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Exploring Internet of Things for Home Automation Applications

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Abstract: Internet of Things is the process of Embedding physical devices with the internet to share their information. IoT modernize our home system with IoT dashboard, which analyze and access data according to applications. In existing system, the portable electronic board used for home appliances by implementing Code excited linear prediction. CNLP belongs to the class of speech coding algorithm. This code used in several 2G cellular telephony standards and GSM, which functions based on encoder and decoder to represent voice signal as code. To overcome processing delay and minimum ability of speech signal in the existing system, proposed system with IoT dashboard is introduced. Smart home appliances are already available but security is very minimum and adoption is not easy to all customers. It reduces the users valuable time to process manually and security of home system. PIC Microcontroller programmed in such a way to undergo various operation in the IoT dashboard for all kind of home appliances. Home automation servers require complete trust across a large number of devices and platforms, each with their own set of trust standards and unique nuances in establishing secured connections. The efficient performance is also analyzed by PROTEUS software.

Keywords: IOT, PIC , Home appliances and PROTEUS Software.

I.INTRODUCTION

1.1 OVERVIEW OF THE PROJECT

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real time computing constraints. Embedded systems are mostly found in consumer, industrial, automotive, medical and military applications. Household appliances such as washing machine, micro wave ovens and dishwashers include embedded systems. Embedded systems are often based on microcontrollers. Internet of Things is an internetworking of physical devices buildings, vehicles and other items embedded with electronics, software, sensors, actuators and network

In the existing system, the devices are controlled by CELP parameters. Kernel Mutual Subspace (KMS) method is used for matching the audio streams. Kernel function takes large amount of processing to calculate the input data. But it has the drawbacks of processing delay and devices are operated to a particular distance.

To overcome the difficulties the IoT is introduced in the proposed system to operate the devices using computer. The processor used is PIC microcontroller. Microcontroller is more advanced than microprocessor. A microcontroller does not need separate storage devices. The home appliances are controlled by giving commands in the Personal Computer. 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 display is used to display the operation of the electronic devices. If the command is given then the LCD displays the particular device in ON state and others in OFF state.

The software used for simulation is PROTEUS. Proteus is the software in which the simulation coding is written to display the result of the circuit. The proposed system based on PIC microcontroller is more compact, user friendly and less complex, which can be easily used to perform any type of applications. This method can be extended for other purposes such as commercial & research

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applications. The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity. Projections for the impact of IoT on the Internet and economy are impressive, with some anticipating as many as 100 billion connected IoT devices and a global economic impact of more than $11 trillion by 2025.

1.2 OBJECTIVE OF THE PROJECT

The main objective of my project is to control the home appliances using Internet of Things for energy saving and power efficiency. To operate the appliances from anywhere in the world.

By using the PIC microcontroller the signals are sent and the devices are turned ON and OFF. In PROTEUS the devices are operated by giving the signals in the computer.

1.3 SCOPE OF THE PROJECT

This Project is used to control home appliances using an application module from android mobile. Communication between appliances and mobile is made wireless via a GSM Modem (GPRS/3G). This reduces man power and saves energy.

II LITERATURE SURVEY

Yue-Ru Chuang, Wen-Jeng Yanget al proposed an idea of controlling an air-conditioner by implementing a Smallest Closed-Area (SCA) mechanism and designed the relative behaviours between home gateway, air-conditioners, doors, and windows. When a user remotely turns on an air-conditioner in a house, the relative doors and windows should perform proper operations automatically and immediately for energy-saving.
In the SCA mechanism, there are five States designed for each device: Initial State, Discovery State, Maintenance State, Operation State, and Update State. A Zigbee module with TI CC2530 is installed. The intelligent and digital home can also be realized via using the integration concept of IOT.

Yasushi Yamazak1t, Yusuke Fujita at el proposed a text-independent speaker verification method based on a speech coding scheme. This method utilizes CELP parameters which are used in speech coding schemes for mobile communication systems, and verifies a speaker only with the encoded speech information. In the CELP coding block, speech signal is encoded by a CELP coder and the encoded parameters are extracted. In general, CELP is an AbS (Analysis by Synthesis) coding scheme with an excited sound source which is prepared in a codebook.CS-ACELP is used which operates on speech frames of 10 ms corresponding to 80 samples at a sampling rate of 8000 samples per second. For every 10 ms frame, the speech signal is analyzed to extract the parameters of the CELP model. The speaker verification block contains two sub processes, enrolment process and verification process. Each sub process is preceded by another process called frame selection. In this process, speech frames which are effective for speaker verification are extracted. To realize noise robust speaker verification, it is important to select stable frames in which the value of LSP is not affected by noises.

