Real Time Home Appliances Monitoring By IoT Using UTLP

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Abstract- The Internet of Things (IoT) has recently emerged as enabling technology for the smart gird, smart health, smart transportation, and smart environment as well as for smart cities A real world event provides services with or without direct human intervention. IoT provides fully smart environment condition monitoring by various sensors Temperature, Humidity and Light for providing necessary data to automatically adjust the comfort level in homes by optimize use of energy. By implementing in Unified Technology learning platform (UTLP) kit it control all home appliances. It creates an interface between users and smart home by using GSM and internet technologies. These commands are sent to embedded system module through GSM network. By using UTLP it check whether the device will be in ON or OFF condition

Keywords-GSM, Home Automation, Internet of things (IoT), Mobile phone, Smart home, UTLP Kit

I.INTRODUCTION

The Internet of Things can be described as connecting everyday objects like mobile phones, smart watches, electronic tablets, sensors and actuators to the Internet where the devices are intelligently linked together enabling various ways to communicate between things and peoples, and between things themselves. With the rapid development of Internet and communications technology, our lives are gradually led into a virtual dimension of augmented reality. People can chat, work, talk and interact via connected objects. However, human beings live in a real world, human activities cannot be fully implemented through the services in the virtual worlds.

Many utility companies around the globe started to install renewable energy sources such as solar and wind energy nearby the consumption sites. Also, residential home owners started to install smart home appliances and renewable energy resources in their premises to generate and consume electrical power efficiently.

Building IoTs has advanced significantly in the last couple of years since it has added a new dimension to the world of communication technologies. It is expected that the number of devices connected to the Internet will increase from 100.4 million in 2011 to 2.1 billion by the year 2021, growing at a rate of 36% per year. In the year 2011, 80% machine to machine (M2M) connections were made over mobile networks such as 2G and 3G and it is predicted that by 2021, this ratio will increase to 93% since the cost related with M2M over mobile networks are generally cheaper than fixed networks.

Lei Wang [1] et al. described a low-cost and flexible solution to control and monitor home appliances using Smart Plug devices. The Smart Plug is a power switch which can be accessed via WiFi connection. It integrates two temp sensors, a current sensor and an IR-emitter. Users can plug devices into the Smart Plug to remotely switch power on/off, get information of device's power consumption and ambient temperature, and eventually control the nearby devices using the integrated IR-emitter.

Jin-Seok Yang [2] et al. described the IoT technology provides networking service to connect each other unmanned combat system. IoT has the security vulnerabilities of each element of the technology itself because the technology integrates several components to configure a specific service. And new security vulnerabilities will be caused when they are interconnecting. In military information communication technology, we should concern in four perspectives; illegal remote control, information leakage, false information insert, and signal disturbance.

Rahul Godha [3] et al. described the Smart Home is being rapidly deployed by service providers. Services such as home monitoring (camera), home automation (control over home appliances, home access, etc.), and home security (connected alarm system) enable user control over a wide range of services by means of end-user devices. Furthermore, home appliances are being connected to the Internet for software updates, malfunction reports, and so forth. These transformations have introduced a wide variety of new risks. The potential for malicious activities ranges from mischief to crime and malicious hacking.

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Hacking into cameras, violating privacy, and accessing content (pictures and movies) are some of the security threats introduced by the new era of connected homes.

Rishabh Agrawal [4] et al. described the design and development of a smart monitoring and controlling system for kitchen environment in real time has been reported in this paper. The system principally monitors kitchen environment parameters such as light intensity, room temperature, fire detection, motion detection and LPG gas level, has been developed. The system can monitor the status of kitchen and send an email and/or an alert SMS via GSM network automatically, if the conditions get abnormal, to a concerned
Authorities' mobile phone.

The concerned authority can control the system through his mobile phone by sending AT Commands to GSM MODEM or by taking the necessary steps in user email, which is password protected. Users can monitor and control transducers on active Web pages enhanced with JavaScript and Java. This system finds a wide application in areas where physical presence is not possible all the time. The ZigBee device and ARM1176JZF-S microcontroller are used in the implementation of sensor module. The system offers a complete, low cost, powerful and user friendly way of real-time monitoring and remote control of kitchen. A prototype model is developed and tested with high accuracy result.

