief conclusion in Section 5.

2 System Functions

Based on the micro-computer hardware interface principles, the author designs the Intelligent Anti-Disaster Security System (IADSS). The System Structure Graph and the Appearance of the Detecting Appearance and the Circuit Physical Graph are listed in Fig.1 and Fig. 2.

The proposed Intelligent Anti-Disaster Security System (IADSS) owns the following functions:

i. The Automatic Security and Anti-Thief System
ii. The Automatic Gas Detecting System
iii. The Automatic Fire Detecting System
iv. The Automatic Humidity Detecting System

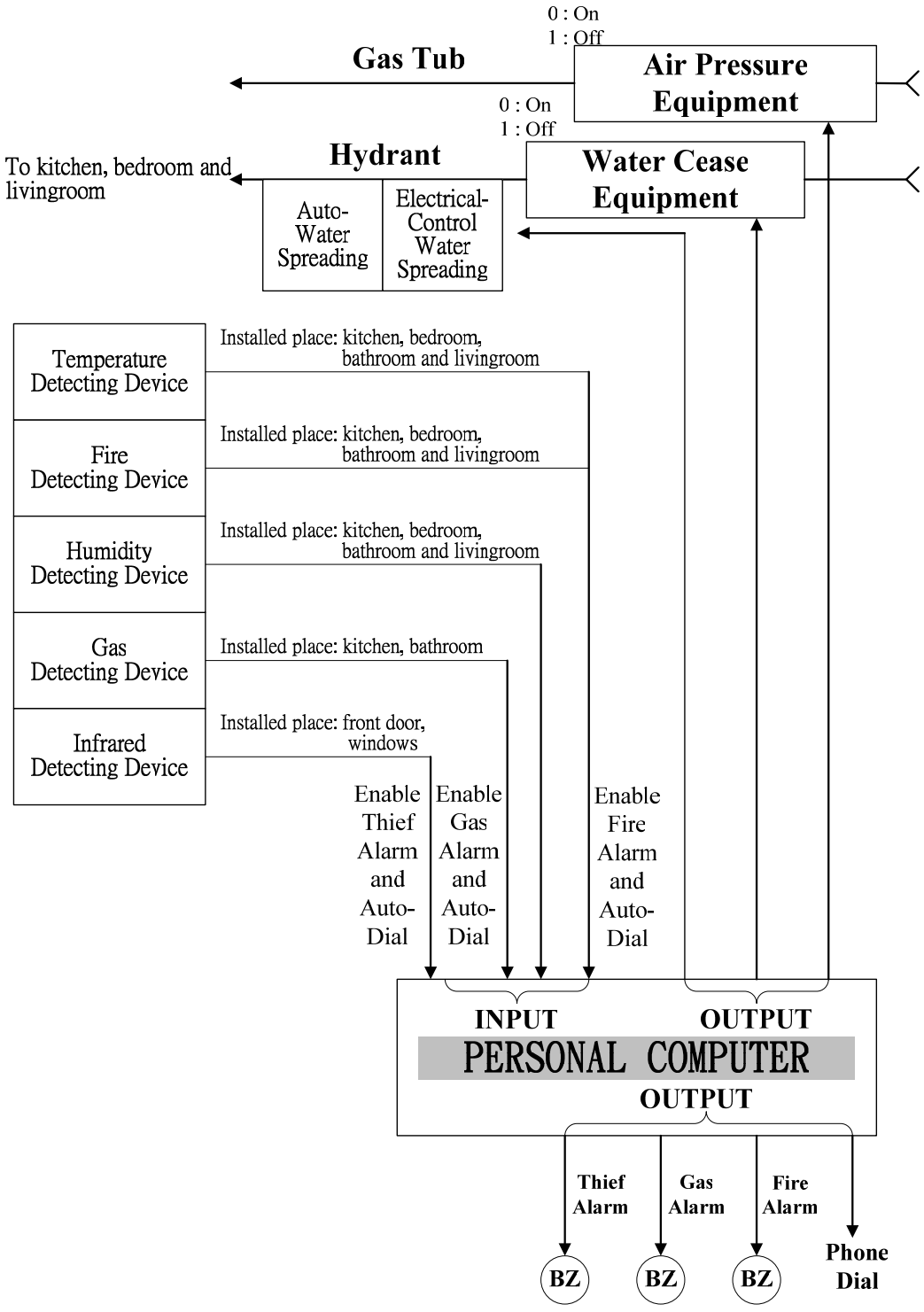

Fig. 1 The System Structure of the Intelligent Anti-Disaster Security System

In order to forbid the breakdown of the computer, we use two versions of control processes. These are 'Analog Signal Control & Digital Signal Control'. The detailed introduction of our research design is listed in the following:

