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WSN BASED DESIGN OF INTELLIGENT SMART HOME SYSTEM FOR POWER MANAGEMENT USING ZIGBEE

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Abstract-Smart home system using wireless sensor network technology enrich human life and helps to take care of the very old people easier who lives alone. The advances in the field of Wireless sensor network became very interesting & challenging area of Networks. It describes the design of a wireless sensor network based on ZigBee technology. It is mainly used for Monitoring & collecting Information from various sensors connected to various Home appliances. Same information can be processed through Microcontroller & then displayed in order to control various appliances depending on need. For communication we use algorithms which improves the Speed and efficiency of the system. Based on ZIGBEE technology a wireless remote and smart home security system has developed. A wireless remote system for smart home application is developed to analysis and detects the status of home equipment based on ZIGBEE technology. It consists of host control system and several sub function module and software. The host control system has a controller, ZIGBEE module and PIR sensor. The several sub function modules consists of the data acquisition module, centralized switch and ZIGBEE module.

I. EXISTING METHOD

While previous research and industrial works have shown that simple lighting controls using motion sensors, such as Passive infrared sensors (PIR) sensors, are effective at reducing the amount of electrical energy used for lighting buildings, advanced lighting control strategies have the potential to achieve even greater energy savings, better quality of service and offer many advantages over simple on/off controls. However, until present, advanced control strategies, such as dimming light according to the day lighting or load shedding, which require a more systems-oriented approach, have been less successful, and there are no wireless sensor networks to control and monitoring the operations. This is especially due to the high cost of installation and maintenance and the impossibility of retrofitting.

II. PROPOSED METHOD

On the technological side, Light Emitting Diode (LED) is rapidly becoming a commonly used solid-state light source technology in general lighting applications. With the advance of wireless sensor network (WSN) technology, it is now easier than ever to monitor and control houses, offices and industrial buildings. WSN is the backbone of a large variety of cyber-physical systems (CPS) applications in environmental monitoring, healthcare, security, and industrial domains, among others, due to the flexible distribution of WSN devices. Each device embodies a networked node that integrates computing, wireless communication, power management and sensing capability in order to collect and process data from sensors, generally collaborating to coordinate activities. WSN in combination with LED lights and novel drivers reduces the power consumption of the illumination in several application scenarios by several orders of magnitude. WSN has the potential to achieve a low cost and ultra-high power saving system. The novel driver can be controlled using distributed sensors in the environmental area to increase the quality of the control reducing the power consumption and increasing the quality of

the service. A methodology for deploying low power sensor networks to enhance the power consumption of intelligent buildings using novel, ultra-low power hardware architecture and smart distributed algorithm. It is directly control a LOAD and ELECTRICAL DEVICES with distributed intelligence and allowing retrofit is a novel Experimental validation of the proposed approach. The power consumption characterization of panels according to the dimming and the average energy reduction in a real-life, long-term deployment is presented.

