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An Innovative Method For Smart Energy Saving Using Embedded System

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ABSTRACT

An innovative method for effective energy saving using embedded system is proposed to increase energy conservation mainly in residential area. Through this method it is possible to save 10-20% of energy in our daily usage of power. In this paper the sensor network is framed which include sensors of Co_2, Temperature, Humidity, LDR. Electrical equipment such as Fan, Light, AC are controlled manually or automatically by a key which is based on room capacity and number of people. These equipment are mainly operated based on RFID technique, In future it would be implemented in smart grid, real time electricity price etc.,

I INTRODUCTION

Availability of power is one of the biggest inputs necessary for the sustained growth of any economy. Currently, India needs to double its generation capacity over the next decade or so to meet the potential demand. The electricity generation target for the year 2012-13 has ben fixed at 930 BU. The target for power capacity addition during the 12th Plan period is 88,000 Mw. With about 60,000 Mw under execution, this 88 Gw should be achieved after hitting 55 Gw in the 11th Plan. The Environment Protection Department of Administration Ministry of Taiwan has proposed the project to enforce the energy-saving and reduce carbon pollution as well as develop green industry in 2011, in which the goal of the project was to diffusion amount of CO2 could get the standard of 2005 all over the country.The efficiency of energy consumption could upgrade more than 2%, the density of energy could decrease 12% in 2016 while 18.3% in 2020. If all the people could really get to energy-saving in power system, luminance, air-condition, and affair machine, the total energy-saving could get to 20%.

II THE PURPOSE OF THE STUDY

Energy-saving and carbon reduction becomes the global issue for saving the earth. Since people often forget to turn off the electrical facilities with carelessness, so the effect of passive to remind people for energy-saving was limited, but if we constructed automotive and active monitoring mechanism to proceed to energy management, the effect of energy-saving would be much better . The detecting of running parameters of the energy-saving system was affected by design cost and efficiency, which includes power, power factor, voltage, current, harmonic. The space parameters include classification of facilities, number of people, temperature, CO2, humidity, luminance, the position of people etc.

The detected signals easily disturbed by obstacles in traditional design of communication mechanism such as when transmitting data with ultra-red sensors, if we used cable communication RS-422, the layout would be complex, if we used power line carry (PLC), its communication would be effective at primary side with ether-net equipment . In this paper we used Zigbee RFID, web-meter, embedded system to construct all-purposed, active, and module-design intelligent energy-saving system, combining with intelligent technique in servo-end and power-managed database as one optima mechanism of electricity power manage system . We would construct and demonstrate the whole energy-saving platform as well as provide related techniques for industrial manufacturers.

