Internet of Things based Operation of Home Appliances using Embedded System

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Abstract— Internet of Things is a system that uses computers or mobile devices to control basic home operations and operates automatically through the Internet from anywhere in the world. An automated home is called as smart home. It is meant to save the electric power and human energy. In the existing system, the CELP (code excited linear prediction) parameters are used for speech coding in mobile phones to operate the devices. The disadvantage of CELP coder is its processing delay. The processing delay of the CELP coder is higher because the processing is done for each frame of size 32 vectors and each vector is of 5 samples. An embedded system is used in all fields for any applications. In the proposed system, the processor used is PIC microcontroller. Personal Computer is connected to PIC microcontroller. The home appliances are controlled by giving commands in the Personal Computer. Cloud storage is used to secure the system. PROTEUS software verifies the experimental results.

Key words: PIC, RS 232, Home Appliances, Relay, LCD

I. INTRODUCTION

Internet of Things is widely used in all fields. The smart home is ranking as highest Internet of Things application. Internet of Things is an internetworking of physical devices embedded with electronics, software. It enables the devices to collect and exchange data. IoT devices are implemented using hardware and software components. Microcontrollers are used to execute the software that interprets inputs and controls the system. Hardware components are used to implement the interface with the physical world and to perform tasks.

People carefully handle Home appliances to save energy. If people are going tour and they forget to switch off the fridge, then it can be turned off by using Internet of Things. Home appliances can be controlled using the internet. Embedded systems are used to enhance the performance. Embedded systems are used in home, industries, office. An embedded system has microprocessors and microcontrollers. The microcontroller is more advanced than a microprocessor. Microcontrollers do not need separate storage devices. The microcontroller used to operate the devices is PIC microcontroller.

II. LITERATURE SURVEY

Yue-Ru Chuang et al. [1] a tree-based network architecture and smallest-closed area (SCA) mechanism are designed. An air-conditioner control network, which is intended the related behaviors between the devices like home gateway, air-conditioners, doors, and windows. When a user turns on an air conditioner in a house by using remote, the relative doors and windows should perform proper operations automatically and immediately for energy-saving. A Zigbee module with TI CC2530 is used to implement a smart home control system. In this method, a device is controlled remotely by the user using Zigbee.

Y. Yamazaki et al. [2] a text-independent speaker verification method based on a speech coding scheme. CELP based speaker verification utilizes the CELP parameters which are used in speech coding schemes for mobile communication. CELP encoder and parameters encode the speech signals are extracted under noisy conditions.

Jeong-Sik Park et al. [3] proposes a post-processing for online spoken content retrieval in portable electric devices. It is to maintain stable performance. Keyword recognition technique is used to test the efficiency of the devices. Confidence Measure and Dynamic Time Warping methods are utilized. Keyword recognition will provide the best solution for spoken content retrieval.

Taewan Kim et al. [4] used a URC to control the home devices. To use URC several wired and wireless communications should be connected to their devices. The controlling technique used is Zigbee. It has the disadvantage of using in short range it cannot be operated after a particular limit. URC has some drawbacks like inconvenient user interfaces, restricted control to dedicated appliances.

Hoopoo Lee et al. [5] proposed a voice trigger system using a keyword-dependent speaker recognition technique. A voice trigger can perform both the recognitions without using speech recognizers. A hidden Markov model (HMM) based method is used for voice trigger. However, this proposed system is complementary and used depending on the device of interest.

Katsamanis et al. [6] focused on detection and recognition on spoken commands preceded by a key-phrase as recorded by a set of multiple microphones installed in rooms. Robust modeling and multichannel processing methods are employed. Recognition runs on the microphone with highest Signal Noise Ratio. More space and time is needed for multichannel processing. Beamforming algorithms are not satisfactory for real-time applications.

Gil-Jin Jang et al. [7] in this remote control collects speech by the microphone and performs automatic voice recognition and provides a reference signal for the background noise source. It equalizes the interference by maximizing the instantaneous correlation between nonlinear target recording and the reference signal.

