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Design of Sensor Module for Better Energy Saving

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Abstract -This project presents a new methodology for intelligent energy-saving system. Thegoal of real energy-saving is to be done from the view-point of system-orient strategy instead of materials. In this system design, temperature value, humidity value, CO density level, andpower level are to be sensed. In addition to design backend intelligent agent technology, the feedback control system through hybrid net-work of ZigBee technology has been added which would sensor the running parameters and environment factors of energy-aving system. The energy-saving system would collect all the running parameters in the energy- consumption system such as room, house, office, factory, community, or any space.

Keywords: *Energy saving, Wireless sensor networks, ZigBee.*

I. INTRODUCTION

Wireless sensor networks provide a new way of working for applications such as indoor monitoring, security or robotics. A wireless sensor network (WSN) generally consists of a base station (or "gateway") that can communicate with a number of wireless sensors via a radio link. Data is collected at the wireless sensor node, compressed, and transmitted to the gateway directly or, if required, uses other wireless. The transmitted Sensor networks have been identified as one of the most promising technologies for the future, mainly due to the wide range of real-world applications that have already been identified for this technology. WSNs have the ability to sample, coordinate and actuate at time scales and network dimensions not previously possible. Various sensors or sensor networks are generally utilized to recognize the user's state and surroundings. The potential benefits of these networks are simple deployment, low installation cost, lack of cabling and high mobility. The introduction of strategies for the reduction of energy consumption have been stimulated by the urgent need to improve production efficiency, while residential users have a low awareness of the problem and usually lack of tools for measuring and optimizing the energy consumption of their daily activities. This project has been motivated by the aim of effectively designing and deploying WSNs for monitoring environmental indoor conditions, such as the temperature and humidity in an office space.

In this system design included sensors of temperature, humidity, luminance, CO2, and power detection addition to designing backend intelligent agent technology to quickly response to the feedback control system through hybrid net-work of ZigBee and Bluetooth technology which would sensor the running parameters environment factors of energy-saving system. The potential benefits if these networks are simple deployment, low installation cost, lack of cabling and high mobility.

II. LITERATURE REVIEW AND RELATED WORKS

The development of wireless communication technique was proceeding faster and faster nowadays more and more wireless sensor networks were implemented in daily life such as environmental monitoring and controlling, automation in home-appliance, biomedical technologies, traffic control system [4]. The initialization of development for wireless sensor networks was first applied in the monitoring assignments in the battle fields [3]. The spec and standard of ZigBee, which is the most popular and important wireless sensor networks, was broadly used in many intelligent systems. Therefore, we used ZigBee in our wireless control and monitoring system on account of its lower cost, less power consumption, longer communication distance, and higher reliability [5].While the IEEE 802.15.4/Zigbee protocol stack is being considered as a promising technology for low-cost low power Wireless Sensor Networks (WSNs), several issues in their specifications are still open. One of those ambiguous issues is how to build a synchronized cluster-tree network, which is quite suitable for ensuring QoS support in WSNs [2].Applications of WSN are Military applications, Eco system monitoring applications, Industry monitoring system, Detecting cracks in bridges, Automation in home appliance, Biomedical technologies, Traffic control system.Reinforcement of energy saving is required for home appliances in order to observe the regulations. Thus, energy saved appliances have been developed and supplied to market. However, there is no interlocking control between each appliance. It is effective to introduce home energy management system into a home in order to realize further more energy saving[1].

III. SYSTEM ARCHITECTURE

In this design, a system that can minimize energy waste in home environments efficiently managing devices in the operating modes. In our architecture we use a wireless sensor network to monitor physical parameters like light and temperature as well as the presence of users at home and in each of its rooms.

1.TEMPERATURE SENSOR:

A thermistor is a type of resistor used to measure temperature changes, relying on the change in its resistance with changing temperature. Thermistor is a combination of the words thermal and resistor.

$$\Delta R=K\Delta T,$$

Where ΔR = change in resistance, ΔT = change in temperature, k = first-order temperature coefficient of resistance If the temperature was higher than 28°C, then the cooling function would be turned on. As for central control air-conditioning with cool-water machines, which consumption the most electricity power, we could use time-interval method and temperature sensor to take turns turning off some cool-water machines with certain period so as to achieve the attempt to save energy. In addition, we learned that to save the electrical energy we must handle all running parameters and the environmental factors such as the number of people, temperature, humidity, luminance, quality of air in the living space and probably adjust all the parameters dynamically, for example, if the temperature in the living space were lower than 28°C, the air conditioner would keep closed, and if there were none in the space all the facilities ought not be opened.

