PROGRAMMABLE SYSTEM FOR SECURITY AND ADMINISTERING BUILDINGS

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Abstract: *The creation of a system which combines the necessity of security for today peoples and their wish of greater comfort is possible because of the great rank of integration reached by the technology nowadays. This paper presents a scalable solution of an implemented security and administering system, described only at block level.*

Key words: *programmable system, security system, embedded system, system with microcontroller.*

1. INTRODUCTION

Nowadays buildings have two important problems: security and comfort.

The existing systems have two major disadvantages which consist of resolving only security, or domotics [1] problems, and subsystems communications made trough cables. To solve this drawback Security and Administering System prototype was created.

The projected system is designed for buildings with small or medium courtyard and manages: the security of courtyard, the access control, the interphone, the outside lighting command, the boiler command and the air conditioned command.

The implemented system has a high degree of scalability, which means that it can monitor and process data, in real time, from a large number of sensors (see Fig. 1).

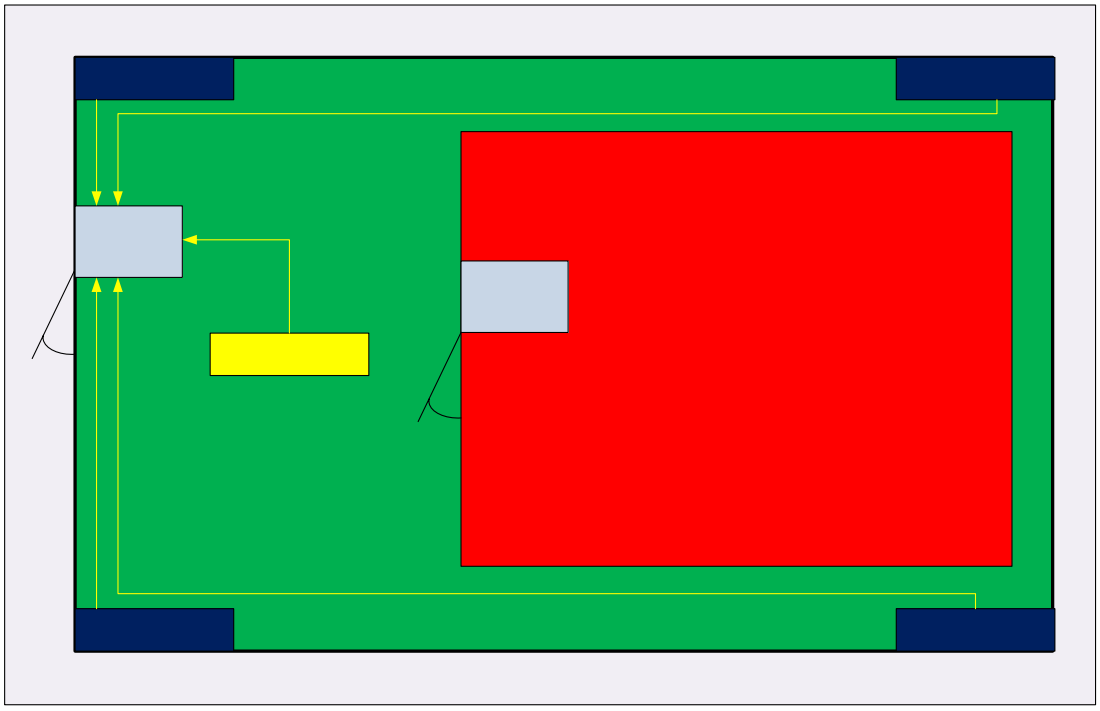

Fig.1 Principle diagram of Security and Administering System

Further facilities that can be added: CH_4 and CO constant analyze and alert, the inside lighting command, video-interphone.

The communication is realized trough wires [2], on a maximum distance of 500 meters, or trough air [3], on a maximum distance of 200 meters.

Because the transceivers (Bim2-433-160-5V) communicate on 433 MHz, frequency which is in the ISM (Industrial, Scientific and Medical) band, we don't have to buy a frequency band.

Each one of the entities of this system are coordinated by one 8 bit microcontroller (PIC18F452) [4,5,6].

2. SYSTEM OVERVIEW

Secondary System is placed outside the building, near the courtyard entrance (see Fig. 2). Secondary System collects information's from Light Detector and IR Detectors, sends the collected information's to the Main System.