III. BLOCK DIAGRAM OF TRANSMITTER SECTION

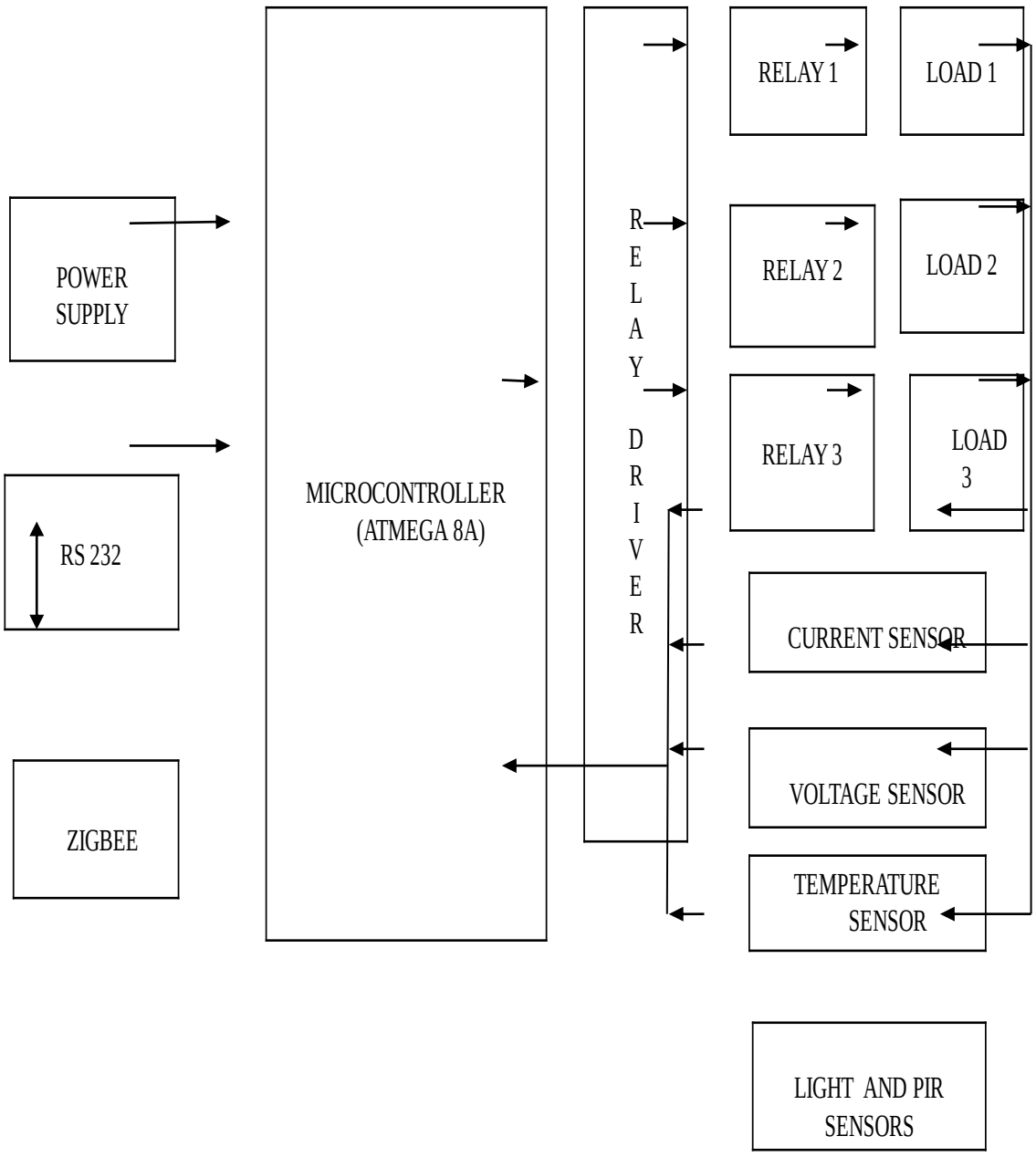

Figure: Block Diagram of Transmitter Section

IV. BLOCK DIAGRAM OF RECEIVER SECTION

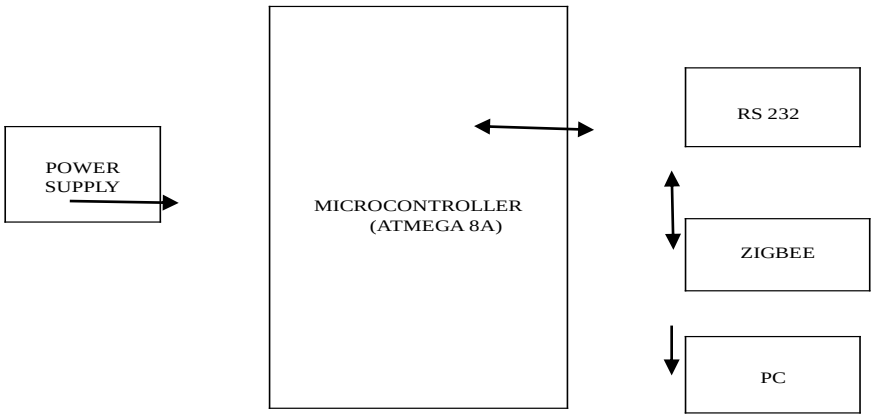

Figure: Block Diagram of Receiver Section

V. ALGORITHM OF HOST CONTROL SYSTEM

STEP1: Start
STEP2: Reset and initialization
STEP3: User gives the miscall to the host controller device for the identification of the User MSISDN number.
STEP4: The host control system accepts and stores the number of the user for future Acceptance and gives and message to the user number accepted.
STEP5: User sends the command for knowing the status of the home devices.
STEP6: Host control system sends the status of all the device or home appliances.
STEP7: User sends the OFF/ON command to the host control system after knowing the Status of the home appliance.
STEP8: Host control system accepts the command of user if yes the hosts control system Sends the command to the sub function system of that particular device.
STEP9: If no the host control system sends the message to the user that particular device Status.

VI. ALGORITHM OF SUB FUNCTION SYSTEM

STEP1: Start
STEP2: Reset and initialization
STEP3: Command is accepted from the host control system
STEP4: The host control finds the particular device chosen by the user to be controlled
STEP5: If yes the command is accepted and that task is done. If not the status of the device is sent to the user mobile.

VII. ADVANTAGES

- A methodology for deploying low power sensor networks to enhance the power consumption of LED lights using novel, ultra-low power hardware architecture and smart distributed algorithm. The

concept of using light sensors and WSN in LED control is not new, however using it to directly control a LED driver with distributed intelligence and allowing retrofit is a novel contribution.

- The power consumption characterization of panels according to the dimming and the average energy reduction in real-life, long-term deployment is presented.
- Reducing the power consumption and increasing the quality of the service .cost, wireless, easy to install, adaptable, and smart LED lighting system to automatically adjust the light intensity to save energy and maintaining user satisfaction.
