

The Developed Security System Based on Communication Technology with Internet Networks

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Abstract—The security automation system technology is unique from other systems which give ability to the user to control the system from any location around the world through internet connections. For this reason, the internet networks play a vital role in the field of security Systems. This paper presents a security system based on communication technology. The security system uses smoke sensors, motion sensors, and magnetic sensors to detect environment conditions, using a microcontroller to control system operation. The output from the devices is used as raw data and then sent to analyze with a central computer using The Delphi software. The program will send signal to operate the alarm system and it can operate on the designed webpage. By considering experimental results, all of sensor devices and notification system can work realizable and effectively.

Index Terms—security system, communication technology, sensors

I. INTRODUCTION

Nowadays, communication technology has been widely developed. Thus, there is new technology emerged to easily communicate, i.e. Wi-Fi, 3G, 4G, and so on. People around the world can easily interact with each other because there are communication networks installed in all areas: enterprises, department store, public places, and homes. Generally, the communication networks are allowed to access all times in term of convenience and easy usage. In addition, the communication networks can be used to send data as control signal.

Bahtiyar *et al.* [1] present a framework to assess trust to security systems of web services. The framework is used to improve an automated system to assess trust of a specific security system protecting web services. Zhaozheng *et al.* [2] investigate a set of Internet service security system. RFID technology, GSM communication technology, and LCD display are studied by Pinggui *et al.* [3]. The results indicate that the proposed security can effectively prevent campus safety accidents. Paper [4]

proposes the design of an Automated Office receptionist system using Raspberry Pi 3 and an Android Application. The proposed system can eliminate manual assistance and also improve the security with simple devices and low costs. Tanwar *et al.* [5] present a security alert system based on advanced Internet of Thing to detect an intruder or any unusual event at home. A small Pyroelectric Infrared (PIR) module and raspberry pi are used to reduce the delay during process. Thus, the proposed technique is low cost for a home security system and flexible usage. Kaliyamurthy *et al.* [6] investigate combination of user and system interaction, whole together in the course of providing efficient secured network using multilevel system and user intervention which in turn reduces the system or the user's possibility of false perception in securing the network. The physical network environment threat data is analyzed as a Decision Support System.

Communicative technology is applied to the easily accessible safety systems of life and property. Thus, communicative technology which is an internet network is developed to use as monitor and notification systems using a microcontroller to control and detect. Additionally, when the communicative technology is cooperated with a designed software program, it can be alerted through the user's computer. This paper presents a security system uses smoke sensors, motion sensors, and magnetic sensors to detect environment conditions, using a microcontroller to control system operation. The output from the devices is used as raw data and then sent to process with a created program. The program will send signal to operate the alarm system and it can operate on the designed webpage.

II. EXPERIMENTAL TEST SET DESIGN

The box diagram of the designed security system based on communication technology with internet networks is shown in Fig. 1.

- MC is the microcontroller (ATmega64) used to control relays and sensors, using the Dlphi software to communicate with the computer via RS232 port.

- LED is used to display the status of sensors (ON-OFF) and relays (0-1)
- Sensor comprises 3 types, i.e. a motion sensor, a smoke sensor and a magnetic switch. If faults are detected by the sensor, the notifications will be showed on the control screen of the webpage.
- Switching is used to control input voltage of 5 volts of the microcontroller.
- RS232 is a port that interacts the microcontroller with the computer.
- Webpage is the space used to observe fault conditions from sensors and relays operation, written by the PHP software.
- Access is a database of the system.
- Xampp is a web browser on the user's computer via the localhost link.

