

Elderly Assistive System based on PSOC

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Abstract -This paper presents a system to assist the old age person in their day to day life. Assistive systems are gaining their importance in fast growing global elderly population. The given assistive system is an accelerated expansion of next generation smart home and assistive environment [6]. The system has two important parts, wall mounting unit and controlling unit. PSOC is the wall mounting unit which acts as the heart of the system. It incorporates programmable and reconfigurable analog and digital blocks with flexible automatic routing. PSOC provides proper interface with the sensors and controlling of the house hold appliances. The controlling unit is smart phone in which android application would be loaded [1]. The elderly assistive system will provide technological assistance for day to day activity of aged people likewise one touch emergency calling, locating things, health related checkups, controlling of home equipment's etc.

Key words: Elderly assistive system, PSOC, Smart phone, technological assistance

I. INTRODUCTION

The modern elderly assistive system provides better healthcare and improves the quality of living by providing healthy and safe environment. The remote monitoring and controlling of the different equipment's of house using personal PC becomes heavy and cannot be carried around. In this system for the purpose of communication smart phone using android operating system is used [2] [3]. The advantage of smart phone is that it can be carried easily and would be helpful to elderly people. Today our lives are totally occupied by nationally scheduled time tables. Therefore there is an urge to proceed in this direction to ease the lives by creating something very subservient. In this system there are number of correlated devices for supervising many functions inside the house. This elderly assistive system is combination of home automation system and medical monitoring system as it combines the uses of both such as controlling of house hold appliances and medical checkup such as measuring heart rate [10]. This explored application part is extremely important and will expand in future while it also provide strong way for helping and assisting essential needs of the old age and people with disabilities, for supervising and controlling the environment . In this paper, an inexpensive wireless controlled assistive technique for regulating and observing the home environment is shown [11]. A PSOC kit and an android based smart phone are used for controlling. An android app in smart phone having IP connectivity is used to access and control the appliances and other devices [7].

II. RELATED WORK

Assistive system is not a new term in science community though; it is quiet much more away from people's imagination. In recent years, Development of Elderly health care system which is public oriented attracts considerable

research interest in both academia and industry, and same time development in information and communication technologies open the new paradigm for innovation in health care segment. Thus, in this section, we provide an overview of some of the existing systems and projects, and related service composition work.

A. Gsm Based Home Automation System:

This system presents a simple, economical and adjustable GSM- ZigBee based home automation system. The entire system depends on a controller and is connected with ZigBee transceiver which communicates with every device connected with it. The mobile phone technology is used by GSM controller to communicate. The command can be sent via sms to controller with the cell phone. The system is simple to operate, and is reliable in that only pre-defined mobile numbers can function the GSM Controller [9]. The block diagram is as follows:

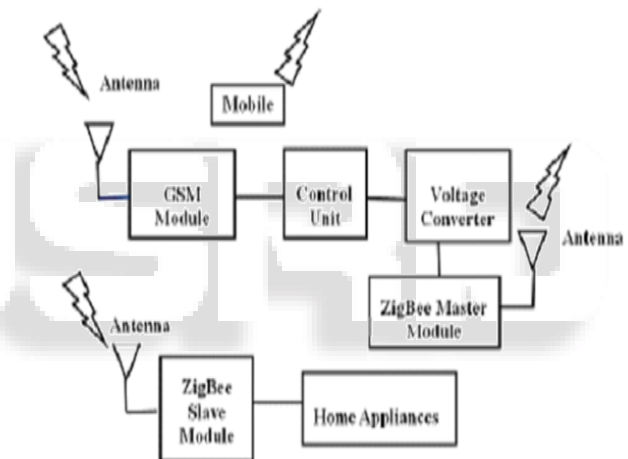


Fig. 1: GSM Based Home Automation System

B. Open Care Project:

Open care Project is basically a combination of different assistive devices into one unit. They have made different prototypes but not able to combine these entire prototypes into one, which includes customize developed phone calls, infra. Message, reminders, alerts, GPS support etc. The other prototypes of hand-over sensor communication solution, the third function include accelerometer and compiled the data to use with other sensors [5]. But all these separate unit's needs to become single solution, which is the objective of the project.

C. Bluetooth Based Home Automation System:

Bluetooth abilities are fine and many of present laptop/notebook, tablets and mobile phones have an integrated adapter that will incidentally reduce the cost of the system [12]. But it associates the control to inside the Bluetooth range of the domain while majority of the other systems are not too viable to be executed as inexpensive solution.