R.S. Vetrivel [5] et al. described the Internet of Things (IoT) is an ideal emerging technology to influence the internet and communication technologies. Simply Internet of Things connects living and non-living things through internet. Traditionally in the object oriented paradigm everything in the world is considered as an object, but in the IoT paradigm everything in the world is considered as a smart object, and allows them to communicate each other through the internet technologies by physically or virtually. IoT allows people and things to be connected Anytime, Anyplace, with anything and anyone, by using ideally in any path/network and any service.

This paper proposes architecture to enable the users to control and monitor smart devices through internet. It creates an interface between users and smart home by using GSM and internet technologies, or it simply creates GSM based wireless Communication from the web server into the smart home. In this architecture the users give commands through web then the users inputs are converted into GSM-SMS commands. These commands are sent to embedded system module Through GSM network, and finally the user commands executed by microcontroller to control any electronic objects like home appliances, lights, etc. and it sends the acknowledgement.

C A Bindyashree [6] et al. described a low cost wireless embedded gateway for remote Home Control and Monitoring system through internet. The gateway in the proposed prototype provides data transfer between the clients and the multiple home appliances through internet. The light weight Constrained Application Protocol (CoAP) is used to provide efficient data transfer between the gateway and the Wireless Sensor and Actuator Modules (WSAM). This system uses wireless technology to avoid wired connection between appliances and the gateway. It helps to do complete monitoring and control functionalities of the home environment using wireless sensors and actuators modules than just the switching ON/OFF functionality provided by similar systems. Using the proposed prototype system the existing home appliances can be automated at low cost. This system does not require dedicated expensive components like a server PC as it uses low cost embedded devices.

Kusuma S M [7] et al. described the internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Wireless Home Automation system(WHAS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The home automation system differs from other system by allowing the user to operate the system from anywhere around the world through internet connection.

Huang Jinhui [8] et al. described with the constantly emerging of the high-tech, Household life of intelligent, network, digitization has become a research direction in the field of Internet of things. Against this background, this paper puts forward a set of intelligent household IoT system based on ZigBee architecture design. The design scheme can be connected to various devices in the family, In order to realize people and equipment between communications, greatly convenient people's home life. Because the ZigBee module has many advantages such as saving the electricity, small volume, low cost .Based on ZigBee smart home system has great research value, and is a good way to promote the speed of the Internet of things into our life, let people know well to the role of the Internet of things to get convenience for our life.

A. R. Al-Ali [9] et al. described the Internet of Things (IoT) has recently emerged as enabling technology for the smart gird, smart health, smart transportation, and smart environment as well as for smart cities. The major smart grid devices are smart home appliances, distributed renewable energy resources and power substations. The seven domains existing smart grid conceptual model was developed without the IoT concept in mind. As the smart grid evolved, many attempts started to introduce the IoT as enabling technology to the grid. Each device in the grid can be considered as an object. Utilizing the concept of IoT,

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each device can have a unique IP address that can upload its status and download Control commands via the Internet. This paper proposes a conceptual model for the smart grid within the Internet of Things context. The proposed model is based on IPV6 as the backbone of the smart grid communications layer. As a result of the smart grid evolution, some recent enabling technologies have emerged to reduce the number of communication protocols and handle big amounts of data.The Internet of Things (IoT) is one the most recent enabler for the smart grids.

II.BLOCK DIAGRAM

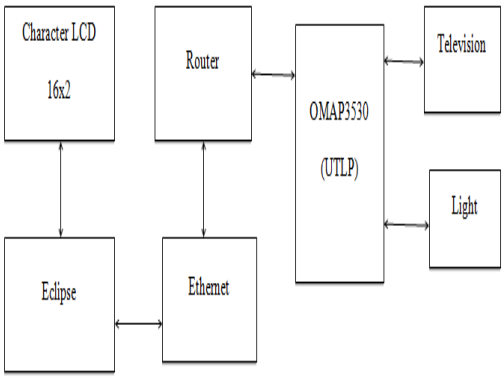

Fig.1.Block diagram of Monitoring home appliances

2.1. Description

The block diagram of monitoring home appliances is shown in the figure 1. Today, Global System for Mobile Communication is a vital communication technology and the proposed architecture uses GSM is a primary communication technology between the home and IoT agent. The IoT agent is the core part of this architecture because it manages web server data, SMS command, GSM module interactions and all knowledge based processes parsing, analysis and Creation of SMS commands.