III
BLOCKDIAGRAM

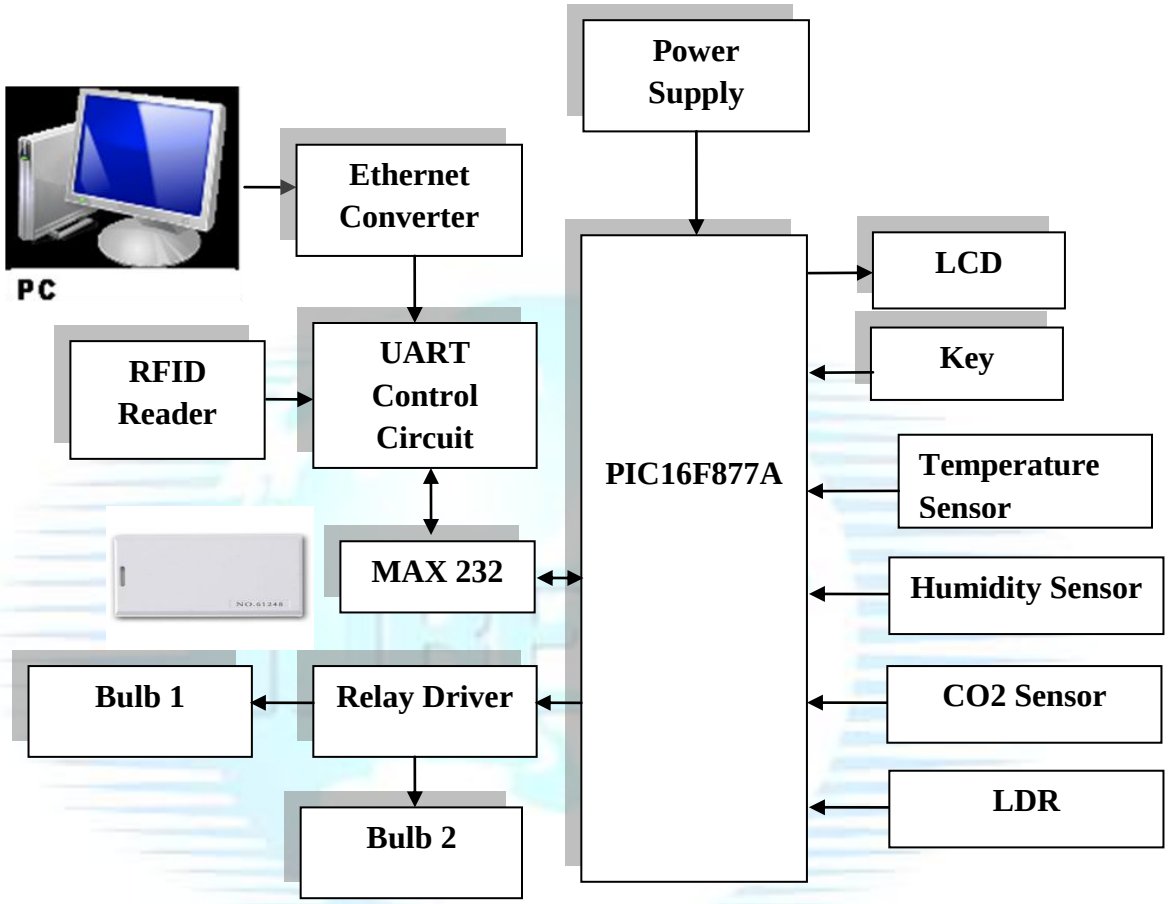


Figure 1:Block diagram

IV DESIGN METHODS

A. The introduction of embedded system PXA300

In this paper the middle-way adopted embedded system PXA300-Splatform as shown in The hardware of PXA300 includes CPU, FLASH ROM, DDR-SDRAM, CPLD kernel, peripheral interfaces. MCU PXA300 was developed by MARVELL with Intel X-scale techniques, in which dynamic voltage and frequency regulator and mature power management, resource, memory, interrupt to control the whole operating system. With single 5(V) external voltage, the whole system could work in additional 3500mA/h Li-cell to work more than 3 hours, and support both power supply and USB charge.

B. ZigBee technique

In this paper we used XBee-PRO Series2 wireless sensor network with low power consumption and long distance transmitting features produced by zigbee. In this study the monitor system was composed of many wireless sensor net works, so we adopted star topology and the sensor information was transmitted to the servo-end through SOC middle-way coordinator. If the transmitting distance couldn't reach the subject, then we used router as the information media, and the topology might change mesh topology or tree topology so as to upgrade the communication efficiency, and that function must set

the X-Bee module with certain software so as to construct the wireless communication system.

V SYSTEM STRUCTURE

A. Intelligent energy-saving system

The fetched running parameters of active intelligent energy-saving system was transmitted from End-device, which has one X-Bee module responsible for delivering the detected parameters to the middle-way, and then the middle-way would send the parameters to the servo-end computer. The communication and its protocols were constructed by wireless platform including the standard interface of the SOC middle-way, and the running parameters included Co2, temperature, luminance, humidity, RFID human detecting system, smart web-meter (outlet) six sensor modules all included X-Bee modules embedded in the end-device interface. After the servo-end computer receiving the related parameters from middle-way, then the intelligent agent software would judge the space condition and then give orders (control codes) to the middle-way to feedback control the power consumption facilities.

