Appliance Control System for Blind People using Machine Learning

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Abstract - *Home Automation is nothing but to control home appliances using smart technologies. This system aims to enhance the home automation experience by collecting usage data from the user and applying prediction algorithms on it to predict the next step the user may take. Machine learning is a data analytics technique that teaches computers to do what comes naturally to humans: learn from experience. Hand gestures are one of the natural ways to understand the human language. To provide satisfactory results we are going to introduce a system "Smart Home Appliance Control System for Blind People Using Machine Learning". This system is based on machine learning. Our system's goal is to make blind people's lives easy and comfortable by providing them with a self-dependable environment. This is a monitoring system based on Kinect sensors to control the appliances. This system will be built to control the electric appliances like light and fan. It will follow and use various machine algorithms. The purpose of the system is to help blind people on their own and live without disturbing others. The input given to the system will be a physical action (various gestures). It consists of both hardware and software. It is different than IoT. There will be no use of any smart phone.*

Key Words: *Smart Home, Hand Gestures, Body Movement, Machine Learning, Kinect Sensor*

1. INTRODUCTION

Gesture and speech recognition technologies, a couple of years back, were deemed as futuristic concepts. Recently those technologies have rapidly advanced with software and hardware technologies and have integrated with speech and gesture. These technologies will offer the facility for people to enhance their lives comfort. The proposed system is specially focusing not only on normal people but also on people who need an external aid for their lives. **[**

The primary objective of automation is to make peoples life easier. Everyone can benefit from its ability to allow appliances to communicate with one another, as well as its capability for letting the homeowner manage everything around the building remotely or via an electronic device. However, people who are living with a disability are able to especially benefit from an automation system. Whether you or your family member has difficulties with their vision, mobility or memory, having a home automation system within the property can make life considerably simpler.

Because you can set your oven, for instance, to switch off if it has been left on for longer than a certain amount of time; you reduce the risk of causing a fire. The same can applied for any other electronic appliance around the home: taps, toasters, hair straighteners, etc. It also allows you to minimize the use of energy and cut costs around the home. Similarly, these appliances can be controlled remotely so, if you gave a family member or close friend access to your home electronics, they could turn off an appliance for you from their smartphone or tablet. Technology aims to solve many of the problems people have in their everyday lives. For people with disabilities, a home automation system can be an invaluable tool for making simple tasks easier.

This system deals with identifying the hand gestures by using Kinect sensor and using these actions system will control various gadgets around us. The main motive is to create more interaction with human and machine in a natural, intuitive and seamless manner. To build this system there is need of different types of algorithm like Skeleton-tracking, Normalization and 3D Euclidean distance algorithm. Researchers have successfully implemented this system in various fields with high accuracy and impact using a highly feasible system. But our system is based on Kinect sensor and more useful to physically challenged peoples.

2. LITERATURE SURVEY

Paper-1: In year 2009, the authors Gonzalo Pomboza-Junez and Juan A. Holgado-Terriza. Proposed a system named as "Control of Home Devices based on Hand Gestures". This paper describes the architectural model of a system that addresses these interfaces to control home automation systems. An armband for gestural capture called MYO is selected in this case. This device combines the measurement of electrical activity produced by the movement of forearm and hand muscles in order to detect the hand gesture, but it is also able to capture the orientation and rotation of the movement. Finally, a study is performed of its application [1]

Paper-2: In year 2009, the authors Gill, S.H, Yao et al. proposed a system named as "A Zigbee Based Home Automation System". In this system the authors used new communication technology like Zigbee. Zigbee is nothing but a wireless standard network used for Remote Control Products. [2]

Paper-3: In year 2011, the authors Piyare, Tazil et al. proposed a system named as "Bluetooth Based Home Automation System Using Cellphone". This system used Bluetooth for communication and implemented using various Bluetooth protocols. It was applicable for short range distances. [3]

Paper-4: In year 2012, the author H.Guesgen proposed a system named as Gestural Control of Household Appliances for the Physically Impaired. This system proposed that contribution in Gestural control of household appliances for the physically impaired. [6]

Paper-5: In year 2012, the authors Daniel Martinez Capilla. Proposed a system named as "Sign Language Translator using Microsoft Kinect XBOX 360TM". The goal of the project consists of developing an automatic sign language translator so that a computer will output the corresponding word to a sign executed by a deaf user in front of a camera. Several works have been proposed previously and they mostly make use of probabilistic models such as Hidden Markov Models or Artificial Neural Networks classifiers. [4]

Paper-6: In year 2013, the authors Asma Ben Hadj Mohamed and Juan A. Holgado-Terriza. Proposed a system named as "Assisting people with disabilities through Kinect sensors into a smart house". In this paper, we propose a monitoring system based on Kinect sensors to control and monitor elderly people into a smart house. The system recognizes gestures and communicates them through a network. We test some hand gestures and how it can be recognized with this sensor. [13]