Seungho Han at [8] are concerned with compensation of the channel mismatch of the input signals caused by the path differences, fixed, and adaptive channel compensators are adopted before the noise reduction. GSC-based speech enhancement is performed for mismatch input

signals. To improve noise reduction adaptation mode controller is introduced in the GSC.

Jinsoo Han et al. [9] proposed a home based automation system using Graphical User Interface. However, this system lacks user-friendliness. To improve this 3D view interface is designed. Its level of realism is low. XML schema method is used for exchanging commands.

Dual Tone Multiple Frequency (DTMF) methods are applied to a phone-based message system. It is effective and efficient for long tasks. However, for complicated task speech is effective. Speech is better than DTMF. This system does not measure the user variables. It suffers from small sample size.

III. EXISTING SYSTEM

In the current regime, the CELP parameters are used for speech coding techniques in mobile phones. This verification method is used to match the audio streams. Kernel Mutual Subspace (KMS) method is used for matching the audio streams. MSM does not work if the distribution has a nonlinear structure. Kernel function takes a significant amount of processing to calculate the input data. KMS is robust in noisy conditions. The user sends command in a mobile phone, and CELP encoding processes it, and it reaches the consumer devices. The commands reach the devices through cell phone only for a particular distance. So it is hard to operate the devices when the mobile signal is not available. To overcome this difficult IOT is introduced to operate the devices in an efficient manner.

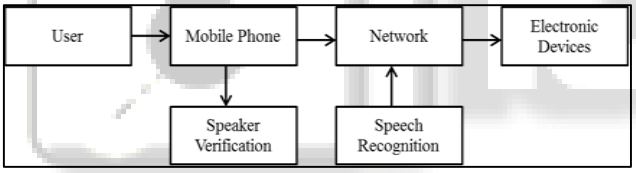

Fig. 1: Speaker verification

Speaker verification is done using the parameters encoded in mobile phones. This method has two phrases. They are enrolment and verification. The result of enrolment and verification are compared with a threshold value.

IV. PROPOSED SYSTEM

The main objective of proposed system is to communicate and to operate the home appliances in an energy efficient way with the help of Internet of Things. Internet of Things is mostly used in home appliances. An embedded system is widely utilized in each and every application. Embedded systems use microprocessors, microcontrollers as its processor.

The four types of single phase devices are used. The devices are lamp, fridge, motor, AC. The devices can be turned ON even if the person is outside of the home. The devices can be operated anywhere in the place by using Personal Computer. The PIC microcontroller is used to operate the devices. The PIC microcontroller is the RISC-based microcontroller fabricated in CMOS (Complementary Metal Oxide Semiconductor). The type of PIC microcontroller used is PIC16F877. The technology utilized in this microcontroller is flash so that the data can be erased and modified easily. The program can be easily loaded in the microcontroller. Cloud storage is used to secure the system so that other person cannot operate the devices.

A. Description of Proposed System

The proposed system consists of PC, PIC microcontroller, and devices which are shown below. PIC microcontroller is inter-connected to PC with the help of serial communication. The serial communication used here is RS 232 cable. This cable is used for communicating with external devices. The four electronic devices are connected to PIC microcontroller by using driver circuits and relays. The driver circuit is used to amplify the signals from the microcontrollers.

