

CONFIGURABLE ZIGBEE BASED CONTROL SYSTEM IN SMART HOMES FOR PEOPLE WITH MULTIPLE DISABILITIES.

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Abstract : *These days, home appliances are mostly relying on wireless sensor networks and on single chip embedded technologies to build smart environment. There are many techniques available in the market, but they have designed without future needs and special needs of the people. This is implemented to control the electronic gadgets by disability people in smart home or environment by using advanced technology. This prototype model was designed, implemented and tested and this system is easy to use, affordable and compact.*

Index Terms - sensor ,Smart home ,electronic gadgets

I. INTRODUCTION

The control circuit is designed with 89C51/52 microcontroller; this chip belongs to Atmel family and offers many latest expectations. This is an 8-bit controller widely used for control systems. This microcontroller is the integration of a microprocessor having 4/8kb memory, 32 I/O lines, timers, ROM, etc. on a single chip. As this chip is having four ports, lot of electronic hard ware can be interfaced with this single chip. Its high-density non-volatile memory compatible with standard MCS-51 instruction set makes it a powerful controller that provides highly flexible and cost effective solution to control applications. Micro-controller works according to the program written in it. The program is written in such a way, so that the Micro controller can read and it can store the information received from the sensing circuit. Micro-controllers are "Embedded" inside some other device so that they can control the features or actions of the product. Another name for a micro-controller is "embedded controller". Micro-controllers are dedicated to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change. Micro-controllers are often low-power devices. Any device that uses micro controllers falls under the embedded system technology. A brief description about embedded systems is provided below.

Embedded system is a combination of software and hardware designed and programmed to perform one/more particular task(s). The hardware is designed for specific application and then software is embedded in this hardware to perform the task. Both software and hardware are dedicated to that particular application. The heart of the system is either processor or controller. Processor / controller may be general purpose or special purpose that controls whole system.

There may be more than one processor/controller if system is complex. It may be possible that there is one general purpose processor / controller and one or more special purpose processors / controllers. For example in 3G (or 4G) cell phones there is one general purpose processor that handles user commands, memory and display etc. And there are special purpose processors like DSP for voice communication and network management, display controller to generate real and reach images on color LCD screen. An embedded system is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

Nearly 99 per cent of the processors manufactured end up in embedded systems. Any microcomputer system requires memory to store a sequence of instructions making up a program, parallel port or serial port for communicating with an external system, timer / counter for control purposes like generating time delays, Baud rate for the serial port, apart from the controlling unit called the Central Processing Unit.

II. LITERATURE REVIEW

A large portion of the current keen home observing and control frameworks don't suit unique penniless clients to deal with their home apparatuses. The proposed framework comprises of utilitarian remote sensor hubs. be monitored continuously Integration of Bluetooth and Wi-Fi technology in Controlling home appliances can help and improve lifestyle of all user groups especially to the disabled and elderly people in term of safety and comfortable. The implementation of combined wired and wireless systems would be of most practical in designing a smart home system especially in cutting the systems installation cost for conventional home. The smart elderly home monitoring system (SEHMS) is divided into three different modules which are safety monitoring system, telehealth system and telecare system. The smart phone is then connected to the monitoring system by using the TCP/IP networking method via Wi-Fi. A graphical user interface (GUI) is developed as the monitoring system which exhibits the information gathered from the system. The GUI opens an option to the user to examine the fall as well as making the confirmation or cancellation. A remote panic button has also been tested and implemented in the same android based smartphone.

In addition, the monitoring system can also answer the call automatically after the emergency alarm has started. The SunSPOT development kit will be used to simulate smart home devices. In this paper, the functionalities of a digital home temperature reader, as well as light switches will be demonstrated on the SunSPOTs. Possibilities of remote access to the SunSPOTs can be breakdown into two alternatives that can be either through the Internet,[1]

cloud or through the GSM cloud. Appliance control subsystem enables the user to control home appliances remotely whereas the security alert subsystem provides the remote security monitoring. The system is capable enough to instruct user via SMS from a specific cell number to change the condition of the home appliance according to the uses, needs and requirements. The second aspect is that of security alert which is

achieved in a way that on the detection of intrusion the system allows automatic generation of SMS thus alerting the user against security risk. In addition, the monitoring system can also answer the call automatically after the emergency alarm has started.

This project will also not be a research or analytic based system to monitor human behavior. It will only provide ease of access to control house appliances and also monitor certain areas of the house. In terms of connection variant, this project proposed mixture of wired and wireless connection, where wired connection will run from the home appliances to the main control board while wireless connection will only exist in between the main control board and the UI platform, which is the phone or PC connected via Bluetooth.

Existing Smart Home Technologies Home based system automations can range from systems as simple as for heating, ventilation, and air conditioning, Lighting control, or Audio and Video distribution to multiple sources around the house, to more complicated systems such as for security (involving presence simulations, alarm triggering and medical alerts) and robotics for home care or home management. Smart home applications; or task automations in a general household can be grouped by their main functions such as,

- i) Alert and sensors – heat/smoke sensors, temperature sensors
- ii) Monitoring – Regular feed of sensor data i.e. heat, CCTV monitoring
- iii) Control – switching on/off appliances i.e. sprinklers, lightings
- iv) Intelligence and Logic – Movement tracking i.e. security appliances
- v) Telecare/telehealth – distress sensor, blood pressure monitoring

