HELP-O-BOT: A SMART HOME AND COMPANION ROBOT

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Abstract: An assistive robot which not only provides company but also performs home automation, with elder friendly interaction is proposed. The proposed Help-O-Bot can detect and prevent fire. It can alert and avert gas leakage by gas sensor. It also conserves electricity by controlling the home lighting system. It keeps the elderly person updated about date and time. It also provides interactive reminders of special days and specifies the medicine needed to be taken at the appropriate time. It can navigate around the house with the person living in it and provide guidance as to where he/she is and what needs to be done in that area. In short, it is a safe replacement for a human caretaker and an economical replacement for the otherwise complicated and costly home automation system. It is a robot which not only provides elder assistance but also provides home automation in an elder-friendly way.

Keywords: Home automation, Gas sensor, inter active reminder

I. INTRODUCTION

Assistive robots in "smart-home" environments have been suggested as a possible cost and care solution to demographics changes characterized by an increasing elderly population [1], [2]. The vision is that service robots are available in the home to help and assist elderly residents. Furthermore, the robot might also motivate and provide active support in terms of rabblement defined as "Support people 'to do' rather than 'doing to / for people"' [3] and co-learning working together to achieve a particular goal.

Thus, the assistive robot and the person form a partnership which is ever changing and evolving to meet the changing needs of the elderly person as they age, the robot effectively becoming a trusted companion to the person. We define this mechanism of providing support, assistance, and active engagement over time as personalization. This paper describes an approach to service robot personalization based on end-user robot teaching and learning designed to be used by carers, relatives, and elderly persons themselves. Personalization has been shown in longitudinal studies to reinforce rapport, cooperation, and engagement with a robot.

II. LITERATURE SURVEY

The Figure below shows Basic Architecture of Remote Homeautomation.

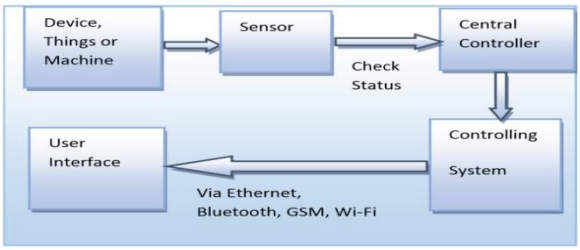

Fig 1: Basic block diagram of home automation

The Home automation system that uses Wi-Fi technology [1]. System consists of three main components; web server, which presents system core that controls, and monitors users' home and hardware interface module(Arduino PCB (ready-made), Wi-Fi shield PCB, 3 input alarms PCB, and 3 output actuators PCB.), which provides appropriate interface to sensors and actuator of home automation system. The System is better from the scalability and flexibility point of view than the commercially available home automation systems. The User may use the same technology to login to the server web based application. .If server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser. The application has been developed based on the android system [2]. An interface card has been developed to assure communication between the remote user, server, raspberry pi card and the home Appliances. The application has been installed on an android Smartphone, a web server, and a raspberry pi card to control the shutter of windows. Android application on a smartphone issue command to raspberry pi card. An interface card has been realized to update signals between the actuator sensors and the raspberry pi card. Cloud-based home appliance monitoring and controlling System. Design and implement a home gateway to collect metadata from home appliances and send to the cloud-based data server to store on HDFS (Hadoop Distributed File System), process them using MapReduce and use to provide a monitoring function to Remote user [3].

III. HARDWARE SYSTEM

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

LPC2148 µC: The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embed- ded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For criti- cal code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power con- sumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, pro- tocol converters and embedded soft modems as well as many other general-purpose applications.

Liquid-crystal display (**LCD**): It is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available

to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

Temperature sensor: A thermistor is a type of resistor whose resistance is dependent on temperature. Thermistors are widely used as inrush current limiter, temperature sensors (NTC type typically), self-resetting over current protectors, and self-regulating heating elements. The TMP103 is a digital output temperature sensor in a four-ball wafer chip-scale package (WCSP). The TMP103 is capable of reading temperatures to a resolution of 1°C.

Ultrasonic sensor: The sensor is primarily intended to be used in security systems for detection of moving objects, but can be effectively involved in intelligent children's toys, automatic door opening devices, and sports training and contact-less-speed measurement equipment. Infrared sensors are characterized by high sensitivity, low cost and are widely used. But, these sensors can generate false alarm signals if heating systems are active or temperature change speed exceeds some threshold level. Moreover, infrared sensors appreciably lose sensitivity if small insects penetrate the sensor lens. Ultrasound motion detection sensors are characterized by small power consumption, suitable cost and high sensitivity. That it why this kind of sensor is commonly used in home, office and car security systems. Existing ultrasound sensors consist of multiple passive and active components and are relatively complicated for production and testing. Sensors often times require a laborious tuning process.

Gas sensor(MQ2) : Gas sensor is used to detect any leakage of smoke and any hazardous gases such that an alarm can be initiated to avoid any damages in the industries. These sensors are also used in many applications like corporate and in any office work areas these are linked to fire alarms and buzzers through the micro-controller.

There are two main types of gas detectors: Ionization detectors and photoelectric detectors. A smoke alarm uses one or both methods, sometimes plus a heat detector, to warn of a fire.

LDR:LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. The animation opposite shows that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it. This is an example of a light sensor circuit: When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED lights on. The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive.