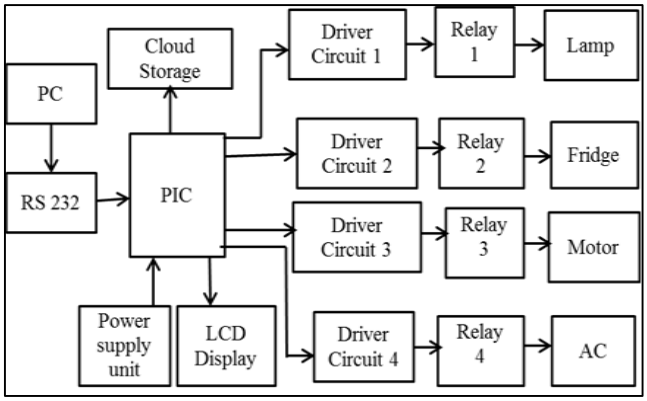

Fig. 2: Proposed System

The relay is an electromagnetic switch that can turn on and off an electric current. The program for the computer is written in Java. The program to turn the devices ON and OFF is written and loaded in the microcontroller. By giving commands in the Personal Computer, the devices can be turned ON and OFF. The LCD is used to show the operation of the electronic devices. If the command is given, then the LCD shows the particular device in ON state and others in OFF state.

V. SIMULATION

The software used for simulation is PROTEUS. Proteus 8 is a single application with many service modules offering different functionality (schematic capture, PCB layout, etc.). It is an easy simulating software to simulate microcontrollers, function generator, oscilloscope and also all other electronics components.

The Proteus is the software in which the simulation coding is written to display the result of the circuit. The wrapper that enables all of the variable tools to communicate with each other which has three main parts. The parts are application framework, common database, live net list. Personal Computer is connected to PIC microcontroller. If the commands or any other signals are given in the computer then PIC microcontroller operates the relay circuit and turns ON and OFF. The schematic layout is shown below,

In this diagram, the computer is connected to PIC to give the commands. The pins connected to LCD will display the status of the devices. The four pins that are connected to transistor will operate the devices. The transistor used in this application is NPN transistor.

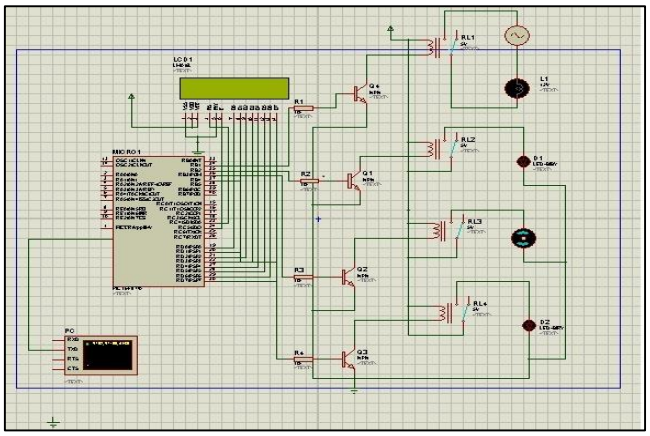

Fig. 3: Simulation output

VI. SIMULATION OUTPUT

The simulation output for each device is shown below. The device is turned ON by giving separate commands for each device. The commands that are allocated to each device are unique.

The figure 4 shows when the command is given to the microcontroller the lamp glows. When the command is given as *1and if it is read by microcontroller then the relay gets switched with other connection and the lamp gets turned ON. When *5 command is given it gets turned OFF.

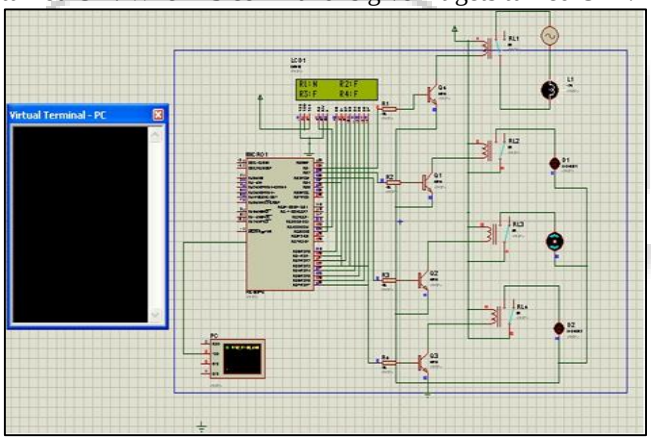

Fig. 4: Simulation output

The figure 5 shows the fridge turns ON. When the command *2 is given fridge gets ON. LCD will display the device turned ON. If the command *6 is given the device gets turned OFF.