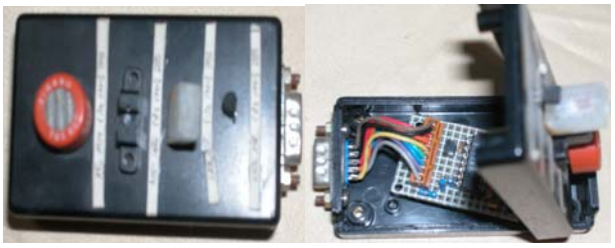

Fig. 2 The Appearance of Detecting Device and Interface Circuit Physical Graph

2.1 The Automatic Security and Anti-Thief System

There are two steps instructions: Alarm Ringing and Auto-Redial.

2.1.1 Alarm Ringing

While someone breaks into the house, the guy would enable the infrared, the alarm of the Intelligent Anti-Disaster Security System (IADSS) rings to remind people to take protection process.

2.1.2 Auto-Redial

While someone breaks into the house, the computer would enable Auto-Redial function and transmit the voice-mail to notify the help requirement message.

2.2 The Automatic Gas-Detecting System

There are three steps instructions: Alarm Ringing, Turn-off Gas and Auto-Redial.

2.2.1 Alarm Ringing

While the gas or carbon monoxide spreads out, the density of the poisoned-air increases in the air. Then, the alarm of the Intelligent Anti-Disaster Security System (IADSS) rings to warn people to take protection process and fresh the air immediately.

2.2.2 Turn-off Gas

While the gas spreads, the computer monitoring gas master switch would be turned-off to forbid huge disaster.

2.2.3 Auto-Redial

While the gas spreads, the computer would enable auto-redial function and transmit the voice-mail to notify the help requirement message.

2.3 The Automatic Fire-Detecting System

There are three steps instructions: Alarm Ringing, Auto-Water-Spreading and Auto-Redial.

2.3.1 Alarm Ringing

While there is a fire disaster, the temperature of the house increases and the smoke occurs. Then, the alarm of the Intelligent Anti-Disaster Security System (IADSS) rings to warn people to take protection process.

2.3.2 Auto-Water-Spreading

While the fire disaster occurs, the computer monitor center will spread the water immediately.

2.3.3 Auto-Redial

While there is a fire disaster, the computer would enable auto-redial function and transmit the voice-mail to notify the help requirement message.

2.4 The Automatic Humidity-Detecting System

There are two steps instructions: humidity display and auto-humidity equipment.

2.4.1 Humidity Display

The auto-humidity detecting device will display the humidity data through the computer monitoring system of each room in the house.

2.4.2 Auto-Humidity Equipment

While the detected humidity data is higher than the standard data, the humidity functions will be enabled to main the normal environment for the precious goods in the room.

3 Design and Production Principles

In this section, we would like to introduce the design and the production principles. Fig. 3 is the Hardware Interface Diagram of the Intelligent Anti-Disaster Security System (IADSS) and Fig. 4 is the Hardware Circuit of the Intelligent Anti-Disaster Security System (IADSS).

In order to forbid the breakdown of the computer, we have two sets of control process: The Analog Signal Control and the Digital Signal Control. The Rule of the Analog Signal Control is to transfer the system control authority to the interface control. We set up the critical value (safety value) of the temperature, gas and humidity into the pre-set reference voltage. While the sensor detects the voltage is higher than the critical voltage, the reaction process

