

Smart Home Control by using Smart Phone - Android

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Abstract— The evolution of the modern technologies in the field of electronics has brought colossal transformation in the day to day life of every human being. This change also aid to ensure autonomy to people with disabilities throughout the world. This paper precedes a smart home control system which could control household appliances remotely via smart having an android application. This android application is universal one with dynamic features. The controlling process in the home is done by using PIC microcontroller with GSM network technology. The main objective of this paper is to enhance the value of our lives by controlling home appliances in a smart way. We can assist person with disabilities by enabling them to control the home appliances while they need. It also deals with safety and security issues such as smoke detection and anti-theft respectively.

Index Terms— *Autonomy, smart home, smart phone, android, PIC, GSM*

I. INTRODUCTION

Smart Home (SH) become feasible since the early 21st Century following the epidemic introduction of electricity into the home, and the expeditious growth of information technology. In the past years, computational devices have turned faster, smaller, connected and cheaper. It brings the “intelligent house” vision, promised for decades, closer to reality. Smart home technology is amongst the convenient evolution that have been formulated yet still developing today. Smart home is a home which is furnished with unique structured wiring to facilitate occupants to remotely control an array of home appliances by conveying a command via computer or smart phone. This pervasive, intelligent home, a luxury item for many people, could have a key role in assuring the autonomy of people with disabilities. Smart home for the aged and physically challenged people can afford increased quality of life who might contrarily require caretaker or institutional care. On focusing persons with disabilities, it is important that smart home design should be dynamic, universal and easy to learn and use. In this aspect, accessibility is defined as "a condition for autonomous and safe use of space, furniture and urban facilities, buildings, transport services and devices, systems and media and information by people with disabilities or reduced mobility." [2]. The betterment of home automation systems (the smart house systems) are recorded as security, comfort, power saving etc. As this system affords these benefits, some technical requirements should be also respected such as low

cost, plug and play, flexibility, easiness of use and reliability. Smart plug enables the users to operate a appliance even from a remote location using an android UI. Control and data acquisition at the same time thus enhances the user's ability to have a greater control over his/her spending on electricity. The application(hardware and software combined) will thus increase the awareness and will alert the users about the wastage of electricity if any and thus will result in considerable savings in his/her monthly bill. The CPU for the proffered system is developed using the PIC microcontroller which is a low cost and efficient controller used in many applications. Here interface embedded system technology with the GSM technology. A call and message alert system is employed in case of detection of smoke or unauthorized unlocking of door is attempted in the smart home.

II. RELATED WORKS

Considering the phase of the art, it is conceivable to concern that the works on user interface for smart home for people with disabilities are very specialized and distinct one. There are some researches which are concentrating on elderlies, physically challenged people and psychical disabilities. This research develops a practical accessible interface to control home area networks figuring out the important requirements for a diversified group of impairments[1]. In [3] a framework for managing security & preserving privacy for analysis of sensor data from smart homes, without compromising on data utility is presented. In that paper they suggest a method to achieve data security & privacy throughout the complete data lifecycle. Neng conferred an architecture for home automation [4] which spotlight on how an integrated system control the home appliances. This system only pinpoints how to solve the home automation problems at the software level while hardware aspects were not studied. A system that could control electrical appliances using Bluetooth technology proposed by Mr. Sriskanthan in the year 2002 [2].The disadvantage of this system was that it was unable to control the system remotely through a dedicated network. The embedded system which is connected to the appliances in home is ready to receive control through bluetooth receiver. Any bluetooth enabled device (generally we use smart phone) is connected to that embedded system and send a command for controlling the home appliances.

III. PROPOSED WORK

By accounting all the merits and demerits of previous related works , few things are sorted for betterment of smart home. They are listed as

- No network area limitation
- Importance of Android application
- Android application should be user friendly, dynamic and universal
- Cost effective

As per the list the proposed system is one which control the home appliances remotely with the combination of GSM technology by using a Smart phone having an android application. the android application is dynamic one i.e. we can add or remove the appliances as per our requirement and we can edit the destination number. It is universal to all the appliances and the users.