Paper-7: In year 2013, the authors Ahmed M. Elshafee and Karim Alaa Hamed. Proposed a system named as "Design and Implementation of a WiFi Based Home Automation System". This paper presents a design and prototype implementation of new home automation system that uses WiFi technology as a network infrastructure connecting its parts. The proposed system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors users' home. [14]

Paper-8: In year 2014, the author Y. Kim and Major Phenolics in Apple proposed a system named as Non-Contact Gesture Recognition Using the Electric Field Disturbance for Smart Device Application. This system proposed that contribution in to the Total Antioxidant Capacity. [7]

Paper-9: In year 2014, the authors Ankita N. Chadha, Jagannath H. Nirmal, and Pramod Kachare. Proposed a system named as "A Comparative Performance of Various Speech Analysis-Synthesis Techniques". In this paper, authors present a comparative performance of the various analysis-synthesis techniques which separate the acoustic parameters and allow the reconstruction of the speech signal, which is very close to original speech. The analysis-synthesis of speech signal is used for speech enhancement, speech coding, speech synthesis, speech modification and voice conversion. Our comparative study includes Linear Predictive Coder, Cepstral Coder, Harmonic Noise Model based coder and Mel-Cepstrum Envelope with Mel Log Spectral Approximation. [15]

Paper-10: In year 2015, the authors Amrutha et al. proposed a system named as "Voice Controlled Smart Home", which uses MATLAB programming solution for voice recognition part in their system and the system needs to be trained for the speech pattern of each user in order to maintain its high recognition accuracy. [8]

Paper-11: In year 2016, the authors Juan J. Ojeda-Castelo Jose, A. Piedra-Fernandez and Cesar Bernal-Bravo. Proposed a system named as "Sign Communication for People with Disabilities Using Kinect Technology at Home". In this paper authors present a communicator which interprets a series of commands by means of corporal expressions. These body expressions are learned by a gesture recognition system according to the requirements and disability of the user. Each of the commands adapt themselves to daily tasks. The system learn gestures and associates them with concrete actions that the user wants to do or needs at that moment. [16]

Paper-12: In year 2017, the authors Shihab Shahriar Hazaroi and Lamia Alam. Proposed a system named as "Designing a Sign Language Translation System using Kinect Motion Sensor Device". In this paper, Kinect Motion Sensor Device is used to recognize the gesture of the user. But the gesture of each user of a particular word will be slightly different. As real-time recognition of a large set of dynamic gestures is considered, some efficient algorithms and models are needed. Here an efficient algorithm is used to recognize the gesture and translate them. In this paper, in order to recognize the gesture in both training and translation mode a grid view algorithm has been used. We evaluated our system by translating gesture by various people for twelve different words and experimental results reveals that our proposed system has about eighty percent success rate in translating gestures. [16]

Paper-13: In year 2017, the authors Héctor J. Carlo, Yeiram Martínez, Cristina Pomales-García. Proposed a system named as "Real-Time Dock Door Monitoring System Using a Kinect Sensor". This paper describes a proof of concept where a single Microsoft Kinect sensor is used for automated monitoring of a dock door in real-time. The proposed system will automatically and in real-time: detect when an object breaches the dock door perimeter, and its corresponding speed and direction, count the number of pallets loaded/unloaded to/from a trailer, record the loading/unloading time of each load. [18]

Paper-14: In year 2018, the authors Huang-Chia Shih and Chang-Hsian Ma proposed a system named as "Hand Gesture Recognition Using Color-Depth Association for Smart Home". This system proposed that a robust hand gesture segmentation method which associates the depth and color information with online training. Different existing methods, when the hands close to the body part or in cluttered background, our system remains valid. [21]

Paper-15: In year 2016, the author K.A.S.V.Rath-nayake proposed a system named as "Voice operated home automation system based on Kinect sensor". This system proposed that a single HCI system which can be utilized by people with physical challenges as well as speaking and hearing disabilities. Voice and gesture commands acquired by Kinect motion sensor are availed to manipulate home appliances via a Wi-Fi enabled wireless network hub. Even though nowadays, there is a pool of HCI systems with various technologies, cost and accuracy of those systems are debatable factors. Experiments carried out in the evaluation process reveal that our system provides more than 80% of recognition accuracy in gesture mode as well as in voice mode. Moreover, it can work well in uncontrolled, environments. [11]

3. CONCLUSION

We have studied various IEEE papers related to our problem statement. By doing the study of literature survey of all this papers, we conclude that there is a lot of evolution in the field of automation whether it is based either voice or gesture. Smart home system is one of the best creations of modern technologies. Most of the smart home systems are developed for normal people. But, Most of the disabled people are living insecure and dependable life. So, being highly motivated by the suffering of these people, we are going to develop a system which will give them a secured and independent life and provide them with a comfortable and interactive smart home system**.**

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