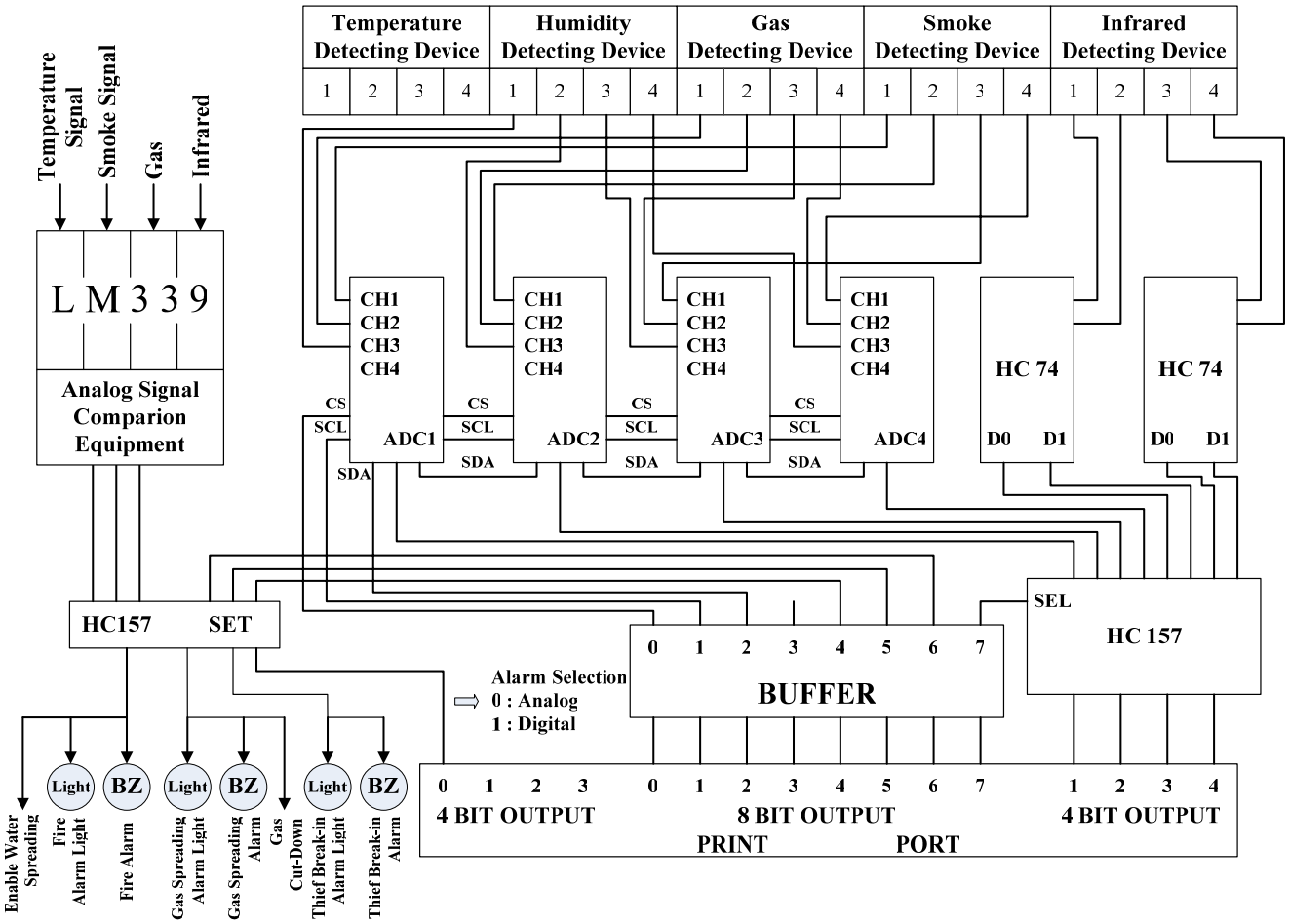

Fig. 3. The Hardware Interface Diagram of the Intelligent Anti-Disaster Security System

enables. There are three control systems in the Analog Signal Control Function: the Automatic Fire Detecting System, the Automatic Security and Anti-Thief System and the Automatic Gas Detecting System. Except the computer auto-redial function, the rest functions of the Analog Signal Control is the same as the Digital Signal Control. In Digital Signal Control, we use the A/D0804 Analog Digital Transform Device to detect the analog voltage and then transfer into the digital voltage. And the processing is executed by the digital signal control method.

The introduction of the system function design principles of the Digital Signal Control is listed below:

3.1 Automatic Fire Detecting System

We design two devices in the Automatic Fire Detecting System. These are: Temperature Detecting Device and Smoke Detecting Device.

3.1.1 Temperature Detecting Device

We use LM35 Temperature IC to detect the temperature (the Detecting range is -30~100℃). While the temperature increases, the electricity increases. While the detecting temperature reaches the critical value of the range, the resister appears non-linear characteristics. Then, the resister will accommodate and then correct the circuit into linear mode.

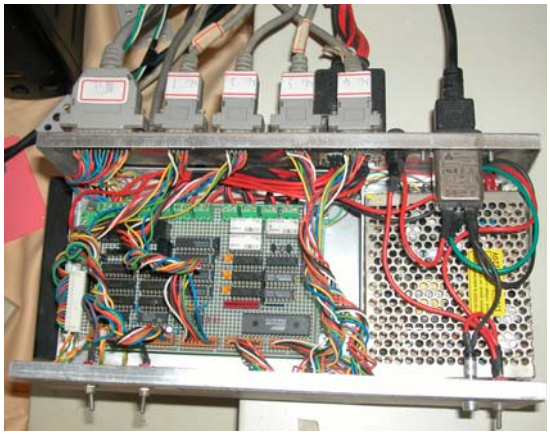

Fig. 4 The Hardware Circuit of the Intelligent Anti-Disaster Security System

3.1.2 Smoke Detecting Device

We use a new Smoke Sensor TCKT1000 (the detecting range is within 2m). The rule of this Smoke Sensor to justify the density of the smoke is to use the photo-reflection to check the corpuscular.