The system is not only used to turn on/off the appliances but also used to vary the phase of the appliances i.e. for example we can vary the speed of a fan by choosing the level as per our requirement. The hardware unit also have magnetic lock and smoke detector for security and safety precautions respectively. Fig 1 shows the features of proposed methodology.

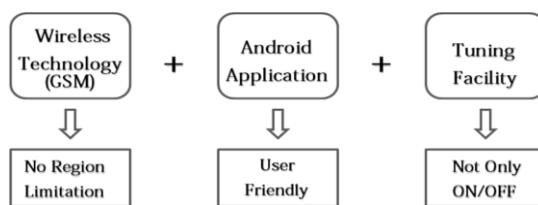


Fig 1 Features of proposed methodology

IV. SYSTEM DESCRIPTION

A. HARDWARE SECTION

In case of controlling home appliances Smart phone with android application act as transmitter and the controller kit with GSM module act as receiver. This controller kit is connected with all the required appliances.

In case of safety and security precautions such as smoke detection and magnetic door lock system, controller kit with GSM module act as transmitter and smart phone act as receiver.

1) PIC 16F877A

In this proposed design PIC16F877A act as CPU of the hardware unit. It can be programmed to bring out an enormous amount of tasks. The features of PIC16F877A is given below:

- High performance RISC CPU
- Interrupt capability (up to 14 sources).
- Power on Reset (POR).
- Low power- high speed CMOS flash/EEPROM
- Wide operating voltage range (2.0 – 5.56)volts.

- High sink/source current (25mA).

2) GSM Module

GSM (Global System for Mobile) is SIM900 Quad-band GSM / GPRS device, works on frequencies 850 MHZ/ 900 MHZ/ 1800 MHZ and 1900 MHZ. It is compatibility in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows User to directly interface with 5V Microcontrollers (PIC).

It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface. The modem can be interfaced with a Microcontroller using USART (Universal Synchronous Asynchronous Receiver and Transmitter) feature (serial communication).

3) Smart Phone

A mobile phone which achieves many of the functions of a computer, normally having a touchscreen interface, Internet accessibility, and an OS able to run the downloaded applications. In this proposed method Smart phone act as transceiver.

4) Relay

Relay is used for the switching process(On/Off) electrically. Contactor is a type of relay which is used to control the high power required to directly control a motor or other loads.

5) Smoke Sensor

Smoke sensor is a device which senses the smoke naturally an indicator of fire. The Smoke sensor is able to sense smoke particles that are too small for the naked eye. By alpha radiation, the ionization smoke detector passes through the air-filled space container, allowing flow of electrodes. However if any smoke gets inside the chamber and absorbs the alpha particles, it lowers the level of ionization, hurting the flow of electrodes, thus alert the user by alarm or messages via control unit.

B. SOFTWARE SECTION

1) Eclipse

Eclipse is an integrated development environment (IDE). It contains a base workspace and an extensible plug-in system for customizing the environment. Written mostly in Java, Eclipse can be used to develop applications. By means of various plug-ins, Eclipse may also be used to develop applications in other programming languages.

The Eclipse software development kit (SDK), which includes the Java development tools, is meant for Java developers. Android Development Tools (ADT) is a plug-in for the Eclipse IDE that is designed to provide an integrated environment in which to build Android applications. ADT extends the capabilities of Eclipse to let developers set up new Android projects, create an application UI, add packages based on the Android Framework API, debug their applications using the Android SDK tools, and export signed (or unsigned) .apk files in order to distribute their applications.

Eclipse uses plug-ins to provide all the functionality within and on top of the runtime system. Its runtime system is based on Equinox, an implementation of the OSGi core framework specification. In addition to allowing the Eclipse Platform to be extended using other programming languages, such as C and Python, the plug-in framework allows the Eclipse Platform to work with typesetting languages like Latex and networking applications such as telnet and database management systems.

2) Mikro C

The mikroC PRO for PIC is a powerful, feature-rich development tool for PIC microcontrollers. It is designed to provide the programmer with the easiest possible solution to developing applications for embedded systems, without compromising performance or control.

