Home Automation System using PIR Sensor

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Abstract— In this paper my aim is to use ardunio for classroom automation. This paper presents design and implementation concepts for a classroom automation system based on Arduino Uno microcontroller as central controllers. In this we have studied all technologies which are used for implementation for classroom automation. In this dissertation, Arduino microcontroller is the crusial part. we have also used PIR (Passive infrared) sensor to detect the presence of person within certain range, it is designed to cover a wide area this sensor rather than emitting light such as from LED's, detects the amount of change in infrared rays that occurs, when a person whose temperature is different from surrounding, moves .This dissertation is made so that electricity will be saved to some extent by using arduino microcontroller. Thus in quickly the main desire of our free ride is to save electricity, time and maintain in functioning of classroom system smoothly.

Key words: Arduino, PIR Sensor, LED

I. INTRODUCTION

Recently, man's work and life are increasingly tight with the rapid growth in communications and information technology. In this paper we have studied various techniques for implementing classroom automation such as arduino, raspberry pi, Bluetooth connectivity. The informationized society has changed human being's way of life as well as challenged the traditional residence. Followed by the rapid economic expansion, living standard keeps raising up day by day that people have a higher requirement for dwelling functions. The intellectualized society brings diversified information where safe, economic, comfortable and convenient life has become the ideal for every modern family .It is will know that the concept of smart home has focused the attention of researchers, lifestyle practitioners, and the consumers to be directed forward the usage of the recent technology. Considerable efforts have been made to the development of remote control systems for home automation. The earlier work of such systems are mainly based on the use of telephone line, such as a phone-based system for home automation using a hardware-based remote controller, based on a personal computer approach. These kinds of systems which make use of the telephone as the remote control input device have no way to be connected through any user interface. The proliferation of telecommunications technology has made most of recent home automation scenarios focus on using wireless communication to communicate the home appliances.in this we have used all those techniquies which can be used for implementing classroom automation.

Technologies can be used:

1) Bluetooth Wireless networks for short range communications have a wide spread usage of Bluetooth radio transmissions between 2400–2480 MHz by Telecom vendor Ericsson since 1994. Bluetooth technology forms small ad hoc networks termed as Personal Area Networks (PANs) also provides a mechanism to emulate the RS-232 data cables, supervised by the Bluetooth Special Interest Group, since 1998. Modern mobile devices embed small, low-powered and cheap integrated chips functioning as short-range radio transceivers for Bluetooth radio communications. Device pairing, authentication, encryption and authorization techniques have given recognition to Bluetooth technology due to its vital security mechanisms.

Different types of Bluetooth applications can be developed using Android platform architecture using the Bluetooth profiles. The device manufacturers provide the services using the support of these profiles in their devices to maintain compatibility for the Bluetooth technology.

The Bluetooth profile used in Home Automation System (HAS) Android mobile phone application is the Bluetooth Serial Port Profile (btspp). RFCOMM is a connection-oriented protocol. It provides streaming communication between the devices. The btspp profile and RFCOMM protocol are used in the application to access the serial port and communicate using streaming data. All of the Bluetooth APIs is available in the android. bluetooth package.

2) .Keil Vision IDE

Keil development tools for the 8051 Microcontroller Architecture support every level of embedded software development. The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Singleboard Computers, and Emulators support all 8051 derivatives. 'C Language Program code' for AT89c51 microcontroller is developed, compiled and debugged using Keil Vision IDE.

3) UC Flash+ Programmer

The ucFlash+ Programmer is an affordable, reliable, and fast programmer for MCS51/AVR Microcontrollers and 24Cxx I2C EEPROMs. The programmer is designed to operate with the Intel Pentium-based IBM-compatible desktop computers and notebook computers. No interface card is necessary to plug the module into a PC (this feature is especially handy for notebook computer users). The menu-driven software interface makes it easy to operate.

ucFlash+ Programmer is used here for programming AT89C51 microcontroller for HAS.

A. Classroom Automation Hardware:

Classroom Automation Hardware is work as client part in Home Automation System is Automated. Automated way is an actual system and known as circuit for Home Automation System which is shown in Home Automation Circuit comprises microcontroller AT89C51, Serial Bluetooth Module, octal peripheral driver array ULN2803, regulator IC 7812, IC7805 and a few discrete components. Here in this circuit, microcontroller AT89C51 is worked as main

programmable switching unit which receives data from Bluetooth serial module and transferred appropriate program data to ULN2803 for operating relay ON and OFF. The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89C51 provides the following standard features: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, five vector two-level interrupt architecture, a fullduplex serial port, and on-chip oscillator and clock circuitry.