III. SYSTEM ARCHITECTURE

This system is one complete solution for old age which helps them to live independently in their own homes. It will be very easy for their love ones to monitor them. Following figure shows the block diagram of assistive system

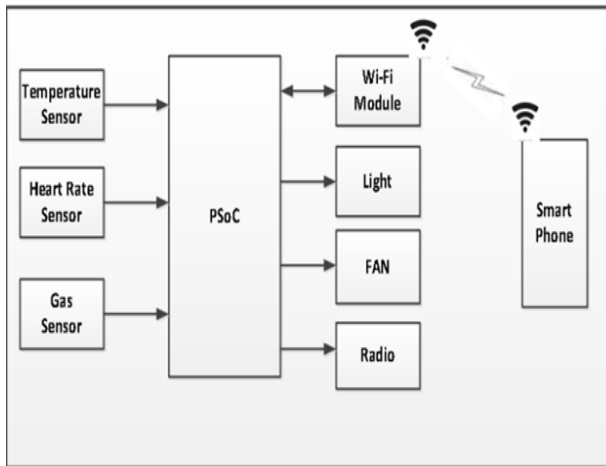


Fig. 2: Block Diagram of Elderly Assistive System

The given system is designed in such a way to avoid limitations of existing systems. The given system provides more pliability, comfort capability and safety. The given elderly assistive system is operating with immensely popular android phones. The three main components of system are, the android enabled user device, a Wi-Fi module having a good scalable range, and a PSoC board. Here the users can control different devices through android enabled device. The commands from the user will be transferred by the Wi-Fi network. The PSoC board is configured according to different requirements and will function as per user request. The serial data coming from Wi-Fi unit is connected to PSoC. The core of the home automation system is made up of PSoC board and it can be considered as small computer capable of doing various functions. This project mainly consists of following modules:

- User Interface
- Wi-Fi Router Configuration
- PSoC 4
- Relay Board
- Appliances
- Sensors

The role of above modules is explained below:

A. User Interface:

All the things that the user can see and interact with are a user interface. The control of whole system is made by android based smart phone. Android imparts many built in UI elements like structured layout objects and UI controls that permits you to build the graphical user interface for your app [9]. Android also has many other UI modules for specific interfaces such as notifications and menus. The user should be able to control and view the device with this interface.

B. Wi-Fi Router Configuration:

The Wi-Fi unit gives an environment for communication. It can be also being used for security service [4]. The Wi-Fi should be configured with a definite address and by Wi-Fi unit user commands would be directed. The sudo

nano/etc/network/interfaces comment can be used for configuring Wi-Fi with PSoC.

C. PSoC4:

It is the heart of the system. The PSoC board is configured according to different requirements and will function as per user request. PSoC 4 architecture is scalable and reconfigurable platform with an ARM Cortex-M0 CPU. It incorporates programmable and re-configurable analog and digital blocks with automatic routing. The Wi-Fi module, sensors and home automation appliances are connected with it. It has I2C, SPI, UART and up to 32 GPIOs.

D. Relay Board:

A relay is an electrically controlled switch. Relays are used where it is mandatory to monitor a circuit by a low-power signal (with entire electrical separation between control and controlled circuits). In this system the output from PSoC is directly given to relay circuit. According to the out, corresponding relay will turn on and makes its device working. In this project four channel relay board is used.

E. Sensors:

The different types of the sensors used are combustible gas detection sensor, temperature measurement sensor, heart rate measurement sensor. All this sensors are interfaced with PSoC board. The gas sensor will recognize the leakage of gas inside the house and if found any leakage will indicate with a message. The room temperature would be indicated by temperature sensor [8]. The heart beat sensor calculates the heart beat when a finger is placed over it. It uses the concept of light modulation by blood flow through finger at each pulse.

IV. IMPLEMENTATION

A. Graphical User Interface:

The Application is developed in eclipse after installing the adk (Android Development Kit) plug-in. For hassle-free debugging AVD (Android virtual device) is used as application can be loaded on it from eclipses it-self with a single click and there no need of carrying an actual device all the time.

The GUI contains five modules

- 1) Home Screen (contains access to below listed modules)
- 2) Phone (Make a call to pre-stored numbers)
- 3) Locator (Locate necessary things like spectacle or pillbox)
- 4) Home Automation (control electrical appliances)
- 5) Sensors (Measures different parameters)

B. Emulator:

Fig. 3 shows the emulator which has been used to run the android app for testing on computer itself and latest version of android is used. As per need of the different mode customize applications needs to be developed and tested with the help of such emulators.



Fig. 3: Emulator

C. Home Screen:

Home screen of application designed featuring large icon for proper visibility. Here we can see the different apps which assist elderly to perform various functions. The home screen of the application is as shown in Fig. 4. Here we can see the different modes such as controlling of home appliances, entertainment mode, emergency calling, locator mode, sensor mode



Fig. 4: Home Screen of Application

V. CONCLUSION

The system lends itself to be a promising technology for developing smart and cost-effective solutions for EHA applications. It excels in revealing the context awareness of ongoing EHA situations through interactions of human users with the environment. It supports the sensing, predicting, and reasoning of assistive actions by taking advantage of a priori knowledge about solved cases to meet the elderly needs in a smart home environment. The concept implies a unique perspective for home control, security, safety, and comfort Services, specifically geared toward the elderly.

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