- This is due to its longer lifetime, reduced power consumption, and having no poison mercury content compared with the conventional fluorescent lamps .In addition, dimming control is often needed to regulate lighting levels for individual, on/off, dimming, to color (or color temperature) change and scene setting, with intelligence to react to human mood and activity, and adapt to environments and scenarios.
- Recently, wireless sensor networks have been applied to energy conservation applications such as light control, goal was to adjust lights to minimize the total cost of energy supplied. However, the result was applied to entertainment and media production systems rather than to buildings.
- In light control using wireless sensors to reduce energy consumption in commercial buildings is introduced. In these previous works, lighting devices are adjusted depending on ambient daylight intensity and/or motion sensors.
- This system assumes that the location of each user is known via a wireless sensor that is carried by each user that also detects local light intensity.
- In a smart lighting system where the ambient light at the user's location is controlled in real-time to give users the best indoor light experience is proposed.

VIII. HARDWARE DESCRIPTION

➢ ATMEGA8L FEATURES

• High-performance, Low-power 8-bit Microcontroller Advanced RISC Architecture
– 130 Powerful Instructions – Most Single-clock Cycle Execution
– 32 x 8 General Purpose Working Registers
– Fully Static Operation
– Up to 16 MIPS Throughput at 16 MHz
– On-chip 2-cycle Multiplier
• High Endurance Non-volatile Memory segments
– 8K Bytes of In-System Self-programmable Flash program memory
– 512 Bytes EEPROM
– 1K Byte Internal SRAM
– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
– Data retention: 20 years at 85°C/100 years at 25°C(1)
– Optional Boot Code Section with Independent Lock Bits
• In-System Programming by On-chip Boot Program
• True Read-While-Write Operation
• Programming Lock for Software Security
• Peripheral Features
– Two 8-bit Timer/Counters with Separate Prescaler,one Compare Mode
– One 16-bit Timer/Counter with Separate Presale, Compare Mode
• Mode
– Real Time Counter with Separate Oscillator
– Three PWM Channels