B. Bluetooth Connectivity:

Home Automation System Application has the capability of expandable data with HAS circuit through Bluetooth facility of mobile phone when user touches header .The Android platform comprises with other Bluetooth devices. The application framework help of the Android Bluetooth APIs. These APIs is developed using Android platform for mobile option. Android devices have almost covered a larger pie in the is based on expandable list view and it controls the ON/OFF using Bluetooth and collapsing the groups when user touches header as list view is used to exchange the ASCII s of the Bluetooth network stack. This allows a device to wirelessly excthen provide access to the Bluetooth functionality Is. applications to connect wirelessly to other Bluetooth phones and tablets with Bed room, Kitchen, Guest d exchange data with the help of the Android Bluetooth APIs. These APIs make the applications to connect wirelessly to other Bluetooth devices, for point-to-point and multipoint wireless features.

1) The Bluetooth APIs:

All of the Bluetooth APIs' are available in the Android Bluetooth package. The following is the overview of the classes needed during the application's development. BluetoothAdapter: Represents the local Bluetooth adapter (Bluetooth radio) BluetoothDevice: Represents a remote Bluetooth device, to query information such as its name, address, class, and bonding state. BluetoothSocket: Represents the interface for a Bluetooth socket (similar to a TCP Socket).

BluetoothClass: Describes the general characteristics and capabilities of a Bluetooth device.

2) Bluetooth Permissions:

In order to use Bluetooth features in an Android application, at least one of two Bluetooth permissions:
BLUETOOTH and BLUETOOTH_ADMIN are needed to be declared.

We declared the Bluetooth permission(s) in our application's AndroidManifest.xml as below:

```
<manifest ... >
<uses-permission
android:name="android.permission.BLUETOOTH" />
<uses-permission
android:name="android.permission.BLUETOOTH_ADMIN
" />
….</manifest>
```

3) Methods for Bluetooth connectivity:

Normally, before commencing communication, devices can use two methods for initiating communication with each other which can be done normally either by discovering other nearby devices to detect the address and services thatare provided by other devices or by knowing the device address beforehand and directly using that address forfurther communication process. In Home Appliance Control, the later method is used.

1) The Discovery method:

The devices participating in the communication process must be set to the discovery mode.

2) The Known Address method:

The communication with a known remote device is helpful in faster communication as the discovery time is avoided. In this automation system, the appliances would be already known to the Bluetooth module as and when required. It is established in the following manner:

a) SPP:

SPP (Serial Port Profile) in the Bluetooth profiles is implemented as the Bluetooth Serial Port Profile (btspp). Bluetooth profiles are the implementation of the Bluetooth protocols in full or partial manner as defined and adopted by the Bluetooth SIG. They reside over the Bluetooth protocol stack for their full or partial support. The implementation hence uses the support of Bluetooth Serial Port Profile (btspp) and RFCOMM protocol which is a connection-oriented protocol for Radio Frequency Communication, the replacement for the RS-232 cable to provide serial emulation.

b) MAC Address:

Bluetooth devices have a 12 hexadecimal digit MAC address which is to be known beforehand.

A complete specification for the connectivity in Home Appliance Control is done using the Known Method asfollows:

The entire setup described here includes the completion of these important steps using all classes and interfaces of the Android Bluetooth APIs available in the android.bluetooth package.

II. Classroom Automation System (CAS) using Android for Mobile Phone:

1) Check for Bluetooth support
2) This can be accomplished by using the BluetoothAdapter in the application which serves as an entry point to all Bluetooth interactions. There is only one adapter for entire system and it represents the devices' Bluetooth radio (adapter). If it is null the device does not have Bluetooth support.
3) Enable Bluetooth
4) Check to make sure it is turned on in the application itself. Otherwise, request the user to turn on Bluetooth without leaving the application

A. ZigBee RF communication:

Zigbee protocol is the communication protocol that's used in this system. Zigbee offers 250 kbps as maximum baud rate, however, 115200 bps was used for sending and receiving as this was the highest speed that the UART of the microcontroller could be programmed to operate at. ZigBee

is a radio frequency (RF) communications standard based on IEEE 802.15.4. Figure 2 depicts the general architecture of a Zigbee based home automation network. All communication between devices propagates through the coordinator to the destination device. The wireless nature of ZigBee helps overcome the intrusive installation problem with the existing home automation systems identified earlier. The ZigBee standard theoretically provides 250kbps data rate, and as 40kbps can meet the requirements of most control systems, it is sufficient for controlling most home automation devices. The low installation and running cost offered by ZigBee helps tackle the spoken accent. These factors need to be studied further in more details by conducting more tests. The system was tested in an apartment and performed well up to 40m. With a clear line-of-sight transmission (such as in a wide open gymnasium) the reception was accurate up to 80m. Additional tests are being planned involving a bigger variety of commands.