Current smart home devices are usually a customized hybrid of one or more of these applications for broader applications. Access to these applications can be generally grouped into 4 access types that are the hardwired type using bus line or power line based technology, as well as the wireless type utilizing radio, infra-red or Bluetooth technology. Future smart-home appliances are moving towards the wireless environment and hence the Bluetooth and radio spectrum will be widely used. It is to date, a rather new technology that needs to be further proven in terms of stability and security. Providers of this technology will have to take into accounts used frequency bands for current appliances such as Bluetooth, cordless phones or Wi-Fi routers to ensure devices are robust from interference. The use of radio frequencies such as at 2.4 GHz for wireless LAN and 8.643 MHz (Z-wave UK) enable the systems to be designed for high bandwidth data flow. Currently one of the existing issues that are associated to smart home applications are the fact that in a home with all sorts of automated application, there will be too many remote controls or monitoring terminal, if the user installed a range of proprietary applications from different providers.

There is also the fact that the access range to remotely control these devices are limited by either length of cables or wireless network coverage in a personal area network. It is a widely known fact that an important example of wireless technology application is the mobile phone technology. Mobility¹⁶ is now a lifestyle adopted by all walks of the society, where a United Nation survey has recently revealed that 60% of the world population has a mobile phone subscription. Taking into account a mobile phone's necessity in the majority of our society, this solution will attempt to transfer the functionalities of a smart home device's remote control to a mobile-phone, to achieve a truly remote access convenience. Enabling a single remote access to a single corresponding server in a smart home household will also resolve the issue on „too many control terminals“.

III. PROPOSED WORK

The model explained over here has the remote control unit is nothing but the transmitter unit through which the multiple disabilities persons can operate the electrical devices or voice announcements. The main components present in this unit are the MEMS module, ADC, clock generator, micro controller (89C51), Zigbee transmitter and power supply to all these components. Using a toggle switch, the dump and physically handicapped persons will be identified. Depending on the movement of the MEMS module in any of the four directions, the controller generates a unique 8 bit binary code which is fed to the Zigbee transmitter for modulation. The detailed explanation about the ZigbeeTarang module is provided.

Depending on the voltage variations obtained from the MEMS module the controller is designed to generate the data that is stored in RAM and it is delivered through output pin of the controller (transmitter). The output of the microcontroller is modulated within the ISM 2.4 - 2.4835 GHz frequency band with IEEE 802.15.4 baseband and transmits the binary data to space. Any digital data generated by the MEMS is transmitted as it is, once the MEMS is tilted in the transmitter, binary data is transmitted and according to that data, the receiving controller unit has to be programmed. The main function of the data transmitting section is to generate 8-bit binary code that is to be transmitted through Zigbee transmitter. The 8-bit binary code produced by the keyboard is fed to microcontroller, which functions as encoder; the data obtained from the keyboard is stored and it is converted into 8-bit information which is transmitted through amplified modulated input signal. Based on this code, the other micro controller used in the receiving module, which is designed as 8-bit code decoder, decodes this data and compares with the pre-defined program prepared in assembly language and operates the wheel chair.

The output of the (Encoder) microcontroller is fed to Zigbee transmitter, for radiating the pulsating energy into air. The function of a radio frequency (RF) transmitter is to modulate, up convert, and amplify signals for transmission into free space. An RF transmitter generally includes a modulator that modulates an input signal and radio frequency power amplifier that coupled to the modulator to amplify the modulated input signal. The radio frequency power amplifier is coupled to an antenna that transmits the amplified modulated input signal.

The data receiving module consist Zigbee receiver, microcontroller 89c52, voice chip, audio amplifier, speaker, relays with their driving circuits that are interfaced with the driving circuits as source of information at the receiving side.

The RF signal transmitted by the transmitter is detected and received by this section of the receiver. The Zigbee receiver receives the RF signal, which is in the frequency of 2.4 GHz. The receiver operates at 3.3 volts-DC, and has both linear and digital outputs and its tunable to match the frequency of the transmitter unit.

Depending on the tilting of the MEMS module from the remote, the data is modulated and transmitted by the transmitter, which will be demodulated by the receiver and is fed to the 89C52 micro controller. The controller decodes the data and takes the necessary action depending on the program written in it to operate the voice chip or control the electrical appliances.



Fig 1 . transmitter circuit

Fig 1 represents the transmitter circuit , it transmits the signal generated by MEMS.



Fig 2. Receiver circuit

The receiver circuit operates in the way the signal which is generated by MEMS in transmitter circuits .



Fig 3: circuit showing functioning of bulb



Fig 4: circuit showing functioning of plug point



Fig 5 :transmitter and receiver circuit for voice output

IV. CONCLUSION

The project work is designed and developed successfully. For the demonstration purpose, a prototype module is constructed; and the results are found to be satisfactory. Since it is a prototype module, a simple module is constructed, which can be used by two different disable individuals through remote.

While designing and developing this proto type module, we have consulted few experts, these professionals working at different organizations belongs to Hyderabad, helped us while building this module. Since it is a prototype module, much amount is not invested, the whole module is constructed with locally available components, and they are not up to the requirement. Some of the modifications must be carried out in design and is essential to make it as real working system.

This project revealed that building a relatively low cost, high precision controlled electrical gadgets which is aimed control through a remote. Presently the system utilizes the Zigbee remote technology with lesser transmitting power, there by the range is restricted to nearly less than 20 feet. Depending up on the equipment size, this range is enough. The range restriction is always essential for operating this kind of modules, as it cannot be operated from too long because good visibility is essential.

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