HOME AUTOMATION SYSTEM USING WIRELESS SENSOR NETWORKS

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Abstract—The purpose of home automation system using wireless sensor networks are to monitor, control the parameters like voltage, current and temperature. The main objective is to reduce the unnecessary energy consumption of a smart home. It helps to improve the performance of control network. Visual Basic is used to monitor and control the various parameters and produces the corresponding graphical representation. The Smart home system consists of controller, system server, switches, wireless transceiver, sensors and other major part. The wireless sensor is used to monitor and control the devices upto 100m. In this study input is fed as BCD code into the DALI for monitoring and controlling the device performance.

Index Terms— DALI, Microcontroller, PID Controller, Smart Homes, Wireless Sensor.

I. INTRODUCTION

Many studies have shown that home automation or intelligent buildings can use energy more efficiently than traditional buildings. Thus, several researchers have advocated building home automation for reducing energy consumption. Almost proposed smart home architectures in the literature adopt the WSN (Wireless Sensor Network) [1] as the dominant technology The WSN, rather than Wi-Fi, has been popularly employed for remote control and monitoring applications because it has a low cost and consumes little power.

Human beings are distinguished from other creatures for their superior capabilities of decision-making, and needs sufficient knowledge and information about the subject and its environment. For an automated or complex system, various sensors for reducing energy consumption [2] and are applied to acquire data from objects and their surrounding environments. Sensors are the devices that can replace or extend human being’s physical senses of sight, hearing, taste, smell, and touch. Application of wireless sensor network has been proven to be more flexible and advantageous in the domains such as home automation, building automation, healthcare etc. A wireless sensor network [3] consists of spatially distributed autonomous sensors to monitor and control the parameters that includes temperature, voltage and current .

Smart home can be known as “automated home” as it includes control of devices and also for surveillance purposes.

Home automation system required for,

• People with movement disabilities
• Older persons
• People with low vision
• Hearing impaired people
• Cognitively impaired people
• General population

One of the main purposes of smart homes is to reduce energy consumption. To achieve this goal, smart controls must be implemented in a home automation. Additionally, smart lighting control systems must consider the contribution of natural light (daylight). Therefore, several works suggested that daylight can substitute for partial electrical lighting in commercial or institutional buildings. Sensors and smart controllers enable daylight to reduce the power used to run electrical lighting [4], monitoring and to sufficiently illuminate an office. Although many ideas about smart lighting control for energy saving in smart homes have been proposed, a smart lighting control system with high reliability and control accuracy remains to be found.

The main purposes of the proposed design are to extend the coverage of a smart home control network and mitigate the impact of wireless interference for home automation system [5] on the WSN data gathering subsystem. Wireless sensor network is composed of a large amount of miniature self-organizing wireless sensor nodes. By combining two kinds of technology such as sensor, and wireless communication, WSN [6] can detect, collect and deal with the object information in its surrounding area and sends data to the user.

The WSN has been popularly employed for remote control and monitoring applications because it has low cost and consumes low power. WSN in smart home management [3] Comprises of distributed independent devices which has critical applications such as surveillance, military domains and intelligent transport systems. In WSN for smart home in [7] each node in the network is independent of the other nodes; they are battery powered small in size with attached sensors.

In this paper home automation control system using wireless sensor network has been developed for user convenience via visual basic application .hence it can be implemented without any user intervention. Thus, there is no difficulty to remotely monitor the smart home and control it in real time via the internet.

II. HOME AUTOMATION SYSTEM

Home automation system [8] has been around for more than a decade. The main concept is to form a
network connecting the electrical and electronic appliances in a house. This is a growing technology, which has changed the way of people live.

PIC16F877/A has many applications and used in variety of appliances like industrial instruments, automotive industries, remote sensors, controlling home appliances. It is significant for battery supply devices as well as smart cards due to its low consumption. EEPROM is a memory storage device; the datas can be permanently stored for transmission at both sending and receiving ends. PIC16F877/A has been used in wide areas because of low cost, flexibility, low consumption, easy handling and where the microcontrollers had not previously been considered.

B. Wireless Sensor Network (WSN)

Sensing the occupancy in smart building enables adjustment of services such as light and temperature control in an energy-efficient fashion based on the number and location of the occupants as well as the type of event. In military applications Wireless sensor are mainly used in battlefield surveillance and have wide applications in various sectors including industrial monitoring and controlling, consumer applications, machine health monitoring.

The biggest success of wireless sensor network has been used in smart meters. Now meter reading has been sent the datas wirelessly and it helps to communicate automatically with smart home management [14].

Wireless sensor network can be used effectively in the following:
- Building Automation
- Radio Technology

It can also be used for monitoring device in home, traffic, equipments in hospital. The wireless sensor replaces many wired connections and it also reduces the size and cost.

A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning “ motes” of genuine microscopic dimension have yet to be created. It constraints on sensor nodes result in corresponding resources for communications bandwidth, energy and memory computational speed. The new technology of wireless sensor network has brought a new level of building monitoring [15] systems by saving the cost and time of implementation and maintenance, providing more safety. In recent times WSN control and monitoring system for smart home lightening [4] are gaining popularity in various application domains like, Health care monitoring. Many organizations are developing a proprietary technology to implement a WSN to provide a wide range access to WSN from remote location.

In the proposed architecture, WSNs are responsible for collecting environmental parameters and transmitting them to WSN coordinators. Home automation system integration enables the WSN for data transmission with high reliability. Hence we use a wireless sensor network for monitoring and controlling the smart home systems.