IV. METHODOLOGY

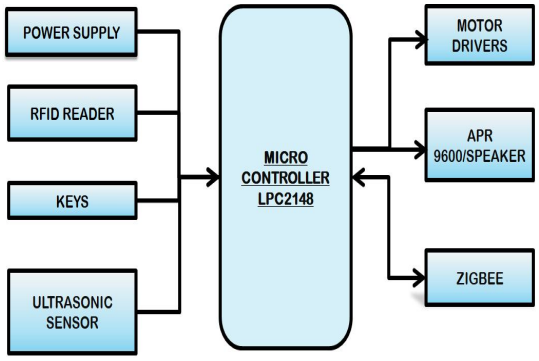

Fig:2: Remote Section

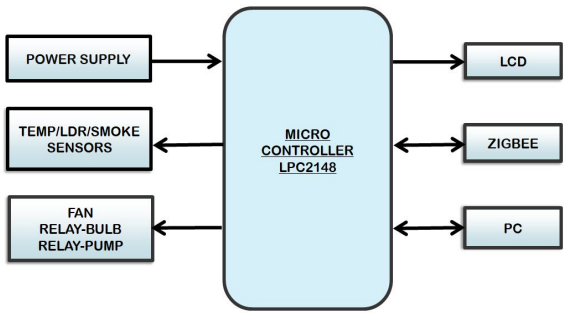

Fig:3: Indoor section

This project consists of two parts: transmitter and receiver. A transmitter part is the device mounted on the robot module. The RFID reader reads the information from the tags and gives the information from transmitter to receiver section through Zigbee. By using ultrasonic sensor, obstacles are detected and motors are stopped. Also, keys are used for controlling the motors. From wireless sensors we obtain the values of temperature, smoke and LDR. If the sensor values exceed the specified threshold value then corresponding devices will ON. The data is also stored on the PC in the receiver section.

FLOW CHART OF HELP-O-BOT

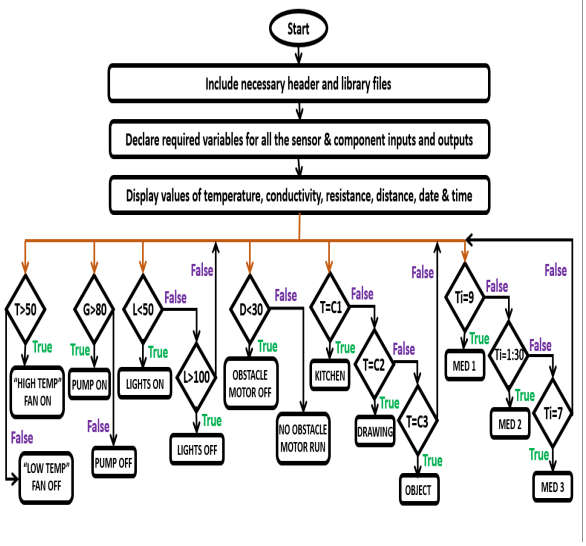

Figure 4: Flowchart for Help- O-Bot operation

Initially, the necessary header and library files are included. Various constants and variables are declared with appropriate datatypes. The brown line indicates the infinite loop. If the temperature sensor (Temp)crosses the specified threshold of 50^0 C then the respective cooling system turns on with a temperature alert message on the LCD. If the gas sensor(G=gas) falls below the specified threshold of 80 μS/cm then the respective cooling system turns on with a gas leak alert message on the LCD. If the ultrasonic sensor (D=distance)detects an object with a 30cm proximity, it stops the motor and declares the presence of an obstacle. If the lightdependant resistor(L=LDR) crosses the specifed threshold value of 50Ω light turns ON.The RFID module is used with tags(T=tags) in prominent areas of the home to guide the elder as to where they are within the home. It provides voice assist stating the room they are currently in. The real time clock(Ti=time) is used to convey the date and time. It is also used to trigger the interactive reminder which mentions the time and appropriate medication to be taken at the moment.

Help-o-bot robot setup

Figure 5: Hardware setup for receiver module

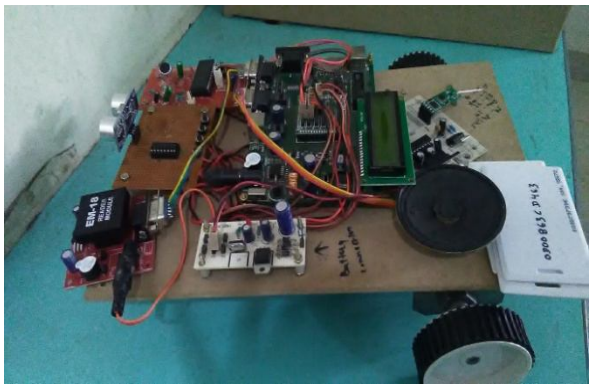

Figure6: Hardware setup for transmitter module or section

V. CONCLUSION

We have described a robot personalization system designed to be used by persons operating in assistive environments in smart homes, typically carers, relatives or the elderly person themselves. This approach avoids the complexity of robot behavior generation for a large set of tasks which we believe would be required by such persons, clearly however more complex tasks would still need technical personnel involvement.

- ✓ The robot has achieved end user personalization
- ✓ Helps in keeping track of mental & physical state of the person
- ✓ Helps in daily chores.

VI. REFERENCES

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