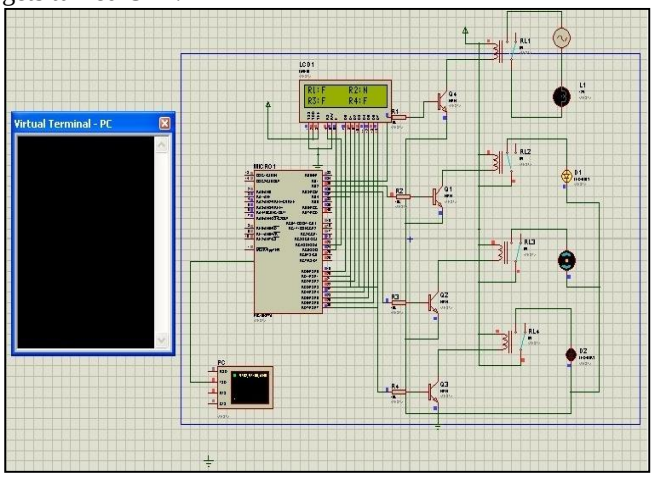

Fig. 5: Simulation output

Figure 6 shows the operation of the motor. If the microcontroller reads the command as *3, the motor gets ON. If it read as *7, it gets turned OFF. LCD will show the status of the device.

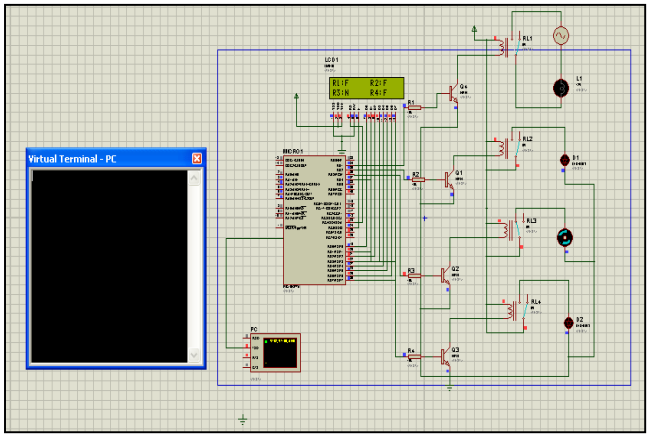

Fig. 6: Simulation output

The figure 7 shows AC turns ON. If the command is given as *4, the device gets turned ON. IF the microcontroller reads the command as *8, the device gets turned OFF.

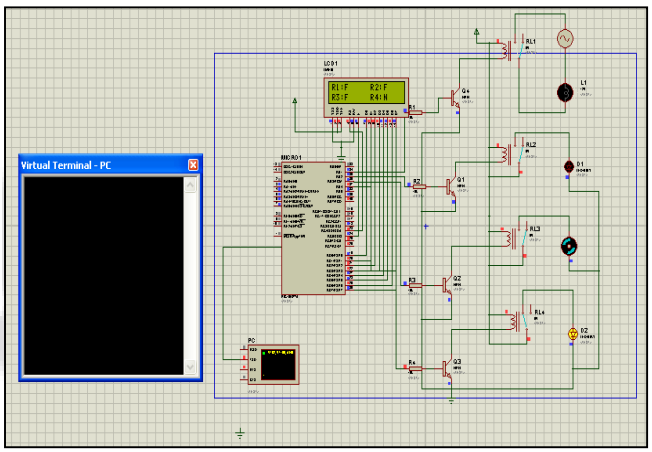

Fig. 7: Simulation output

VII. CONCLUSION

Thus, the proposed system enhanced with home appliances can be turned ON and OFF by using Internet of Things in embedded system. This reduces the electric energy and human energy. It saves time. The simulated result shows that the devices are operated sequentially. The proposed system based on PIC microcontroller is more compact, user-friendly and less complex, which can be easily used to perform any applications. This method can be extended for other purposes such as commercial & research applications.

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