Home Automation For Visually Challenged

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Abstract:*In comparison to the last decade, our lives have been drastically changed by technology. This has increased the quality of life and the next step of this evolution is the home automation. Home automation is the cornerstone to improve the quality of life for visually challenged individuals as home automation can be used with various methods of input such as voice. We have focused on this specific demographic and pursued development in this field. With the help of Arduinos and voice-controlled operations, we can help visually challenged individuals feel more at home, at their own homes and do things which may not come as easily to them.*

I. Introduction

1.1 Problem Statement

Conventional wall switches are located in different parts of a house and thus necessitates manual operations like to switch on or off these switches to control various appliances, thus becoming virtually impossible to keep track of appliances that are running and also to monitor their performances and IoT based Home Automation System helps to bridge this gap.

1.2 Aims & Objectives

Home automation is to control or monitorsignals from different appliances orbasic services. A smart phone can be used to control or monitor the home automation system. The main objective of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving wireless controlled switches. Home appliances are being operated here by developing a home automation system with Android application controlled remote.

II. Literature Review

2.1 Wirelesshomeautomation technology using internet of things (IOT)[6] [7]

This paper mainly emphasizes on fast emerging technology which involves interaction among things through interface without human interface. It represents an affordable and flexible home control system using an Arduino, web server with IP connectivity for interacting with devices and appliances remote control it also provides reminders, voice control functionality. Various wireless technologies that can support some form of remote data transfer sensing and control such as Bluetooth, Wi-Fi, RFID, cellular networks have been utilized to embed various levels of intelligence in the home. The studies have also presented Bluetooth based home automation systems using smart phones without the internet controllability. A GSM and Zigbee based communication and control for home appliances has also been presented where the device is connected to a Zigbee transceiver and it communicates each and every node present inside home. For a GSM, command can be sent via SMS to the controller which in turn interprets the command and then activates the required switch to control the electrical item. The proposed system for this paper, which uses wireless technology for automated home comprises of 3 main components i.e. Arduino, web server and a smart phone application. Suggested in this paper is a novel architecture for low cost and flexible home control and monitoring system using a smart phone. A smart phone can be used to control different device using a web server. Many different features like voice controlling enables users a sense of comfort as no direct operation with the home automation system is required. This proposed system also benefits as it reduces wiring by using wireless network.

2.2. Smarthomeautomation based on IOT using ArduinoMega[2] [3]

In the advancement of technology controlling and monitoring electrical appliances using laptop, computer with the help of internet connection is possible.Using internet of things, we can control various homes, university or industrial appliances anywhere in the world. The main objective of IOT is to help specially challenged people, old people to control electrical appliances and security purposes.There are two ways to access this process, Wi-Fi connectivity or it is connected to a router. This paper enables technologies like RFID, Near-Field communication. RFIDwas dominant technologies in 2000s. Later NFC became common in smartphone as during the early 2010s with users such as readily NFC tags for access to public transformation. This paper also introduces more technologies like optical tags, quick response codes. This is used for low cost tagging and the phone cameras decode QR code using image processing techniques. This paper also introduces to more technologies like the Zigbee, Z-wave and LTE-Advanced. The proposed system here comprises of a computer server with an internet connection a modern connecting the server to the neutral network, an Arduino microcontroller with the hardwired applications connected to the devices. This paper describes various components and technologies used in a prototype system to monitor and control appliances and devices remotely using a mobile phone. The paper intends to bring us a step closer towards a smart home where all appliances and devices are efficiently controlled and monitored remotely. This project also brings up a number of possible extensions to this work such as: support multimedia devices and services through Multimedia Messaging Service (MMS); external wireless coverage within the home through a mix of Bluetooth and Wi-Fi technologies.

2.3. InternetofThings: Smart Things[5] [8]

This paper explains us about the smart things, that are things which have embed smartness or intelligence, identification, automation, monitoring and controlling caliber. This paper exhibits systematically on internet, things and then explores on internet of things and then finally smart things from researcher's and corporate's perspective. This article focuses on the state of smart things and its applications. This paper defines internet of things as an open and comprehensive network of intelligent objects, that have the capacity to auto-organize, share information, resources and data, reacting and acting in face situations changes in the environment. This paper conceptualizes four architectural layers of smart things: which connect to the smart things hub which acts as a gateway for getting events and messages to or from the cloud. which provides the abstraction and intelligence layers as used as the web services that support presentation layer which provides presentation layer for smart things in the form of mobile application and our web IDE. The concept wasn't named until 1999, the internet of things has been in development for decades. This paper also focuses on a report, entitled as internet of things which has predicted that there could be up to 16 billion connected devices by the year 2020 with an average of nearly 6 devices for every person on the planet. It also introduces us to a new concept called sterling with which one could track entire existence of an object from the time, it was made. Smart things help us to focus more on terms of development, deployment, architectural, global level standardization and ethical issues.

2.4.Androidbasedhomeautomationsystem using Bluetooth[1] [4]

This paper is about home automation system which has 3 components; an Arduino microcontroller, a Bluetooth module for signal transfers and an android smartphone. Now this system also supports voice command for naïve users with command sensing, the paper focuses on features and design based in standalone Arduino BT board and the appliances connected to this board use relays. The main aim of this system development project is to be low cost and scalable according to the requirements. The paper sheds light over the features such as voice commands, smart speech sense, scheduler, LPG leakage detection, that makes it conventional system with total efficiency. With the smart speech sense, the users won't be restricted to use any particular set of commands. Since it is Bluetooth based, is wireless and hence, flexible in cost. The project has specific set of sensors that helps it in detecting LPG leakage, intrusion detection or fire breakout. Adding to its security this project also contains special features of authentication from which difference users are presented with us actions for handling appliances.This system ensures compatibility with all types of appliances and does not require any special appliance. Depending upon various BT varies system may have them in variety.