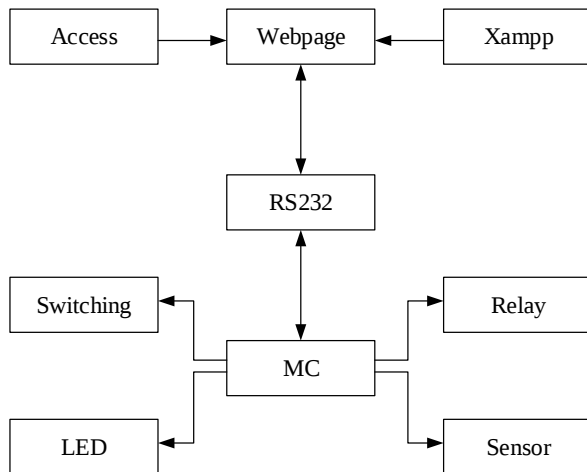


Figure 1. The box diagram of the designed security system.

The central computer is used to be an interface and processing of the proposed system. The Delphi software is used to control the devices using a microcontroller, which receives raw data from sensors via a serial communicate system. In addition, the status of the devices is displayed through a web page created from the PHP program. System operation is divided into two parts: hardware and software as shown in Fig. 2.

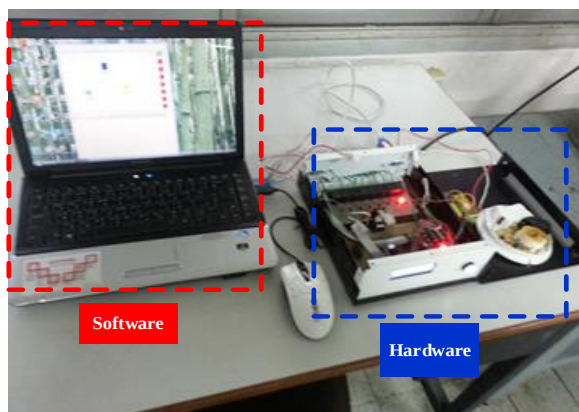


Figure 2. The box diagram of the designed security system.

A. Hardware Part

Hardware consists of 8 relays and 3 sensors (a smoke sensor, micro switch, and a motion sensor), which is connected to the microcontroller. The raw data from the devices is sent via serial ports and recorded as database on the computer in order to process, control, and alert the security system automatically.

1) *Relay.* Fig. 3 shows the circuit diagram of a relay. When the relay's coil is energized by electricity, a magnetic field will be occurred, resulting in movement of the movable contracts making a connection with a fixed contact, hence an electric current flow. Additionally, there are LED lamps to indicate the status of relays.

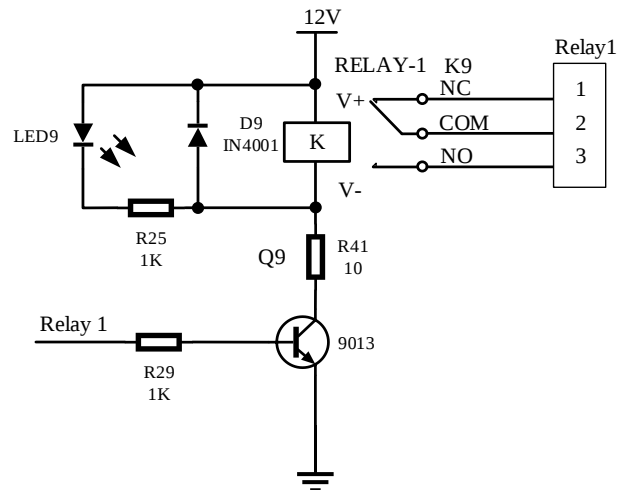


Figure 3. The circuit diagram of a relay.

2) *Motion.* The motion sensor used is an infrared type, consisting of a transmitter circuit and a receiver circuit as shown in Fig. 4. When there is no an obstacle, the receiver circuit will not generate output signals. By contrast, if the sensor able to detect an object, there are signals generated from the output.

