Survey on Home Automation with Voice Authentication using IoT

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ABSTRACT:

The aim of this project is to demonstrate the implementation of voice command based automation system on Raspberry Pi that can perform various tasks or services for an individual especially for disables by speech recognition and device control. It based on the concepts of Internet of Things, Speech Recognition, Natural Language Processing, Machine Learning and Artificial Intelligence. The proposed system is different from other currently implemented systems as this system comes with voice authentication of person so only registered people can give command to assistant. The smart devices and sensors in home automation helps to collect (or sense) the physical experience and convert it into information data. The Raspberry Pi collects data from sensors or takes in speech commands and interprets them to manage household devices like fan, light, television.

Keywords- Speech Recognition, Artificial Intelligence, Voice Authorization, Machine Learning, Raspberry Pi, Home Automation.

I. INTRODUCTION:

Home automation is quite a hot debate and has a high demand due to the helping nature of the technology for handicapped, paralyzed and older people. The home automation system improves the living standards and also helps the elderly people. The major element of home automation based on IoT is the Raspberry Pi. Modern houses are mostly shifting from switches to centralized control system, which involves wirelessly controlled switches [2].

Speech recognition is one of the most complex areas of computer science and partly because of it's interdisciplinary. Speech is naturally dynamic in nature. There are many approaches used in speech recognition namely artificial neural networks (ANN), pattern recognition, language modeling and statistical analysis[1]. In the basic model of speech recognition preprocessing, feature extraction and modeling is performed.

Currently many systems are implemented for home automation with speech recognition [4]. In these systems any person can give commands to do particular tasks which do not fulfill the exact meaning of personal assistance. Caretakers sometimes misses there tasks of giving medicines on time which will cause so many serious problems related to health of old people. Old people really need the automation of home appliances because of their inabilities of doing tasks or frequent movement. So our proposed system is allowing only for authorized person to give commands and this will give us complete personal caretaker.

Voice searching is a method of search which allows users to search using spoken voice commands rather than typing. The search can be done on any device with a voice input.

There are two types of voice recognition systems: [5] Text Dependent: This requires speaker to say predetermined words/ phrase, which is pass phrase. Pass phrase is compared to a sample captured during enrollment. Text Independent: these systems are trained to recognize a person without pass phrase. It depends on persons vocal characteristics such as pitch, cadence and tone.

Voice Commands Analysis and Classification: There are so many algorithms are present for data analysis and classification. KNN algorithm is used for analyzing frequent commands on similar period

of time and date. These commands include daily dose of medicine wakeup time, sleep time, setting alarm for these frequent activities is done by use of various classification algorithms. These algorithms helps in making automatic decisions.

II. LITERATURE SURVEY:

Home automation is currently hot sub-domain of IoT for research and implementation. So many research and implementations are taken place in market. Smart Home Automation System using IR, Bluetooth, GSM and Android [8]. In this paper a home automation system that uses IR remote, Bluetooth and GSM to control AC appliances using android app is introduced that is easy to use over the traditional method of the switch. Therefore, the motivation behind the development of this system is to let people know about these technologies, and make the system as simple as possible for an ordinary person to understand. This proposed system[8] results in the implementation of home automation system which involves control and automation of home appliances through mobile application from remote locations. The limitations of this system are more processing time and unauthorized person can have access of system.

Voice Based Home Automation using Raspberry Pi and Echo-Dot[7]. In this paper home automation system is implemented with the help Google assistant, Raspberry Pi, web camera and computer device. This system mainly focuses on detection of unknown person in the home with the help of web camera. In addition to this, by including a security device such as web camera and telegram, the user gets an alert regarding the unknown person in the home. The user gets the video message about the detected person and can authenticate to unlock the door using telegram. [7] Limitations of this system are system depends on Google assistance, so in offline mode this system fails and voice identification was missing.

III. METHODOLOGY

To implement the above goals, the following methodology is followed:

1. Understanding the dynamics of each part of the system
2. Determination of proposed system's hardware and software requirements.
3. System is initiated by installing our created module on Raspberry Pi.
4. User Authorization of face and voice using image processing and voice matching with local database.
5. Smart Home Automation based on user's commands.
6. User's Analysis of frequent commands on time and event basis, generation of frequent patterns.
7. Based on Analysis, making system to take automatic decisions of such as device control, setting alarm for events.
8. Acknowledgment in case controlling from remote location.
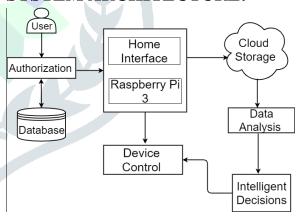
SYSTEM ARCHITECTURE:

Fig 1.1: Proposed System Architecture

IV. WORKING PRINCIPLE:

In this proposed system we are using Raspberry Pi 3 as a main controlling device. When User enters the room system will detect presence of user through physical sensor [8] located inside room and system will get start. With the help of camera module located inside the room, system will check for the authorization of person. After the face recognition module is complete system will starts

its voice command acceptance module. System will match the received voice with the voice which is stored in the database if the voice is matched then system will start accepting commands for controlling home appliances. Commands will be matched with the local database and appropriate action will be performed for controlling the devices. After successful device controlling action is performed then its entry is stored on to the cloud. These entries are analyzed on particular time intervals. Data classification algorithms are applied on these recorded datasets. Based on the results of classification algorithms, some related frequent patterns of datasets are generated. These patterns will help in making decisions for automatic device control. Older people daily medicine time, lunch time, managing light on off based on their wakeup, sleeping time there are the major application areas where this proposed system helps in making decisions based on user's daily routine.

In case remote access of device, user can get every device's status through cloud stored its status, and form remote location also user can control home appliances. In case of emergency situation for older immediate notification to their beloved once, hospitals can be send through phone call or email. Health module, Calendar module, Automation and manual module is developed for easy user experience and smooth working of system.

Fig 1.2: Working module of System.

V. ADVANTAGES:

- Disabled, old aged people can control home appliances with simple voice command.
- Only Authorized person can control home appliances which is unique feature.

- Frequent commands analysis for easy and home automation
- Remote location access and acknowledgment about devices given with help of Email.

V. APPLICATIONS:

- Home Automation for disabled people.
- Intelligent automation based in users pervious behavioral data.
- Caretaker for old people.

VI. CONCLUSION:

Smart Home Automation System is implemented with help of our created voice command based device on Raspberry Pi. Experiments have been conducted to analyze system recognition of registered voice over the system. Our proposed system works only if authorized person gives the voice command. Therefore our aim of developing complete personal caretaker for elder, paralyzed, disabled people as a friend to them is achieved. System performs all home automation tasks intelligently as per the user's need. Based on user's frequent behavior system adjust itself to do smart automation as per the user need like turning on light before some time interval of alarm so that user can wake up.

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