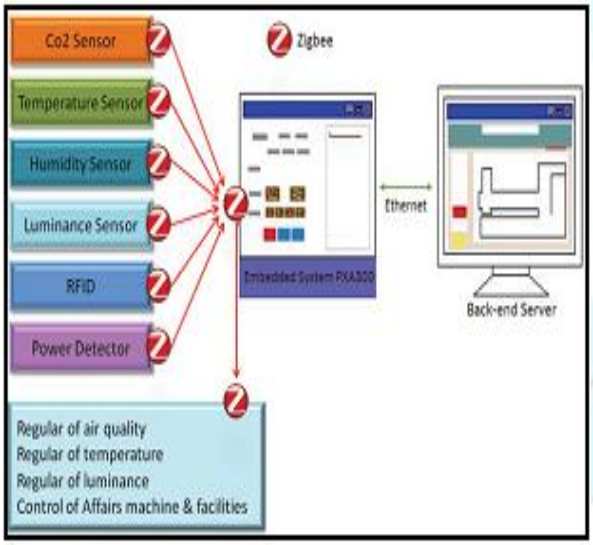


Figure 2. System structure of intelligent energy-saving

VI SIMULATION

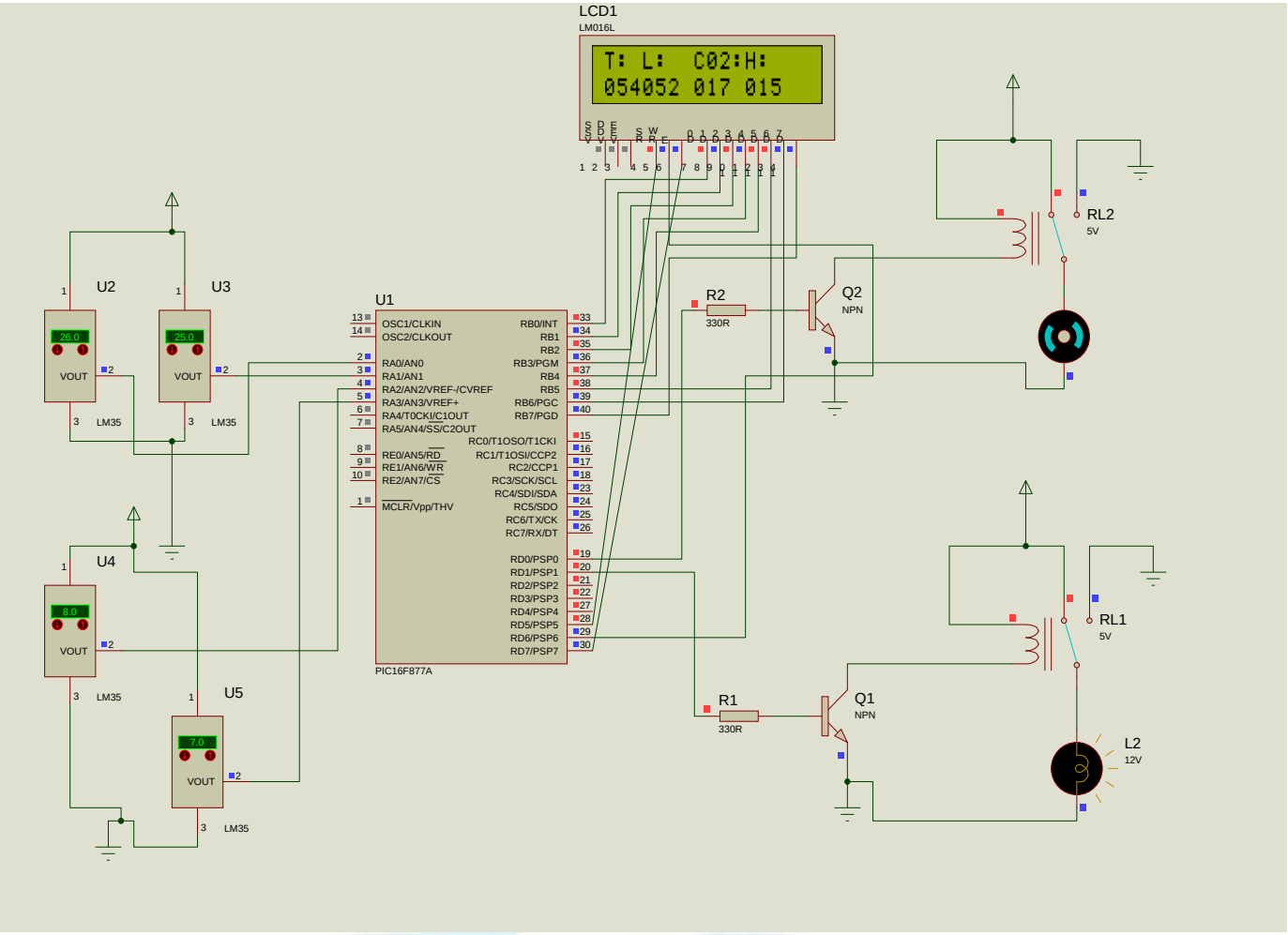
(1) ZigBee wireless communication and its interface ZigBee wireless communication and its interface mainly planed the long distance wireless communication, MCU was responsible for collecting the power running parameters of facilities, persons, environment, instruments, and transmitted to the middle-way (as the control center of the certain space), which would send the information to the servo-end computer so as to carry out the intelligent energy-saving operation as well as feedback control.

(2) RS-485 cable communication To insure the accuracy and stability of the communication system, the system designed a cable communication RS-485 and auto-switching function.

(3) I^2Cinner sensor module integrated interface I^2C inner sensor module integrated interface was designed an integrated interface to link all the sensor modules into all-in-one single micro-control system to simplify the control interface.

(4) The power factor transfer interface of power system The power factor transfer interface of power system was designed for power factor and harmonics and transfer into real control icons in the control interface screen.

(5) RFID recognition interface(stuffs and facilities recognition) As for the number of the person or facility in the space, we designed RFID recognition system as one important parameter to carry out the operating action.



This research has practically layout the exhibition center of intelligent energy-saving in E108A Lab. In this paper we adopted SOC embedded techniques and combined WI-MAX and Zigbee integrated into one middle-way system in the intelligent energy-saving system. Because the power consumption of SOC embedded system was much lower and the screen could switch into power-saved mode when none was using the system by software setting, the SOC middle-way was properly used in the intelligent energy-saving system.

Figure 4. Switching into manual control mode

In the future we hope this intelligent system could be implemented into smart-grid and through remote application software to achieve remote meters

reading, self- diagnosis, real-time electricity price, detecting or confirm whether the power is off-line of users, voltage and null-power detect, troubleshooting/isolation/recovery, smart home, and constructing loading records to proceed loading prediction.

VII ACKNOWLEDGEMENT

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