III.DALI

A Digitally Addressable Lighting Interface (DALI) network consists of a controller and one or more lighting devices that have DALI interfaces. Using bidirectional data exchange the building automation of DALI [13] controller used for controlling and monitoring light. For individual addressing the DALI protocol allows various devices. Unique static address is initialised for each devices in standalone system [upto 64 devices] from numeric range 0 to 63.
At a data transfer rate of 1200 bits/s, the data’s can be transmitted between devices and controllers by means of half-duplex and asynchronous over a two-wire differential bus. The configuration datas of DALI devices have been stored in EEPROM. RAM is considered as the significant storage memory in accordance with EEPROM which helps to minimize the EEPROM writes and their life spans.

DALI permits the devices of various manufacturers to get connected together. The main aim of DALI is to achieve the similar control functionality, for that it needs less complex networks. Communication via radio frequency communications and several technologies can be implemented using wireless extensions.

The systems such as heating ventilation and air-conditioning (HVAC), security systems are hence included along with lighting system to extend the capability of DALI. In DALI master control sections where digital address generation and transmission takes place and a slave section where the DALI address comparison and device control section lies.

For lighting control sensors with DALI are used for on-off purpose. The lighting devices are controlled from one section to other section by using DALI. It has primarily been designed for convenient control of the lighting inside the enclosed spaces. The key focus is on straight forward operation of the light along with all associated components without any complications.

DALI electronic ballasts can be associated with several groups at the same time .Here there is no need for group wiring .Every electronic ballasts within the DALI system can be addressed digitally and individually . As a result DALI systems call for significantly fewer components than comparable 1-10V systems . DALI electronic ballasts easily out strip the capabilities of the 1-10V interface in their functionality by supporting status feedback from every ballasts.

DALI medical lighting consists of interchangeable components. This helps for perfect lighting solution for relevant technical factors. In addition to general lighting reading lamp , examination lamps can also be provided as an integral part of solution. DALI , not only does the room lighting system but also it provides intensive lighting .DALI can able to meet the increasing demands for a homely and comfortable atmosphere .

When the input to the sensor is high the digital address of the lights is sensed and controlled by the DALI board .This is upon the reception of particular digital address of lighting device send by the wireless transceiver.

IV. VISUAL BASIC

Visual Basic is a programming language developed and owned by Microsoft. It allows the programmer to create and learn applications using the components of visual basic programs itself. It includes graphical user interface applications which enables for RAD(Rapid Application Development).It also includes modification of the preselected sections in BASIC programming language.

Visual Basic is easily the most widely used computer programming system in the history of software. This was possible because VB included software tools to automatically create the detailed programming needed by Windows. The software tools not only create Windows programs ,they also take full advantage of the graphical way that Windows works by letting program is “draw” their systems with a mouse on the computer. Hence it is called “Visual” Basic.

Visual Basic also provides complete software architecture.”Architecture” is the way of building of computer programs that includes VB programs and Windows. For Windows software it includes each and every thing to write the programs and it is the main reason to be more successful.

There have been nine versions of Visual Basic upto VB.NET 2005; current version .The first six versions were called Visual Basic and also “backward compatible”. That means the later versions of VB could handle programs written with an .NET Versions.

The Visual Basic program also includes IDE(Integrated Development Environment)helps us to create virtually intellectual programs that can be used by all
Many programmers still prefer Visual Basic 6.0 and a few use even earlier versions. Here the Visual Basic software is used as a web based front end that is fully functional working program in an executable form as well as complete source code of all work done. It performs based on the information they have went on. The program also allows the users to print off the proposal documents. Users can also retrieve the data they have entered.

VB front end to generate excel spreadsheet to enter request number, location, date. Then save the spreadsheet to send back to purchasing. Highly skilled open source front and back end, developer to build and maintain a best poke recovery.

MS access front end program to access multiple data basis of same type. Main program is for accounting in a property management firm and this can be facilitate by the front end. front end can be created for two applications.VB6 is front end is most commonly used software nowadays.

A. IDE [Integrated Development Environment]

IDE is the term commonly used in the programming world to describe the interface and event that we use to create our application. It is called integrated because we can access virtually all of the development tools that we need from one screen called an interface.

The virtual basic IDE is made up of a number of components.

- Menu bar
- Tool bar
- Project explorer
- Properties window
- From layout widow
- Toolbox
- Form designer
- Object browser

Visual basic is an third generation event driven programming language. Visual Basic applications enables user defined functions, automatic processes and accessing windows.

The applications developed by the VB can run in the windows operating system. The following steps are the basics for developing programs in VB:

- Appearance of the applications are to be designed.
- Property settings should be assigned to the objects of the program.
- At runtime, code should be written as direct specific tasks.

The applications of Visual Basic are

- Medicine
- Education
- Research
- Business
- Commerce
- Finance
- Accounting
- Consulting
- Science
- Law

No doubt that the Visual Basic software will kick start the future applications. Hence, the VB programs are written to give the input and also for receiving the output in controlling the lighting devices used in smart home.

V. CONCLUSION

Home automation is a useful way of connecting your home through innovative technology using wireless sensor network gives us an “On-demand access to various system throughout the home ,it can provide cost savings and hence home automation with wireless sensor networks are more intelligent and energy efficient ,so it is used widely.

Home automation control system is also used for the communication purposes .It makes home networks more intelligent and energy efficient. In the proposed solution of existing homes or buildings, some installation costs may be induced. It simplifies the problem of setting up relay nodes in WSNs and increases the impact of wireless interference. It is also highly scalable and can be applied to intelligent buildings.

Only one smart server is enough for monitoring controlling hundreds devices such as lighting systems and home appliances in a home or a small building instead of using many smart servers.

Hence it is concluded that home automation control system using wireless sensor network is proposed to reduce the energy consumption and human efforts.

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