3) *Motion.* The smoke sensor circuit is shown in Fig. 5. When there is smoke occurring around the detected areas, the infrared light inside the sensor will be covered. Therefore, T1 and T2 transistors based on a Darlington connector will operate. The gate voltage of the SCR (T3) is high, causing voltage drop the MOSFET at T4 via the R4 resistance, thus BZ1 and LED lamps are activated.

4) *ATmega64 microcontroller.* A microcontroller is used to control all functions of the designed security system based on communication technology. In case study, the ATmega64 microcontroller of 64 pin is selected as shown Fig. 6.

B. Software Part

The Access software is used to store all data, i.e. device status, command as well as environment, in the system. The Delphi software is a central application used to operative processing of electrical equipment. The PHP is a software used to create webpages.

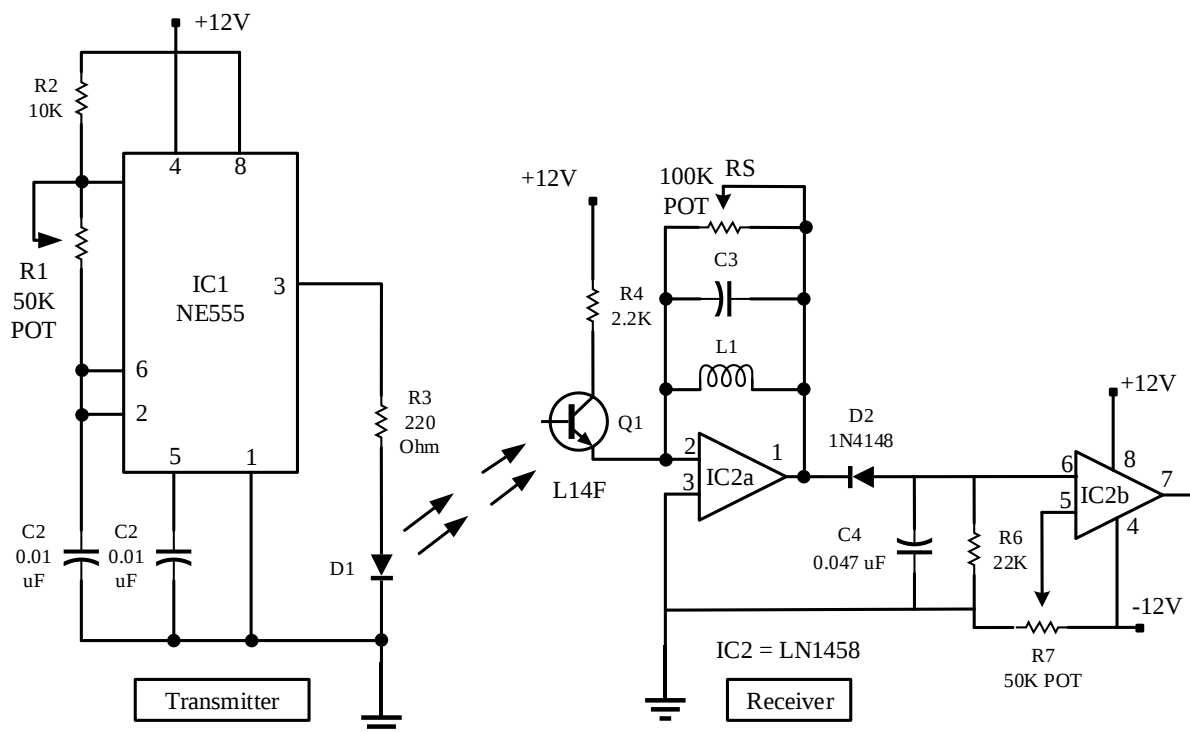


Figure 4. The circuit diagram of a motion sensor.