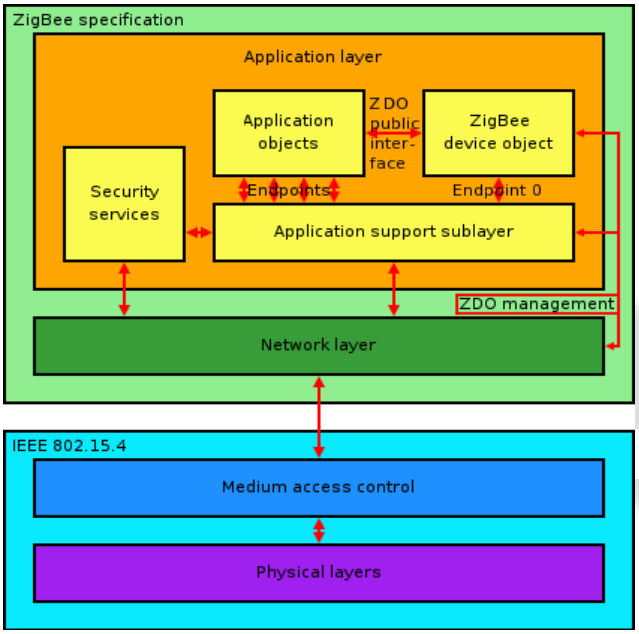

Fig. 1: ZigBee protocol

B. Voice Recognition Application:

The voice recognition application implements Microsoft speech API. The application compares incoming speech with an obtainable predefined dictionary. The Microsoft speech API run time environment relies on two main engines: Automatic Speech Recognition (ASR engine) and Text To Speech (TTS engine) as shown in Figure 8. ASR implements the Fast Fourier Transform (FFT) to compute the spectrum of the fingerprint data. Comparing the fingerprint with an existing database returns a string of the text being spoken. This string is represented by a control character that gets sent to the corresponding appliance's address. The designed graphical user interface (GUI) offers the user the choice of selecting the desired serial communication port as well as it provides a record expensive and complex architecture problems with existing home automation systems, as identified earlier.

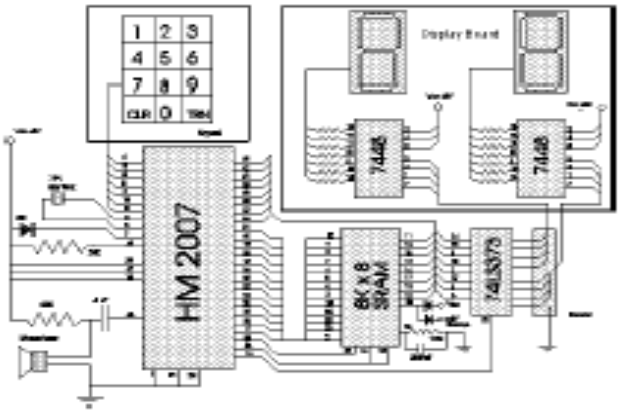

Fig. 2: Voice Recognition Application

C. Appliance Control Module:

Once the speech commands are recognised, control charterers are sent to the specified appliance address through ZigBee communication protocol. Each appliance that has to be controlled has a relay controlling circuit. The speech recognition system uses a single-chip solution for voice recognition. LD3320 is a voice chip for speech recognition based on SI-ASR (speaker-independent automatic speech recognition) technology. LD3320 has a highly effective speaker-independent speech recognition search engine module and a complete speaker-independent speech recognition feature library inside. send them serially. In order to calculate the new predicted value, the compression algorithm decodes the difference and adds it into the current predicted value.

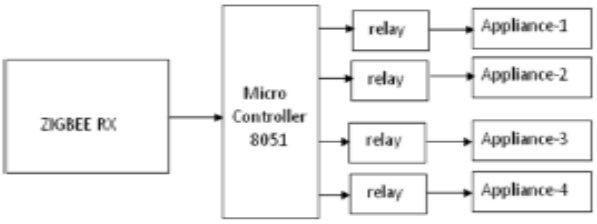

Fig. 3: Appliance Control Module

D. Remote Control:

Wireless technologies represent a rapidly emerging area of growth and importance for providing ubiquitous access to the network; WLANs based on the IEEE 802.11 standard arebeing implemented constantly in the houses and Broadband wireless (BW) is also an emerging wireless technology which is competing with Digital Subscriber Line (DSL). According to this, it makes sense that the logical direction about managing HASs in the near future is going to be by means of a remote control. But wireless technologies in domotics should be implemented carefully.