Jeong-Sik Park at el presented a post-processing done for online spoken content retrieval in portable electric devices. It involves a two-stage procedure for utterance verification. The first stage utilizes a confidence measure based on N-best log-likelihood recognition results. In the second stage, Dynamic Time Warping (DTW) algorithm is applied to obtain a verification result.
To assess the proposed technique, experiments on multimedia content retrieval tasks were performed using spoken broadcast news data.To test the efficiency of the proposed multistage verification technique, we conducted keyword recognition experiments on broadcast news data, in which the advanced CMs successfully detected keywords with improved accuracy.

Taewan Kim at el presented an advanced universal remote controller (URC) with the total solution for home automation and security. To use the URC, need several receivers with wired or wireless communication methods to be connected to all appliances.A user can control appliances in a direct fashion as well as an indirect way through various receivers and Internet. The URC-based system can be also controlle by a cellular phone with a TCP/IP route.

Hyeopwoo Lee at el proposed a voice triggering system using a keyword dependent speaker recognition technique. The voice trigger must be able to perform keyword recognition, as well as speaker recognition, without using computationally demanding speech recognizers to properly trigger a mobile device with low computational power consumption. The HMM based method reduced the recognition error by 27.8% relatively compared to the

template based method. The proposed methods are complementary and can be used selectively depending on the device of interest.The template based method is relatively faster than the HMM based method, the performance of the HMM based method is much better than the template based method.

A. Katsamanis at el focused on the detection and recognition of spoken
commands preceded by a key-phrase as recorded in a voice-enabled apartment by a set of multiple microphones installed in the rooms. For both problems we investigate robust modelling, environmental adaptation and multichannel processing to cope with a) insufficient training data and b) the far-field effects and noise in the apartment. Robust modelling refers to the class of approaches that aim to reduce the mismatch between the training and testing conditions either by simulating the testing conditions for the generation of artificial training data or by using adaptation methods to fit the parameters of a model set in testing data can be used in two ways, namely to determine a multichannel adaptation transformation that would be the same for all channels or a separate adaptation transformation per channel. By employing SNR-based channel selection and the proposed N-best rescoring combination of multiple channels our system achieves word accuracy close to 88%,97% and 98% for the adapted clean, reverb1 and reverb *R* models.

Jeong-Sik Parkat el proposed to improve the voice recognition performance by suppressing acoustic interferences that add nonlinear distortion to a target recording signal when received by the recognition device. The proposed method first equalizes the interference in the two microphones by maximizing the instantaneous correlation between the nonlinearly related target recording and
reference signal, and suppresses the equalized interference. To obtain an optimal estimation of the equalization filter, a method for detecting instantaneous activity of interference is also proposed.The method masks power spectral densities of the input signal to suppress the estimated interference using another device's recording as a reference. An algorithm for equalizing the difference between the two recordings was proposed. It can be applied to more than two sources of interference, as in smart TV environments surrounded by loud interfering sounds.

Seungho Han at el concerned with Generalized Sidelobe Canceller (GSC) based speech enhancement. The speech enhancement is performed in the condition that the arrival direction of the target speech source is given by the sound source localization module. The GSC-based speech enhancement is performed for the channel-mismatch compensated input signals. To improve the noise reduction performance, the probabilistic adaptation mode controller is introduced to the GSC. Firstly, the time delay compensation (TDC) is performed to compensate the time delay difference of the target speech signals between the reference channel and the others utilizing the arrival direction information. Secondly, the input signals are transformed into the frequency domain by the discrete Fourier transform (DFT).Thirdly, the two-step channel compensation, which consists ofthe FCC and the ACC, is performed. The proposed FCC and ACC efficiently and noticeably compensate for the mismatch among input channels.

Jinsoo Han at el proposes a user-friendly home automation system based on a 3D virtual world. To improve the user-friendliness of the interface, a 3D view interface was designed. To provide a more realistic interface, a 3D virtual world is adopted as the user interface for a home automation system. Additionally, a home server is used as a controller for home devices. As an information exchange format between the virtual and the real world, a control protocol that works under a standardization process is introduced. With the help of a 3D virtual world, a user can control and monitor home devices via a user-friendly interface that works both intuitively and realistically anywhere and anytime through the Internet. The home server controls connected home devices in the home. To exchange control messages between the meta verse server and the home server, we configured XML schema of the MPEG-V standard along with a user defined protocol. With the help of the 3D virtual world, the home server, and the control protocols, a user can control home devices and monitor the status of each device anywhere and anytime through the Internet via a user-friendly interface that functions intuitively and appears realistic.