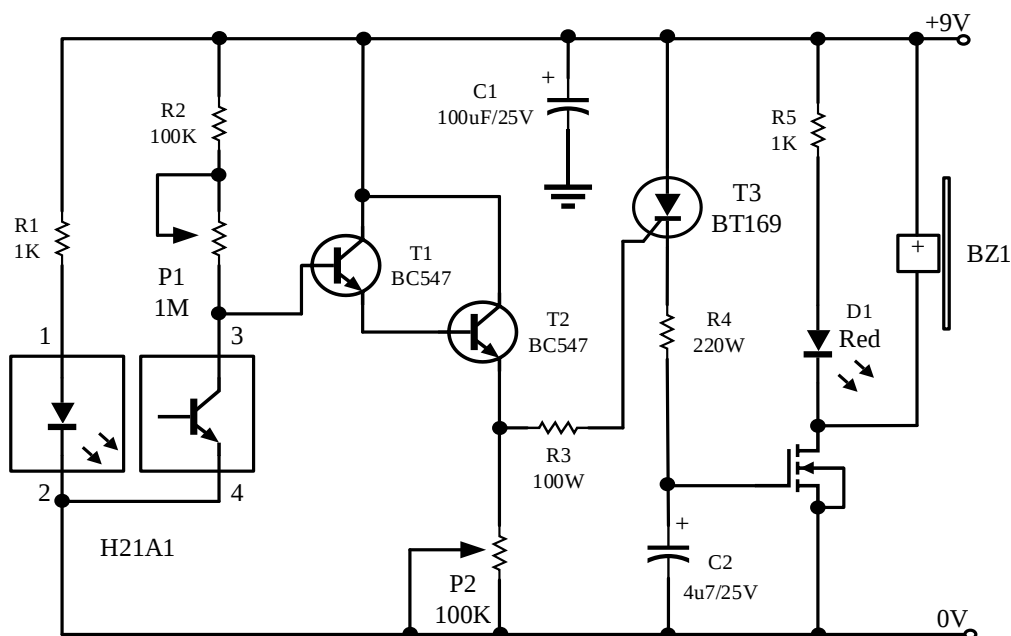


Figure 5. The circuit diagram of a motion sensor.

III. EXPERIMENTAL RESULTS

This section presents experimental results of the designed security system based on communication technology, which are divided into the results of sensor status and relays operation; these are displayed through a webpage.

A. Motion Sensor

Motion sensors are tested by using different distance of motion, which is displayed on the webpage as shown in Table I. If the motion is captured in the control screen, red light will flash and the status at the bottom of the webpage's screen will become ON. Moreover, the output voltage at normal state and activated state of the sensor are measured, which is 5 volts and 3.3 volts respectively.