A. Eclipse

Eclipse is multi-language software which is developed by development environment tool including an Integrated Development Environment (IDE) and an extensible plug-in-system. It is written mostly in Java. It can be used to develop the applications in Java program and, by means of various plug-in systems, other programming languages including Ada, C, C++, COBOL, FORTRAN, Haskell, Perl, PHP, Python etc. Eclipse IDE tool is a tool which is used for developing applications based on C language for UTLP.

B. ULK control panel

The ULK control panel is an application program and it is developed using Ubuntu development personal computer which facilitates the communication between the Ubuntu Host personal computer and the UTLP. It also enables downloading and executing the UTLP program in usual mode. Fig.2. shows the host and client interface.

C.Router

A router is connected with two or more data lines from different networks (as opposed to a network switch, which connects data lines from a single network). When a data packet comes on one of the lines, the router reads the address information in the packet to determine its ultimate destination. Then, using information in its routing table or routing policy, it directs the packet to the next network on its journey.

D. Texas OMAP3530

The ULK is based on Texas Instruments OMAP3530 application processor and Spartan-6 FPGA. The Texas Instrument OMAP 3530 processor is a high performance processor which is based on OMAP architecture. It is used to support high-speed devices and number of thread processing applications. The OMAP3530 processor supports with different interfaces such as Mobile DDr, Nand Flash, Audio in & out, TV out, Touch screen LCD, VGA out, Ethernet, Keyboard, USB two SD cards, Control sensor header, I/O expansion connector, I2C header for GPS, Bluetooth & Modern Connectors, Simple Digital Interface connector, IrDA connector, Camera Connector & LCD connector

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E.Spartan-6 FPGA

Spartan 6 FPGA has 2 mega byte of SPIPROM from Atmel. Then, it has 10 bit ADC with parallel interface and 12 bit DAC with parallel interface. It contains JTAG interface, 7-segment LED's, 20 pin header and 70 pin I/O expansion connector, DIP switches and Status LED's.

F.UTLP- Interfaces

UTLP has different devices and interfaces which can be accessed both in the normal mode and in the lab mode. The program developing and executing them using control panel for the following devices in the normal mode such as 7 segment display, Character LCD, Keyboard, Graphics LCD, Touch panel.

Application Programming Interface (API) are the functions provided by interface libraries. By using these library calls in the programs for an interface functionally. At the linking time, the API library binaries to make an executable program. In the UTLP normal mode, there are interface libraries provided for different devices and functionality.

Reads a string from the control panel input window-
Void ulk_scanf_string (char*user_string)
Outputs a string on the serial port-
Uint8 ulk_printf(const char*fmt….)
Prints a string in the control panel output window-
Void ulk_cpanel_printf (const char*fmt…)
Reads a hex value from the control panel input window-
Void ulk_scanf_hex(unsignedlong*hex_variable)

G.Character LCD

A 16x2 LCD shows to display 16 characters per line and has 2 lines.

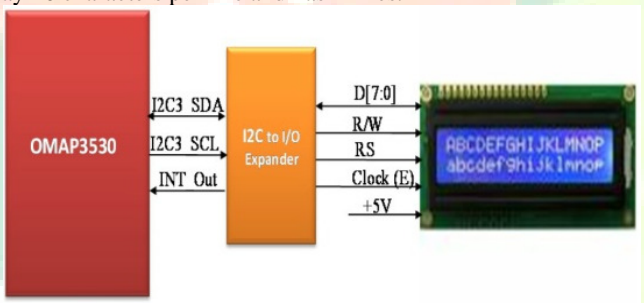

Fig.2. Character LCD

Each character is displayed in 5x7 pixel matrix. Character LCD interface is shown as Fig.3. The 16x2 character LCD is connected through the I2C interface.

H.Implementation

The ARM-8 Cortex processor, based on the ARMv7 architecture, has the ability to scale in speed from 600MHz to greater than 1GHz. The Cortex-A8 processor can meet the requirements for power-optimized mobile devices needing operation in less than 300mW.