Kwan Min Lee at el reports on an experiment that critically tests user preference for an input modality (speech vs Dual Tone Multiple Frequency[DTMF])in a phone-based message retrieval System. the importance of examining speech user interfaces from other perspectives, in addition to efficiency maximization, is emphasized. For simple and linear tasks, the DTMF modality was more effective and efficient, whereas for complicated and nonlinear tasks, the speech modality was better. It

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should be noted that a function mapping was provided in the DTMF condition, which probably favoured this condition. Nevertheless, speech was better than DTMF for nonlinear tasks.In general the speech modality was preferred to the DTMF modality. After completing a set of both linear and nonlinear tasks, an overwhelming majority
of participants preferred the speech modality. Participants in our experiment evaluated the speech modality as being more satisfying, entertaining, and natural to use than the DTMF modality. The speech system was also evaluated as being easier to use and more entertaining user performance with a modality in simple linear tasks does not predict well user preference for that particular modality. Even though participants were able to complete linear tasks more quickly with DTMF than with speech, they were generally more satisfied with the speech modality and more often chose it as their final preference.

II1 EXISTING SYSTEM

In the existing system, system is proposed that can remotely operate consumer electronic devices by voice. It uses the mobile phone as a controller. And it uses the CELP(code excited linear prediction) parameters that are used for speech coding in mobile phones. A speaker verification function protects private information and separates the user's voice from that of people nearby who are also speaking. A CELP-based speaker verification method is used to match the audio stream by comparing the trajectories of continuous phonemes.

In the CELP-based speaker verification method, the CELP encoding method used for mobile phone voice communication is applied to the encoded voice data toperform speaker verification. This verification method uses CS-ACELP, which has been standardized as ITU-T G.729. Although CS-ACELP uses 8-kbit/s encoding, it produces the same voice quality as32-kbit/s ADPCM (Adaptive Differential PCM). This process takes more time to complete.

CELP-based speaker verification method uses the Kernel Mutual Subspace method to match the audio stream. The KMS must be able to solve an eigen value problem in order to represent data in a subspace, which means that the amount of processing is proportional to the cube of the number of frame. The input data for verification is larger and it is difficult to verify the voice of a person.

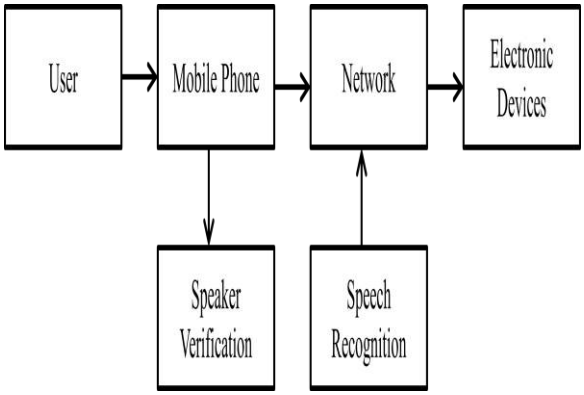

Fig.3.1:Block diagram of existing system

3.2 PROBLEM IDENTIFICATION

1. In the existing system, the devices can be operated only when the mobile has the signal.
2. The processing delay of CELP is higher because the processing is done for each frame of size 32 vectors and each vector is of 5 samples.
3. The input data was acquired about two weeks after the enrolment data was acquired. So it takes more time.

IV PROPOSED SYSTEM

In the proposed system, the command is given by the computer and PIC operates the device and it displays the device status in LCD display. Person can operate the home appliances in an energy efficient way with the help of Internet of Things. It is saves time in operating the devices. The CELP parameters are replaced by the microcontroller so it does not take more processing time. In this project, the methodology used here are PIC processor based on the real time embedded system. By using Proteus software, all the devices like lamp, fridge, motor, AC can be monitored and controlled. Since the Proteus software represents the graphical representation of the above said devices. Proteus an easy way of simulating all type of microcontrollers and microprocessors. According to this software, it is very easy to understand the operations of the devices. Hence by using the advanced processor and Proteus, existing problem can be overcome. The advanced processor used here is PIC microcontroller.

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PIC microcontroller is the RISC based microcontroller. The type of PIC microcontroller used is PIC16F877. The block diagram shown below represents the monitoring and controlling of the system. It consists of PIC processor, PC, Driver circuit, Relay, LCD display and Home appliances. 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. If the command is given by the computer then it is send to PIC through RS 232 cable. RS 232 cable is used for communication. It is a serial communication port. Based on the commands given the processor pins activate the driver circuit and relay. Then the device which needs to turn ON is activated.