Light Detector is placed in the courtyard, reads outside light intensity, sends information to the Secondary System.

IR Detector is placed in the courtyard, read IR variations on the courtyard perimeter, sends information to the Secondary System.

Main System is placed inside the building, it collects information's from Secondary System and the sensors placed inside the building, processes the information collected and makes decisions based on processed data.

Description of subsystems in the block diagram of Security and Administering System:

Secondary System:

- I/U – Current to Voltage Converter, has the function of a receiver and realizes galvanic isolation between Secondary System and the detectors placed in the courtyard;
- Temperature Sensor – transmits to the RF/μC block information about outside temperature;
- RF/μC – is the block which process the information from outside Temperature Sensor, IR Sensor, Light Sensor, Bell Button, microphone and send it to trough the RF interface;
- Supply – is the block which gives the necessary voltages for correct functioning of the system;
- Light Sensor – transmits to the U/I block information about outside intensity of light.

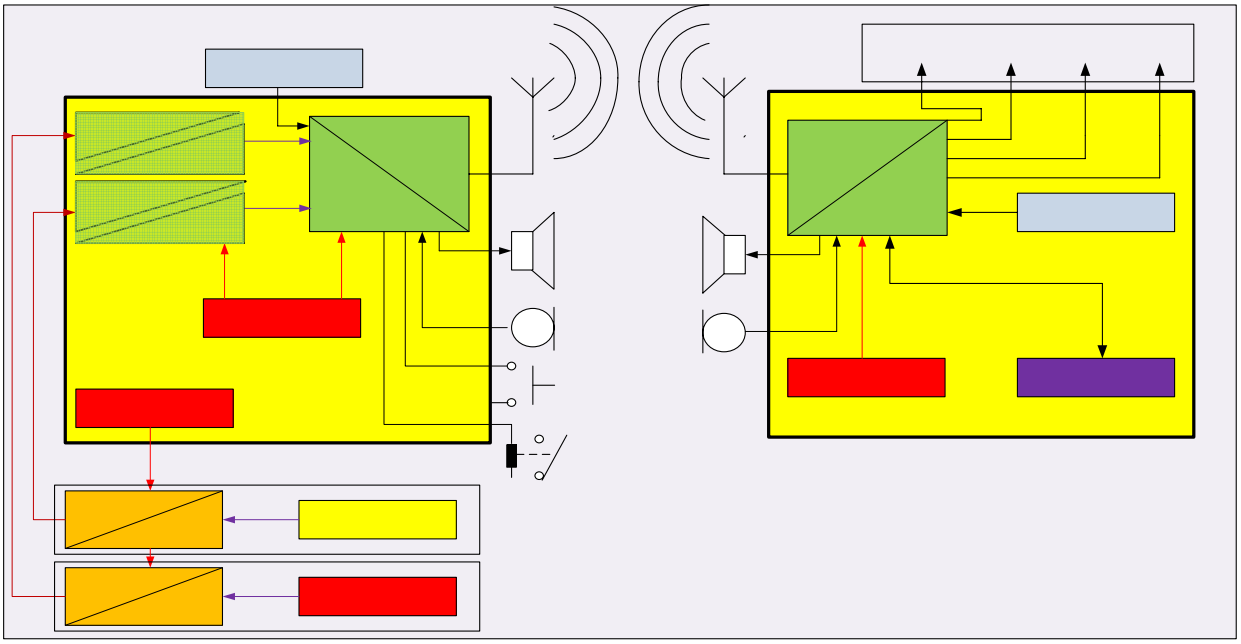

Fig. 2 Block diagram of Security and Administering System

Light Detector:

- U/I – Voltage to Current Converter, has the function of a transmitter.

IR Detector:

- IR Sensor – transmits to the U/I block information about the variations of IR radiation (movement);
- U/I – Voltage to Current Converter, has the function of a transmitter.

Main System:

- RF/μC – is the block which processes the information from the Secondary System and the inside Temperature Sensor and makes decisions upon the setting made trough the User Interface, setting the System Outputs;
- User Interface – allows users to select the operating mode of the entire system;
- Temperature Sensor – transmits to the RF/μC block information about inside temperature.
- System Outputs – represents the command signals of the system;
- Supply – is the block which gives the necessary voltages for correct functioning of the system.

3. FUNCTIONING PRINCIPLES

The information from the output of Light Sensor or IR Sensor is converted in current with the U/I converter and sent on a maximum distance of 500 meters on cable to the I/U converter of the Secondary System which realize the reverse conversion of the received information (see Fig. 3).