III.RESULTS AND DISCUSSION

The program written in Embedded C was executed using the Eclipse software. C application program window is shown in the figure 3.a.After successful execution, it is interfaced with the UTLP kit through ULK control panel. Fig. 3b shows the Execution of home monitoring window of the ULK panel where the program was interfaced with the kit. ULK load and execution operation was done in the ULK panel; it was shown in the fig.3.c and e. Then the output of monitoring home appliances shown in fig.3.d and 3.f

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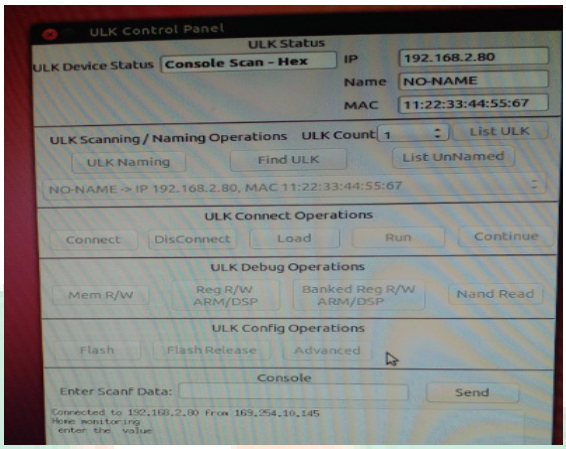

Fig.3.a Control panel of monitoring appliances

Fig.3.b Output of Home monitoring

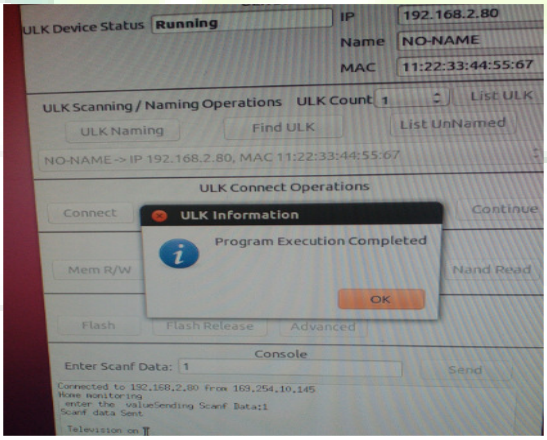

Fig.3.c ULK load operation

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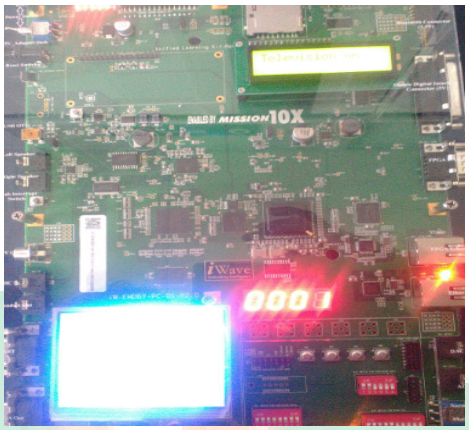

Fig.3.d Television ON

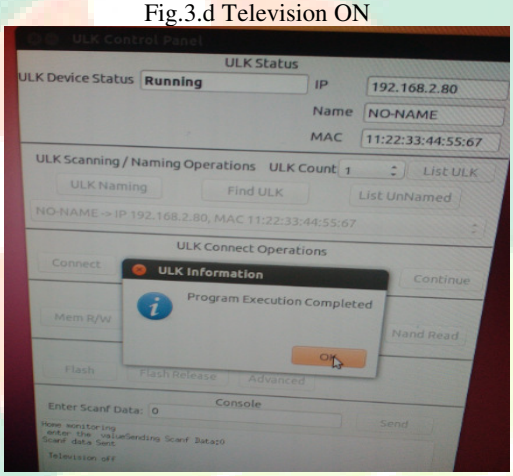

Fig.3.e ULK operation for OFF condition

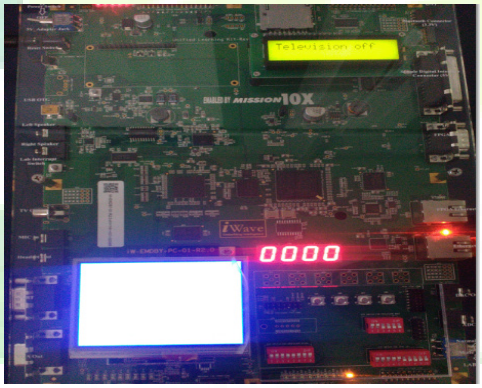

Fig.3.f Television OFF

IV.CONCLUSION

A Smart Home system integrates electrical devices in a house with each other. The techniques which are going to use in home automation include those in building automation as well as the control of domestic activities, such as TV, fan, electric tubes, refrigerator and washing machine. After studying and understanding literature survey and other existing works, we

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proposed a Novel technique that will gives us better understanding of the Environmental conditions in home. We also provide notification to the user about any error occurs in the devices and send mail or SMS to the service provider about the problem

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