E. After considering benefits and issues:

Even with all issues related to remote-controlled HASs it seems that the benefits are just good enough to continue advancing in this field, also just recently, organizations have been formed to ensure network and device interoperability. For example, the adoption of the802.11b standard has made wireless data networks one of the hottest newcomers in the current wireless market. As a result, in one hand remote-

controlled HASs represent in Domotics a great opportunity to improve human computer interaction thanks to its ubiquitous access, but in the other hand they represent one of the most challenging environments due to involved security issues and relative complexity of portable devices.

In accordance with the objectives defined, the final system must achieve remote control, with practical interfaces involving different technologies and the different devices compatible with the selected network protocols. A useful and scalable remote-controlled HAS is produced and its functionality tested using UPnP or X-10 compatible devices. Encouraging remote control, comparing actual standards and accelerating the process of standardisation in HASs are also important factors to consider and it is necessary to use low-price materials in order to make cheap HASs commercially available, sooner, for everyone. The whole control cycle must be complete from the user selecting a control action from their remote point until the target device realizes the desired action.

III. ARDUINO

Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller. The Arduino uno is a microcontroller board based on the ATmega328. It contains everything needs to support the microcontroller, simply connect it to a computer with a USB cable or power it with battery to get started. The Arduino platform has become quite popular with people just starting out and for good reason. Unlike of most previous programmable circuits board,the Arduino does not need a separate piece of hardware(called a programmer) in order to load new code to board. You can simply use USB cable. Arduino uses simplified version of C++ making it easier to learn to programme. Finally Arduino provides standard form factor that breaks out functions of microcontroller into more accessible package.

Specifications:

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended):7-12V
- Input Voltage (limits): 6- 20V
- Digital I/O Pins: 14 (of which 6 provide PWM output
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB (ATmega328)
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

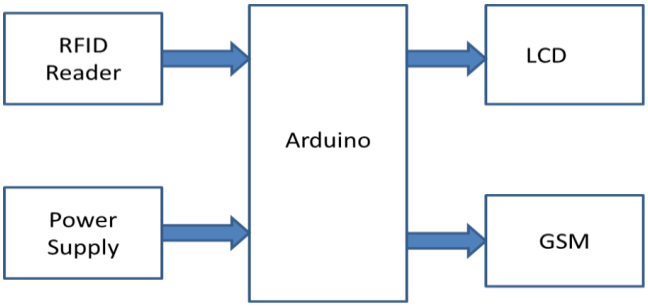

Fig. 4: Basic System Using Arduino

The programming can be like this:

- setup( ): A function present in every Arduino sketch. Run once before the loop( ) function. Often used to set pinmode to input or output. The setup( ) function looks like:
  void setup( )
  {
  //code goes here
  }
- loop( ): A function present in every single Arduino sketch. This code happens over and over again. The loop( ) is where (almost) everything happens. The one exception to this is setup( ) and variable declaration. ModKit uses another type of loop called "forever( )" which executes over Serial. The loop( ) function looks like:
  void loop( ) {
  //code goes here

IV. RASPBERRY PI

This can also be implemented from raspberry pi. block diagram is as shown.The Raspberry Pi is a low cost single-board computer which is controlled by a modified version of Debian Linux optimized for the ARM architecture.the core ofthe home automation system is this mini computer. Here we are using modelB ,700 MHz ARM processor with 512 MB RAM. The setting up of raspi consists of selecting raspbian OS from noobs package. The noobs package consists of raspbian,arclinux,pidora,open ELEC,risc OS operating system. After the os selection we need to configure raspberry-pi using Raspi-config command.we can enter into raspi desktop using startx command. Fig.

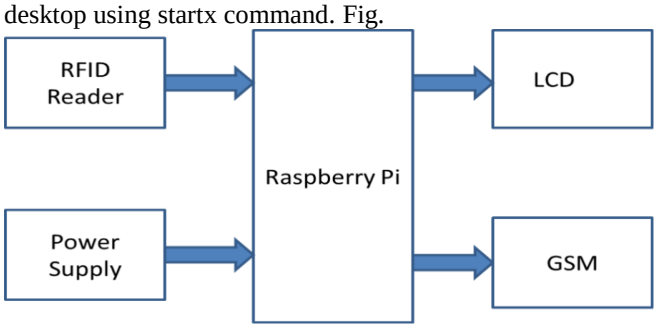

Fig. 5: Basic System Using Raspberry PI

V. FUTURE WORK

- The future work can be done in this kind of project is by using latest microcontrollers.

- This kind of project can also be implemented in MSEB for controlling the power of houses so that more of the energy get saved at greater extent.
- The proposed system can be developed and fabricated as commercial hardware package.
- The new feature can be added to this by using image processing, like whenever particular faculty comes, the projector will automatically on.

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