2.5.Cloudbasedhomemonitoringandautomation system[4] [7]

This paper presents a cloud based low cost home automation system implemented using the Digilent chip kit Uno 32 and Arduino Uno. This also proves the concept of monitoring and controlling a home remotely from anywhere in the world via internet. The remote monitoring aspect of this project demonstrates the ability of being able to know the happenings at home which can be used for control and safety. It also has a very large scope and can be integrated with many other systems like smart appliances at home. This paper brings us across the Sky Link Home Smart Center AM-100A and advanced home controllers like the ISY994; that operates only

with INSETON devices. This project was mainly inspired by the fact that integrated home automation systems today are expensive in terms of installation and regular maintenance. The proposed prototype at this project aims to use as few resources as possible to demonstrate a simple and low cost connected home. A PIC32MX320F128H microcontroller was used as the base node and ATMEGA328 was used to demonstrate a room connected to the base node via RF. The implemented system consists of ChipKITUno 32 and with a Wi-Fi shield. The sensors connected to ChipKITUno 32 communicates values to the cloud and the readings are published to the Exosite server for remote monitoring. This prototype is a starting point for development of a plug and play system whenever user need not buy devices that are compatible with home automation. Using development boards with more resources can even allow addition of alternative interfaces like an LCD module. Ideally, the end solution provided should be customizable based on the cost and the features the customer wants.

III. Proposed System

Home Automation for Visually Challenged proposes to make the life of visually impaired people easy. Even for performing basic day to day tasks like switching various gadgets and devices on/off they have to take immense efforts. Therefore, using this system the project aims to give them enough control to use these devices without much hassle. They will be able to control these devices using voice commands passed to the mobile app even without being able to see the mobile application.

The figure below depicts the flow of Home Automation for Visually Challenged. In the above system there are various modules which when put together enables the system to work. The various modules in the system block diagram are Mobile Application, Bluetooth/Wi-fi Module, Arduino and the various devices which needs to be controlled using the Arduino and the mobile application. The user in this case is considered to be visually impaired. Since the user cannot see the mobile application, they will launch the application using gesture control. This gives the ability to the user to launch the application even without looking at it. After the application is launched, it will ask the user to give voice commands to perform various tasks like switching the lights,fans,etc. on/off. The project uses an Android application which will be able to read voice commands and perform the tasks accordingly. Arduino is the microcontroller which will be responsible for controlling various devices depending on the commands given by the mobile applications. Wi-fi is the most important module as the project is based in IoT of devices. The Wi-fi will enable the communication between the Mobile application and the Arduino which is going to control various devices. The Wi-fi module enable the user and the actual setup to be at major distances and still allow to use the system efficiently. These devices are controlled by Arduino based on the voice commands sent through the mobile application and through enablingthe user to use various devices.
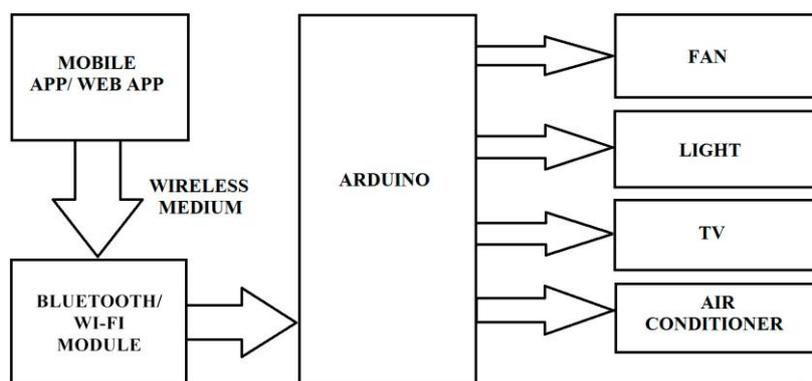

Fig 3.1 System Block Diagram

IV. Methodology

The project aims to enable seamless connectivity of the visually impaired users with day to day household electronic devices.
The process is divided into three parts

1. Gesture recognition
2. Voice Command Deciphering
3. Command Execution

4.1 Gesture Recognition
This is the first part of the process. The user launches the application via gestures on a locked phone. This allows the user to communicate with the devices without having to visually interact with the phone.

4.2   Voice Command Deciphering

After the application is launched, the voice command is the second level of communication with of the user and the phone. This communication enables the application to decipher the queries sent by the user to the phone via microphones on the phone. The voice command is divided into two critical sections: The first being the object(device) and the second being the function to be performed. e.g.Turn on the fan. Here the keywords are ON and FAN. The object being the fan and the function being ON. The functions operate like a binary output like 1&0 i.e. 1 is ON and 0 is OFF. Once these commands are read by the application, they are ready to be executed. The application is connected to the devices remotely via a Wi-fi module attached on an Arduino Uno board. This Arduino is capable of interacting with multiple devices via a switchboard. The Arduino acts as an intermediary between the power outlet and the devices.

4.3   Command Execution

After receiving the command from the application via the Wi-fi module the Arduino executes the commands via binary operations of on and off. After command is executed an acknowledgment is sent back to the application and output via a voice command tells the user that the function has been executed.

V. Conclusion

Thus, Home Automation for Visually Challenge will benefit theones who are actually in need of it and help them to have easy access to day to day tasks making their life easier. The well-established modules will be put together to develop a strong system. A home automation system will be developed which will be able to control various devices using voice commands.

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