While the number of the corpuscular increases (the smoke is heavy), it cuts off the photo-reflection of the sensor, then, the detecting units increases. The detected smoke becomes heavy.

3.2 Automatic Gas Detecting System

We use the new model Gas Detecting TGS800 that owns high sensibility. The rule is to use 5V voltage to add on the sensor end of the Sensor. The heating sensor circles of the detecting device become hot. The anti-degree of the circles decreases and then sends to the OP and then amplifies the signal. We control the Sensor's sensitivity to adjust the OP Amplify device. The TGS800 detecting device can detect the 100PPM of the carbon monoxide.

3.3 Automatic Anti-Thief Detecting System

We design two devices in the Automatic Anti-Thief Detecting System. These are: Infrared Detecting Device and Heat Detecting Device.

3.3.1 Infrared Detecting Device

We apply the infrared launcher TSTS1703 and infrared receiver BPW77 to complete the anti-thief process. During the normal status, the BPQ77 stays at the received status. While there is anything cross through the infrared, the infrared signal is cut off, then the signal goes through the *D* Flip-Flop, and then enable the alarm and alarm light. While the system is monitored by the computer, it use *D* Flip-Flop to implement the output and the alarm, alarm light and the telephone auto-redial are controlled by the software.

3.3.2 Heat Detecting Device

We apply the heat detecting sensor LH1985 to complete the anti-thief process. It uses the human's infrared heat to enable the device. The lenses are set up in front of the LH1985 and decide the detecting range of the detecting device. The work rule is while the LH1985 detects the human's source of the infrared, the internal circuit increases. The signal will be amplified through the OP. Then, through the comparison of the comparing device and the reference voltage and the alarm and the alarm light will be enabled at the time.

While the computer under the status of control, the signal goes through OP, and then transfer into digital signal through the A/D transferring device. And then goes through the printer interface port to control alarm, alarm light and telephone auto-redial by the software.

3.4 Automatic Humidity Detecting System

We design two devices in the Automatic Humidity Detecting System. These are: Humidity Detecting Device and Enabling Humidity Detecting Device.

3.4.1 Humidity Detecting Device

We apply Sensor HOS-104 to complete the functions of humidity detecting. The usage range is 0-100%RH. The usage temperature is 0~60℃. The work rule is to monitor the humidity variation by amplifying the signal through the OP, and the A/D transfer device transfers it into digital signal through the printer interface port.

3.4.2 Enabling Humidity Detecting Device

While there are some precious goods placed in the particular room. And the humidity is higher than the specified degree. We would install the humidity detecting and control system in this area. While the humidity increases the auto humidity device enables automatically.

4 The Testing Method

The Process Procedure of the Intelligent Anti-Disaster Security System (IADSS) is showed in Fig. 5. In order to implement the test process, we produced the software, hardware and the house model. There are Analog Signal Control Model and Digital Signal Control Model in the Intelligent Anti-Disaster Security System (IADSS). The Digital Signal Control is to transfer the analog voltage into the digital signal through the A/D transferring device. These steps are: the software is controlled by the circuit. The analog control is controlled by the interface. There would be a comparison about the electricity of the detected data: temperature, gas and humidity against the inner standard value (referenced electricity). Once there is any difference, the required process implements immediately.

