

AN IMPROVED WIRELESS SENSOR NETWORK BASED ON INTELLIGENT UNIVERSAL REMOTE CONTROL SYSTEM FOR HOME APPLIANCES

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Abstract: *Wireless Packet Data Networks, such as GPRS, hold great promise for applications that rely on machine to machine (M2M) communication. The rapidly advancing mobile communication technology and the decrease in costs make it possible to incorporate mobile technology into home automation systems. Based on an SMS/GPRS (Short Message Service/General Packet Radio Service) mobile cell module and a microcontroller, a home automation server can be established, Powerful microcontrollers are used as parts of most home and office appliances of today. Integrating web servers to these intelligent devices will aid in controlling them over the Internet and also in creating effective user interfaces in the form of web pages. This paper presents the development of AT modem driver, text based command processing software, output for an Atmel micro-controller to facilitate in sending and receiving data via the cell module. The proposed design is implemented using SMS (commonly known as text messages) and GPRS (Internet based protocol) as the main communication protocol. With numerous connected devices and appliances, the smart home is one of the representative fields of Internet of Things (IoT). As the complexity of devices/appliances increase, numerous buttons (sometimes dozens) are designed on the remote controller in home spaces even if several of them are seldom used. A user may be confused with the controller even if he or she only intends to perform a simple operation. This confusion also leads to a higher probability of mal-operations. In addition, conventional methods of communication between remote controllers and connected devices, such as extensible Markup Language (XML) messages, are usually bandwidth-consumptive. To address these problems, an intelligent universal remote control system for home appliances named Point-n-Press is proposed. Point-n-Press addresses the directionality feature, which enables easy and intuitive control by pointing to the target device to display the target's control interface on the screen of the remote controller. By leveraging the state dependencies of home device/appliance operations, only functional buttons that are relevant to the current context are utilized. Two real prototypes are implemented to verify the feasibility of the proposed scheme. The evaluation results show that Point-n-Press is a useful and suitable control scheme for IoT-based smart homes.*

Keywords: *LPC2148 development board, GPRS Modem, Cell Phone which can support JAVA Application,*

Intelligent appliances

I. INTRODUCTION

Internet of Things (IoT) [1] is a technology that connects all things and the Internet in smart spaces. By implementations of intelligence with sensing devices, IoT has been widely applied to different fields, such as smart homes [2], [3]. The application fields in smart homes [4] incorporate smartness into home areas for comfort, safety, security, healthcare, and energy conservation [5], [6]. The need for comfort and a convenient life are especially important in smart homes. Thus, home automation is one of the most essential and critical components for the IoT-based smart home technology. Home automation systems are used to control home devices or appliances in smart homes and provide automatic remote control inside or outside homes [7]. Nevertheless, although remote control provides convenience and ease of use, some major problems require consideration and improvement, such as how to provide an intuitive and user-friendly remote control scheme in IoT-based smart homes [8].

II. LITERATURE SURVEY

The project Assistive Housing was developed focusing on the elderly comfort, allowing home automation by using the television set and its regular remote control as an interface. The design strategy used to improve the legibility and accessibility of the home automation interface on the television screen was to use few and large graphical icons, with horizontal captions describing their function. The interaction is made through numbers as shortcuts avoiding navigation with keys. The idea of having a clean design, with few and large icons and the use of a consumer Electronics appliance that is already familiar to the user will be exploited in our work. In addition to the interface design, this work presents the solution to implement home automation and a sensor network to acquire context and to identify emergency situations. This project relies on power line communications. There are two other relevant projects to monitor elderly using sensor networks and integrating home automation, but they do not explore user interface design. In order to integrate this interface with a home automation system, a development board with an embedded microcontroller was used. The interconnection between the android and the automation system was made using a Bluetooth connection that is currently available in most android models. A

commercial Bluetooth module was used connected to the development board in order to execute the experiment.

III. PROPOSED SYSTEM

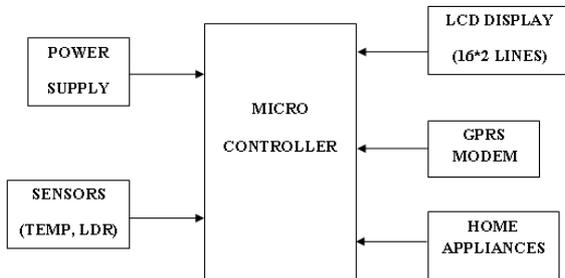


Fig.1. Block Diagram

IV. METHODOLOGY

Microcontroller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

LDR Sensor: LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. The animation opposite shows that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it. This is an example of a light sensor circuit: When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED lights on. The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive



Fig.2. LDR Sensor

Temperature Sensor: A thermistor is a type of resistor whose resistance is dependent on temperature. Thermistors are widely used as inrush current limiter, temperature sensors (NTC type typically), self-resetting over current protectors, and self-regulating heating elements. The TMP103 is a digital output temperature sensor in a four-ball wafer chip-scale package (WCSP). The TMP103 is capable of reading temperatures to a resolution of 1°C.