The LCD display will display the status of the device after activating the PIC. The four devices can be turned ON and OFF with the help of the microcontroller.

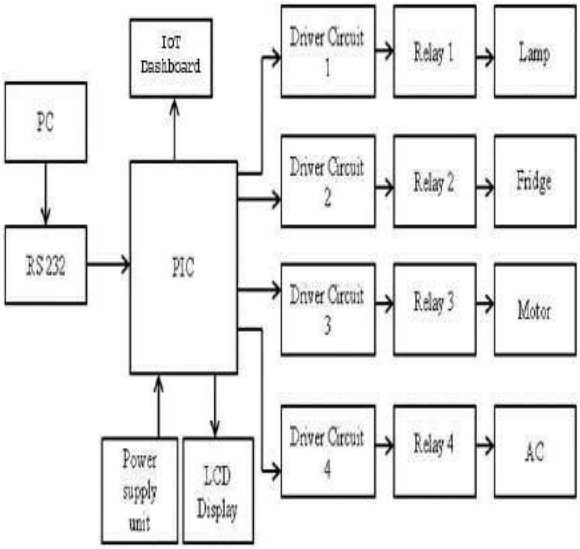

Fig.4: Block diagram for proposed system

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,

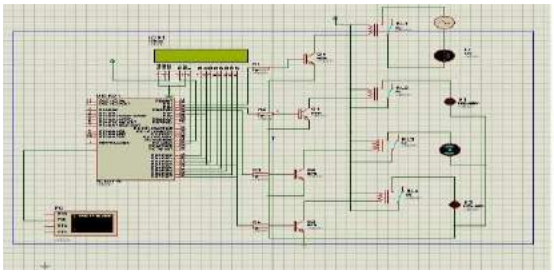

Figure: 5.1

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.

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 5.2 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.

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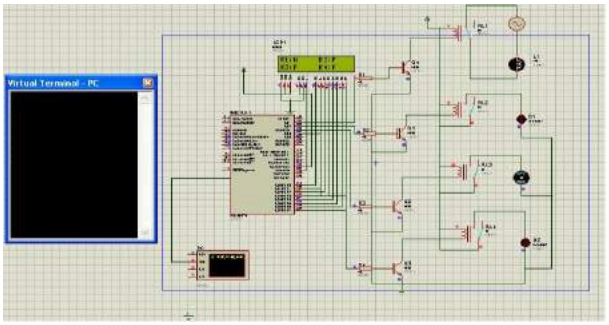

Figure: 5.2

The figure 5.3 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.

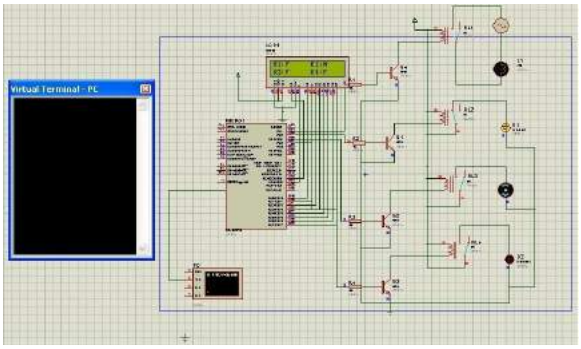

Figure: 5.3

Figure 5.4 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

VI. CONCLUSION

Internet of things extend from smart connected homes to wearable healthcare. Now a days IoT becoming a part of every aspect of lives with increasing comforts of our life's. But also giving us more control by simplifying routine work life and personal tasks. In this proposed system the devices are operated and controlled using the embedded system technology. The microcontroller and internet of things used to operate devices easily and in energy efficient manner. It provides an excellent solution for the existing system by overcoming the drawbacks. The simulation result is obtained using PROTEUS software.

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Biography

S.Sukhumar is pursuing, Master of Engineering in the discipline of Embedded System Technologies at Excel College of Engineering and Technology, under Anna University, Chennai, India. He did his Bachelor of Engineering in the discipline of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. He has published and presented a number of technical papers in National and International journals and Conferences. He is doing minor research works on various fields like Robotics, Biomedical, Embedded Systems, Power Electronics and Renewable Energy systems. He got best outgoing student of the year award, Young scientist award, best student award in national level at Institution of engineers , Achievers awards, best project award in national level at ESIC by ISSRD, best project award in national level at IE , State second prize for his project, best student in co-curricular activities and ERAMBOZ awards. He got Business English Certificate from Cambridge University. He is highly appreciated by the Head of the Department.