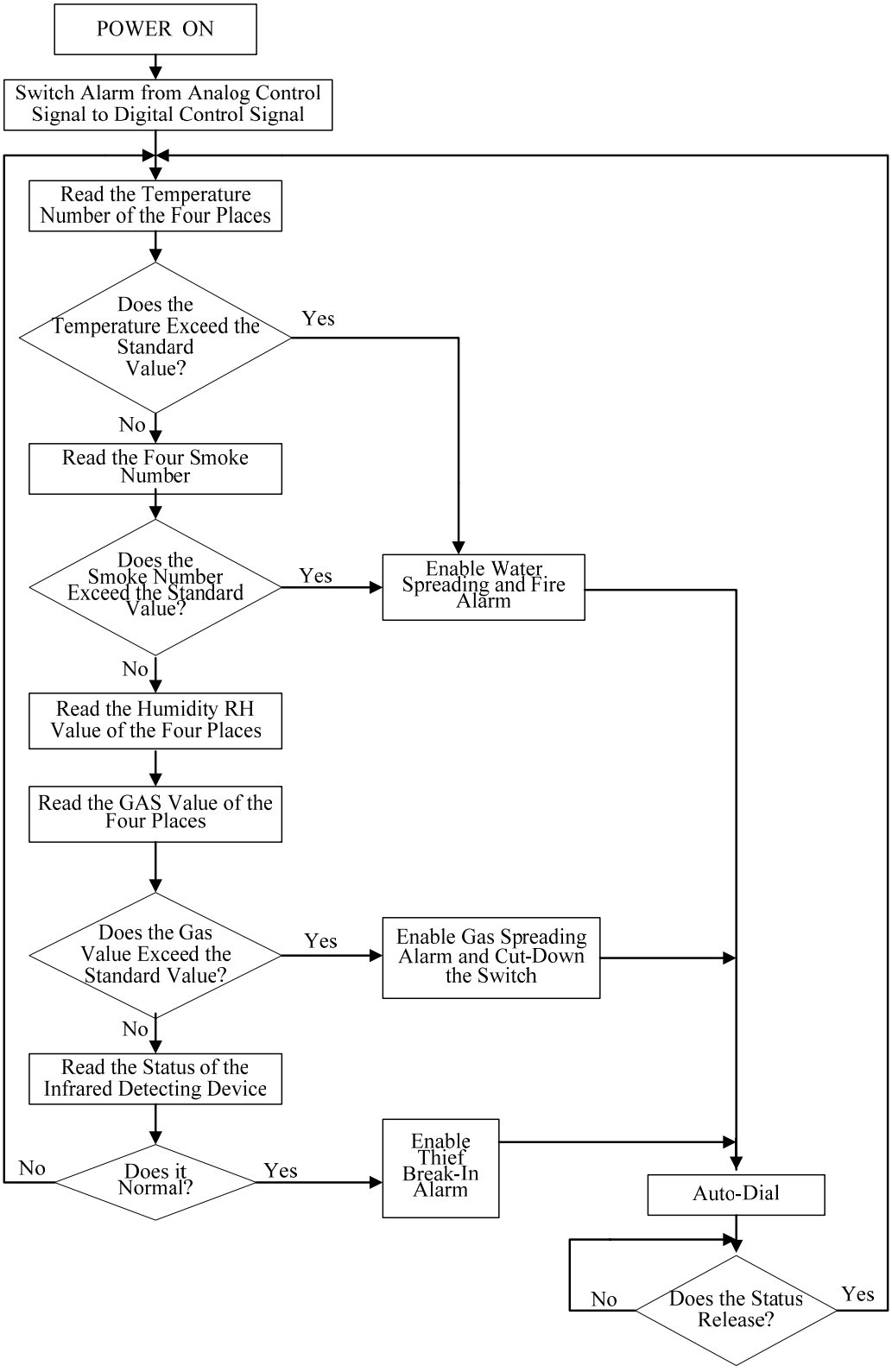

Fig. 5 The Process Procedure of the Intelligent Anti-Disaster Security System (IADSS)

5 Conclusion

The author applies the micro-computer hardware interface rule to design the Intelligent Anti-Disaster Security System (IADSS). Combining with the software, hardware and testing verification, the Security Protection Equipment can be enabled while the disaster occurs. We can check all the status of our home through the computer. Comparing with the existed anti-security system, ours Intelligent Anti-Disaster Security System (IADSS) owns the following strengths: i. Easy settlement and easy maintenance. ii. Complete functions, both of anti-disaster and security. iii. Low cost.

References:

[1] Ferry, *Electronic Materials and Devices*, 2001, pp.43-73.

[2] Harper, *Electronic Materials and processes Handbook*, 2002, pp.36-54.

[3] Caret, *Principles & Applications of Inorganic Organic & Biological Chemistry*, 1993, pp.30-47.

[4] Ludeman, *Electronic Devices and Circuit*, 1990, pp. 101-135.

[5] Fraser, *Integrated Electrical and Electronic Engineering for Mechanical Engi- neers*, 1994, pp.78-97.

[6] Rafiquzzaman, *Microprocessors and Microcomputer-Based System Design*, 1990.

[7] Triebel, *The 80386DX Microprocessor Hardware, Software and Interfacing*, 1996, pp. 32-65.

[8] Boylestad, *Introduction Circuit Analysis*, 1997.

[9] Carstens, *Electrical Sensors and Transducers*, 1993.

[10] Comer, *Advanced Electronic Circuit Design*, 2003, pp.17-48.