Fig.3. Temperature Sensor

GPRS: Global System for Mobile Communication (GSM) is a set of ETSI standards specifying the infrastructure for a digital cellular service. The network is structured into a number of discrete sections:

- Base Station Subsystem – the base stations and their controllers explained
- Network and Switching Subsystem – the part of the network most similar to a fixed network, sometimes just called the "core network"
- GPRS Core Network – the optional part which allows packet-based Internet connections
- Operations support system (OSS) – network maintenance

SM was intended to be a secure wireless system. It has considered the user authentication using a pre-shared key and challenge-response, and over-the-air encryption. However, GSM is vulnerable to different class of attacks, each of them aiming a different part of the network. GPRS (general packet radio service) is a packet-based data bearer service for wireless communication services that is delivered as a network overlay for GSM, CDMA and TDMA (ANSI-I36) networks. GPRS applies a packet radio principle to transfer user data packets in an efficient way between GSM mobile stations and external packet data networks. Packet switching is where data is split into packets that are transmitted separately and then reassembled at the receiving end. GPRS supports the world's leading packet-based Internet communication protocols, Internet protocol (IP) and X.25, a protocol that is used mainly in Europe. GPRS enables any

existing IP or X.25 application to operate over a GSM cellular connection. Cellular networks with GPRS capabilities are wireless extensions of the Internet and X.25 networks.



Fig.4. GPRS Module

V. RESULTS

The project is having the facility of getting the temperature value, light intensity and home appliances status at any time on the server. The Fig-7 shows the IP message page which is send by the customer to GSM/GPRS Modem which is connected to Microcontroller.

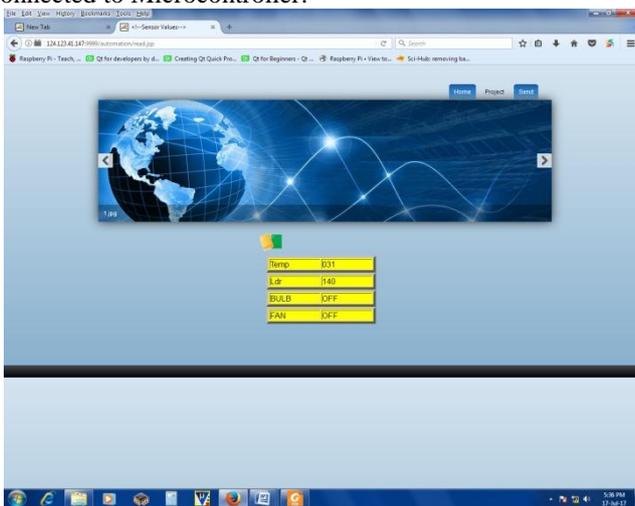


Fig.5. Sensor Data on Webpage



Fig.6. Appliances Status on Webpage

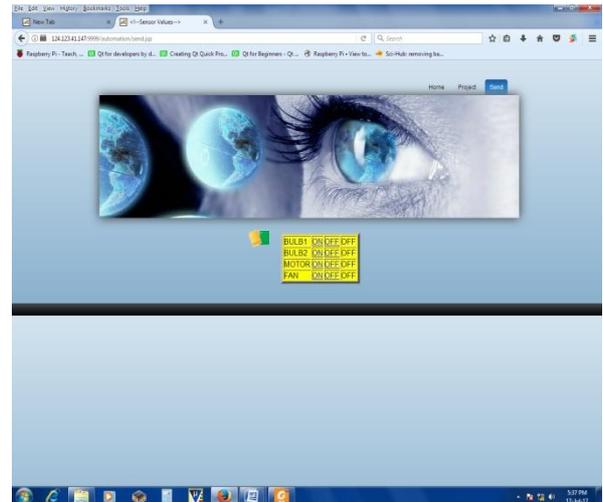


Fig.7. Control Webpage

VI. CONCLUSION

An intuitive control system with a set of user-friendly operations, called Point-n-Press, is proposed for controlling connected devices/appliances in IoT-based smart homes. The proposed scheme leverages the directionality characteristic of IR to enable easy and intuitive control of devices (i.e., controlling an appliance in smart homes by pointing to it). A user-friendly UI is designed by considering the state dependencies between each control operation. This paper demonstrates designing of embedded controlled sensor networks used for monitoring the environmental parameters. A system for remote access terminal using GPRS enabled embedded server is designed in this paper. Using cellular services such as SMS and GPRS to control remote devices leads to a breakthrough in the way we interact with our homes. Therefore, users can control and manage the intelligent appliances using a GPRS network over the internet. If we use SMS or GPRS services for controlling the intelligent devices we just need to pay per use. The overall cost for data services on GSM as compared to other network such as Ethernet will be reduced by a great amount. The operation of embedded server is controlled by the data coming from clients. The adaptability of the embedded server is enhanced by making it possible to accept request from a number of clients having diverse working platforms.

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