2.HUMIDITY MEASUREMENT:

Humidity means that the moisture of air. The temperature and humidity are inter related. If temperature is decreased, the humidity automatically rise. In general, the maximum humidity value is 90.So the temperature will be directly subtracted from 90. Hence

Humidity value = 90- Temperature

Basically, PIC simulator is having only one special register but it has 8 channels. So within a single LCD module, we can show 8 different parameters. The output voltage will be calculated by

$$\text{Voltage} = \frac{\text{Value}}{1023} * 5$$

3. CO2 DENSITY MEASUREMENT:

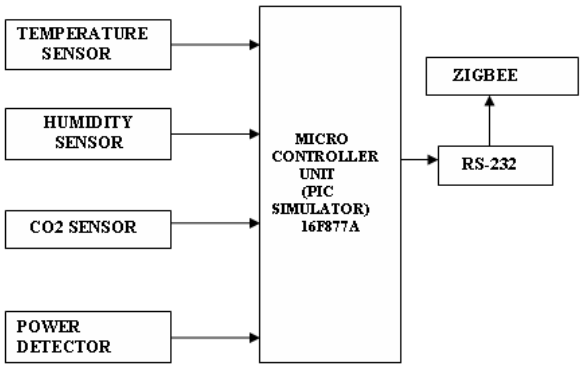

Figure 1: Block Diagram for Sensor Module Design

The CO2 density would decide whether the people inner the space were comfortable or not, if the density was over the standard and made people not feel well then the air conditioning would proceed to winding function rather than cooling to release the condition.

4. MANAGEMENT OF POWER SYSTEM:

Every power consumption home-appliance or facility in a certain space ought to be detected its used power by the system in order to avoid over-loading of power. To accurately and real-time know how much power consumption of the house or certain space, we designed smart outlets as power node on every home-appliance and facility, the outlet would display the real-time power and power factor itself, and sent the data dynamically to the server through ZigBee network, so the server would calculate the total power consumption to decide what kind of high power consumption facility should be turned off to let power consumption maintain under the overloading margin as well as proceed to deal with the low power factor, all this action was automatically performed by the intelligent agent built in the server in advance, and the feedback-control was also judged and controlled by server.

IV. SIMULATION RESULTS

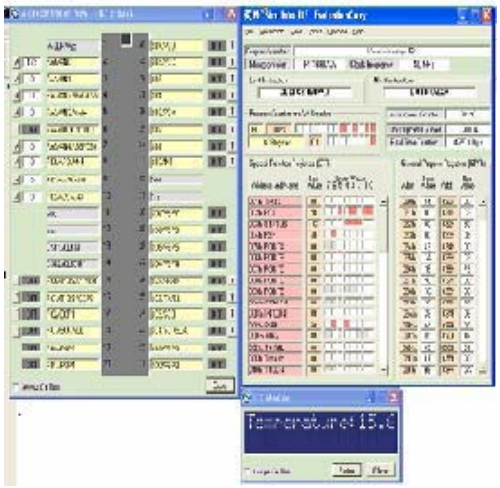

Figure 2:Result for Temperature

The required temperature value had been evaluated through ADC value.

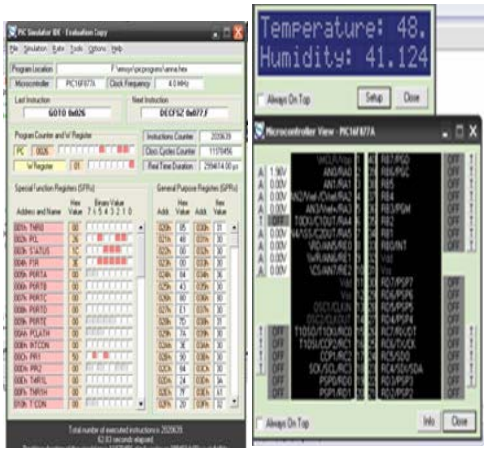

Figure 3: Simulated Result for Humidity

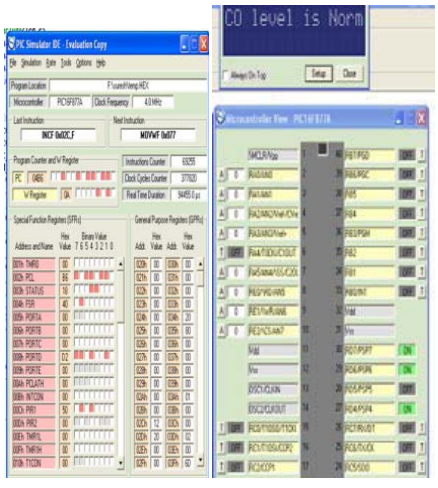

Figure 4: CO2 Density Measurement for Air Conditioning Management

V. CONCLUSION

The running parameters such as temperature, humidity, CO density of electrical facilities were sensed in order to have control over power consumption. These sensed parameters are transmitted to the server through ZigBee protocol. The server calculated the running parameters and accordingly it was decided whether to turn on and turn off the devices by an inbuilt intelligent agent. The automatic corrections were signaled to the device by server feedback control and thus control over power consumption.

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