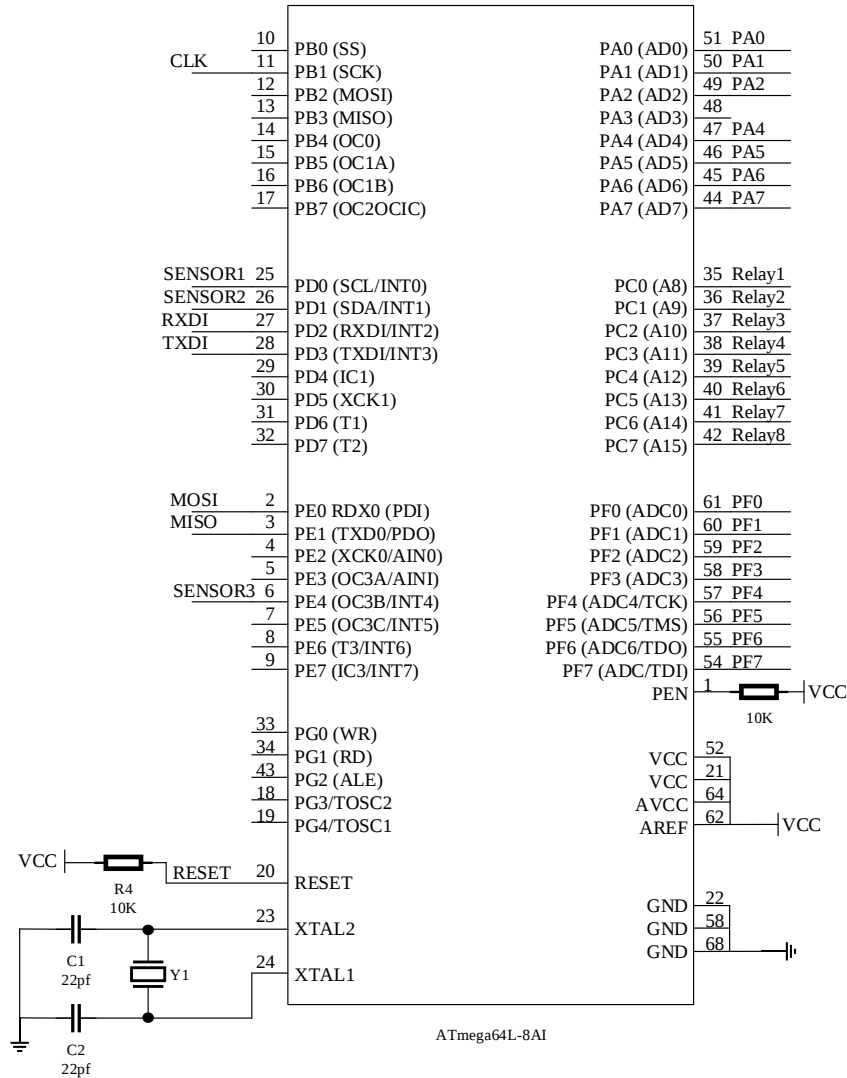


Figure 6. The circuit diagram of the ATmega64 microcontroller.

TABLE I. DISTANCE DETECTION OF A MOTION SENSOR

Number	Motion sensor ranges				
	Distance of 0.5 m	Distance of 1 m	Distance of 1.5 m	Distance of 2 m	Distance of 3 m
1	ON	ON	ON	ON	ON
2	ON	ON	ON	ON	OFF
3	ON	ON	ON	ON	ON

B. Smoke Sensor

Experimental results of a comparison between the normal and detectable state of the smoke sensor are shown in Table II. If the smoke is detected according to various test distance, the light on control screen will flash and the alarm status will be displayed. Thus, status at the bottom of the control screen become ON. The measurement of output voltage between the normal state and activated state of the sensor is 9 volts and 4 volts respectively.

TABLE II. DISTANCE DETECTION OF A SMOKE SENSOR USING SIMULATED SMOKE

Number	Smoke sensor ranges			
	Distance of 0.5 m	Distance of 1 m	Distance of 1.5 m	Distance of 2 m
1	ON	ON	ON	ON
2	ON	ON	ON	ON
3	ON	ON	ON	ON

C. Magnetic Switch

Table III presents the number of accuracy of magnetic switch operation – magnetic contactors are fixed.

TABLE III. MAGNETIC SWITCH OPERATION

Number	1	2	3	4	5	6	7
Status	ON	ON	ON	ON	ON	ON	ON

D. Relay

Fig. 7 shows the LCD window, the upper row shows status of relays—if a relay is activated, it will be ON. The status shows OFF when it is a normal stage. The under

row shows status of all relays (8 relays); 0 is a normal state, 1 is operation state.



(a) All relays not operation



(b) All relays operation

Figure 7. Relay status

IV. CONCLUSION

This paper presents the security system based on communication technology, dividing into two parts: the device control (relays and sensors) and the notification system on a webpage. In part of device operation, all of delays can operate ON-OFF effectively. There is LED display to indicate the status of the relays (0 or 1). The status for the sensors is ON-OFF, which works well together with the control system. For the notification, the status of three sensors is shown in the designed webpage on the server computer. If a fault takes place with the installed sensors, there is alarm on the webpage — ON status is shown. Thus, all installed sensors and the notification system can work realizable and effectively.

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