It is also very helpful to have access to a number of built-in libraries. These fall into three categories: Standard ANSI C, Hardware PIC-specific, and Miscellaneous. Most of the time, hardware libraries require specific hardware parts to be available inside the PIC, but in some cases it is possible to emulate its functions, like we have seen with UART. Their hardware counterparts will work better, but if the PIC does not have the necessary hardware components, all we can do is emulate them. Some libraries will not need any special PIC model (they can work with any of them), but they require some external hardware bits - for example, with the Music library you can play your songs in MIDI only if a buzzer (or other hardware component) is installed.

V. PROCESS DESCRIPTION

An android application consists of appliance's respective icons, a Level bar ,an edit menu, mobile no. display pad, send button etc. We can add/remove the appliances by selecting the add button. We can choose the icons of the respective appliances while adding This application is compact with all android smart phone user's. Fig 2 shows the screen shot of android application.

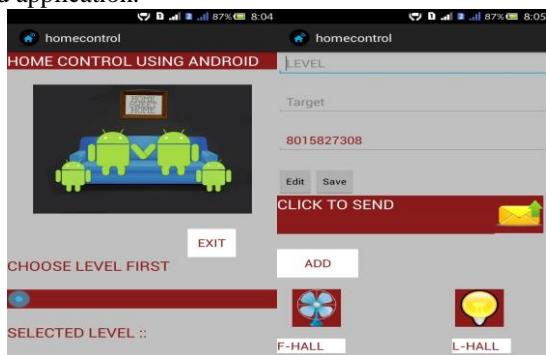


Fig 2 Screen shot of Android Application

Android application process flow chart is shown in the Fig 3. Once the level and target is selected the command will be send to the controller kit as a sms by selecting send button . If the message is delivered the task will be done else the process should be restarted.

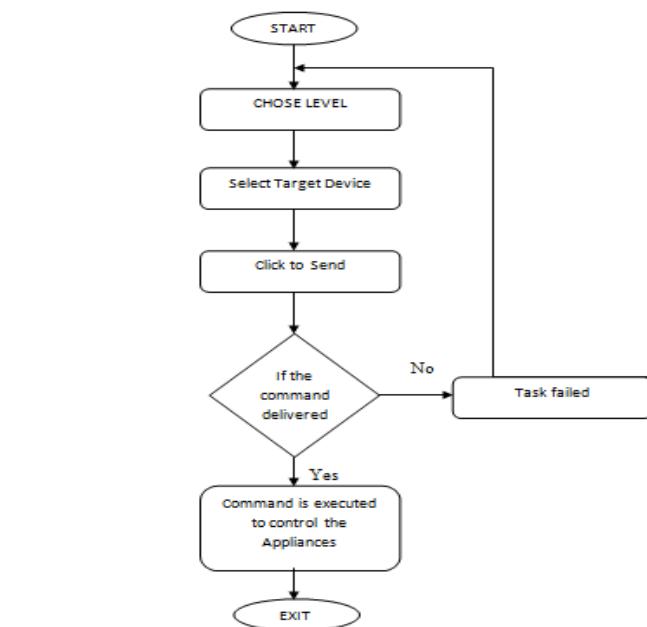


Fig 3 Process flow for android application

Once the command is received by controller kit in smart home the task will be executed as per the instruction. The message is received by the GSM module which transfers the message to PIC via MAX 232. PIC receives the command and then execute the function as given by the user . Fig 4 represents the hardware section of proposed work.



Fig 4 Hardware Section Of Proposed Work

The levels of appliances can be controlled and varied by Variac Unit. By this speed of a fan and intensity of light can be varied as per the user requirement.

In case of any smoke is detected or any unauthorized accessing of door is happened (displacement of magnetic lock on doors), an automatic call will be generated to alert the user.

VI. CONCLUSIONS AND FUTURE WORK

The ultimate goal of this paper is to enhance the value of our lives by controlling home appliances in a smart way. We can assist person with disabilities by enabling them to control the home appliances while they needed most. This android application is having some user friendly features which ensures the objective of the paper. A purposeful safety and security alert system is also employed to alert the user in tricky situations.

The future work will be focusing on the inclusion of some other necessary appliances used in our daily life and to extend some more safety/security precautions parameters to alert the user.

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