– 8-channel ADC in TQFP and QFN/MLF package Eight Channels 10- bit Accuracy
- Accuracy

– Byte-oriented Two-wire Serial Interface
– Programmable Serial USART
– Master/Slave SPI Serial Interface
– Programmable Watchdog Timer with Separate On-chip Oscillator
– On-chip Analog Comparator
- Special Microcontroller Features

– Power-on Reset and Programmable Brown-out Detection
– Internal Calibrated RC Oscillator
- External and Internal Interrupt Sources

– Five Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, and Standby

I/O and Packages
– 23 Programmable I/O Lines
– 28-lead PDIP, 32-lead TQFP, and 32-pad QFN/MLF
- Operating Voltages

– 2.7 - 5.5V (ATmega8L)
– 4.5 - 5.5V (ATmega8)
- Speed Grades

– 0 - 8 MHz (ATmega8L)
– 0 - 16 MHz (ATmega8)
- Power Consumption at 4 Mhz, 3V, 25°C

– Active: 3.6 mA
– Idle Mode: 1.0 mA
– Power-down Mode: 0.5 µA

IX. ZIGBEE PROTOCOL

ZigBee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless M2M networks. The ZigBee standard operates on the IEEE 802.15.4 physical radio specification and operates in unlicensed bands including 2.4 GHz, 900 MHz and 868 MHz. The 802.15.4 specification upon which the ZigBee stack operates gained ratification by the Institute of Electrical and Electronics Engineers (IEEE) in 2003. The specification is a packet-based radio protocol intended for low-cost, battery-operated devices. The protocol allows devices to communicate in a variety of network topologies and can have battery life lasting several years. The ZigBee protocol has been created and ratified by member companies of the ZigBee Alliance. Over 300 leading semiconductor manufacturers, technology firms, OEMs and service companies comprise the ZigBee Alliance membership. The ZigBee protocol was designed to provide an easy-to-use wireless data solution characterized by secure, reliable wireless network architectures.

X. ZIGBEE ADVANTAGES

The ZigBee protocol is designed to communicate data through hostile RF environments that are common in commercial and industrial applications.

ZigBee protocol features include:

- Support for multiple network topologies such as point-to-point, point-to-multipoint and mesh networks

- Low duty cycle – provides long battery life

- Low latency
- Direct Sequence Spread Spectrum (DSSS)
- Up to 65,000 nodes per network
- 128-bit AES encryption for secure data connections

Development of the System in Different Electrical Appliances

Figure: Development of the System in Different Electrical Appliances

XI. CONCLUSION

Intelligent Energy Saving System is not limited for any particular application, it can be used anywhere in a process industries with little modifications in software coding according to the requirements. This concept not only ensures that our work will be usable in the future but also provides the flexibility to adapt and extend, as needs change. In my work we have studied and implemented a complete working model using a ATMEGA8 microcontroller. The programming and interfering of ATMEGA8 microcontroller has been mastered during the implementation. This work includes the study of energy saving system in many applications. Thus, the real-time monitoring of the electrical appliances can be viewed through a website. The system can be extended for monitoring the whole intelligent building. We aim to determine the areas of daily peak hours of electricity usage levels and come with a solution by which we can lower the consumption and enhance better utilization of already limited resources during peak hours. The sensor networks are programmed with various user interfaces suitable for users of varying ability and for expert users such that the system can be maintained easily and interacted with very simply. This study also aims to assess consumer's response toward perceptions of smart grid technologies, their advantages and disadvantages, possible concerns, and overall perceived utility. The developed system is robust and flexible in operation. For the last three months, the system was able to perform the remote monitoring and control of appliances effectively. Local and remote user interfaces are easy to handle by a novice consumer and are efficient in handling the operations. In future, the system will be integrated with co-systems like smart home inhabitant behavior recognitions systems to determine the wellness of the inhabitant in terms of energy consumption.

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