In the Main System, μC collects the information from the inside Temperature Sensor and from The Secondary System trough the RF interface. Based on the settings made trough the User Interface the μC realizes the processing of all information collected by this system, makes decision and generates the System Outputs.

This system allows users to set:

- the level of light intensity at which the system commands the Outside Light Up;
- the minimum inside temperature at which the system commands the Boiler;
- the maximum inside temperature at which the system commands the Air Conditioned;
- the type of Bell sound;
- the state of the alarm system.

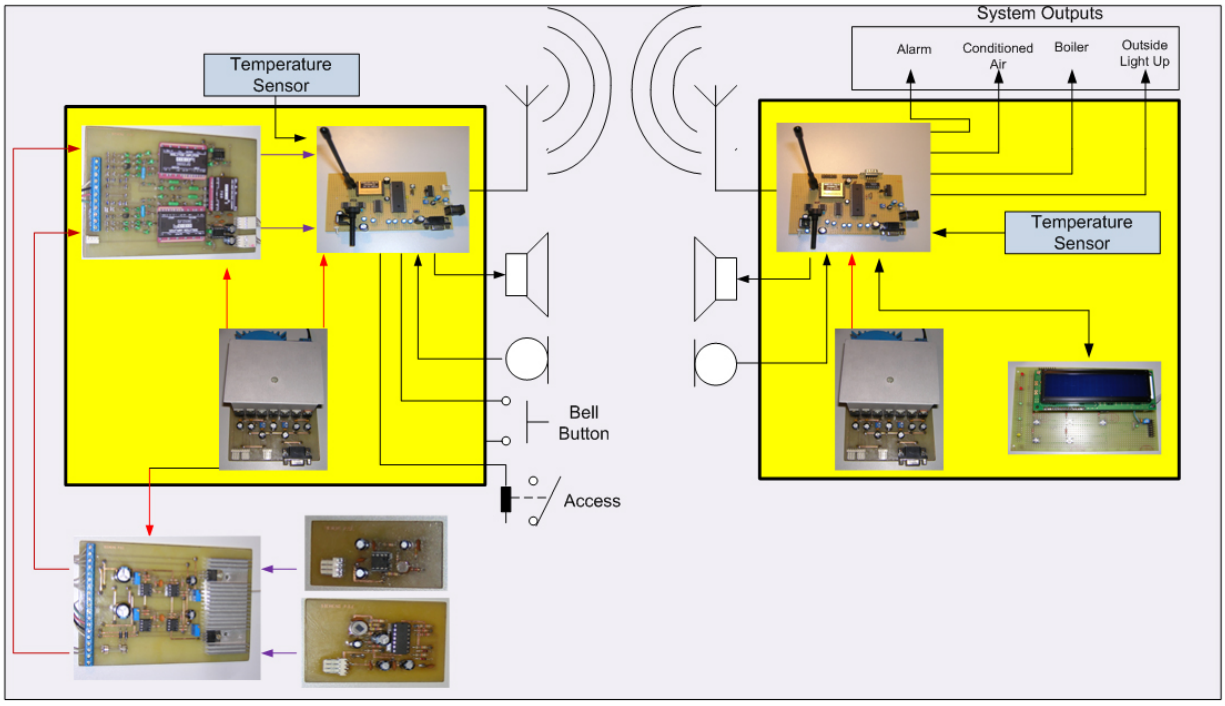

Fig. 3 Prototype connection diagram of Security and Administering System

The Secondary System and the Main System are both using a microcontroller from PIC18 family.

The RF interface uses Bim2-433-160-5V transceivers, which offers greater transmit power, higher data rates, greatly improved receiver interference rejection and a lower profile. The module is ideal for enabling bidirectional wireless connectivity in battery powered or handheld applications.

4. CONCLUSIONS

The system is realized to offer security and comfort to the inhabitants of a building.

Security signifies that is important to the inhabitants to know if a person who is not welcomed enters on their property.

Comfort refers to the personalized settings made by the user for monitoring the inside temperature and maintain the wanted temperature, turning on the outside light up if the light intensity drops under the wanted level.

An important benefit is the use of radio waves instead of cables between the main subsystems (Main System and Secondary System).

Another important benefit is the reduced cost, the installation of system without difficulty and the modularity of the system.

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