

AI Enabled Smart Home Interface Using Gesture based Controls

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Abstract:- Now-a-days, sensors are of low cost and are very easily available. wireless networking is enabling ways in which people can interact with their smart homes. Many approaches like using voice commands are emerging. This paper shows the design and implementation of a low-power, low-cost, hand-held wireless device to interact with home appliances. These devices are gesture-based control system to operate home appliances and as to make smart homes more advanced and easy for people to control devices across them. We can control all the home devices by using leap motion sensor by assigning a different gesture for different home devices. Simple gestures can be used to control these home appliances. Ad-hoc wireless network using the ZigBee protocol can be used to control home appliances. The gestures in each device can be customized to control home appliances. This can be extended to collect gesture based commands for different persons and apply Artificial Intelligence (AI) principles for learning and improving the controls based on gestures of different individuals.

Keywords:- Leap Motion, Smart Homes, Ad-Hoc Wireless Networks, Hidden Markov Models, Artificial Intelligence, Zigbee Technology.

I. INTRODUCTION

As sensors are very easily available now a days and as a result people are interacting with the home appliances in a wireless fashion. There are three ways in which people can interact with their home appliances.

- Users interaction with home appliances can be done either by touch or by sitting, sensors are embedded in the smart home appliances. The use of sensors allows user to interact with objects or home appliances using simple gestures.
- User can communicate with home appliances using voice commands. Several voice based assistance controllers are readily available in the market. Some voice assistance applications uses mobile phone to control the smart home. one limitation of the voice-based approach is that it requires high audio filtering. Even user needs to be nearer to a voice-recognition device and it is not easy to have several such devices around the home and the use of microphone to capture voice input in the home is difficult. Now a days, some voice based services like

Amzon Alexa, Google Home e.t.c., One limitation is that they must be connected to internet to function.

- Hand gestures can also be used to control home appliances, user can interact with a smart home appliances using simple hand gestures. There are two ways in which we can implement gesture based control; visual and sensor-based. cameras can also be used for capturing humans in smart homes. Similarly, neural networks and artificial intelligence can also be used to identify hand-gestures from a video captured with cameras. A main disadvantage of camera is that a person must be in range of camera for the system to detect the person and gestures made by him.

Alternatively, sensors can be used for gesture recognition through which we can control home appliances around us. One advantage of sensor-based approach is that users can interact with a smart home with sensor-based approaches that does not require lighting which enable these devices to work even in night times. A person may interact with the home appliances in smart home through gestures recognized through a variety of sensors. The use of these sensors provides us good convenience and has low complexity. This system enables even smll children to make gestures to control these devices or appliances around them in smart home.

The proposed device uses the ZigBee wireless protocol that is often used in smart homes and is supported in many existing home management systems and smart home devices and appliances. It uses an ad-hoc wireless networking standard i.e., ZigBee, and is low-cost, power efficient. Hence this system can easily be embedded easily in many smart home appliances.

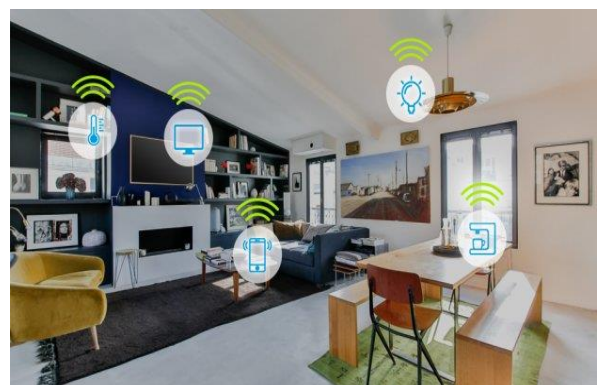


Fig 1

II. EXISTING SYSTEM

In the previous systems, the home devices like lamp and fan these are controlled by manually by switch. In smart home, remote controller is also used for controlling the devices.

III. PROPOSED SYSTEM

The proposed system is controlling devices without using of manual switches in home. For this controlling, we using leap motion sensor and can control the lamp light intensity by using dimmer. We can control all the home devices by using single leap motion sensor. To assign a different gesture for different home devices. When we show gesture to leap motion, the corresponding device is controlled by controller. If want to change the intensity of lamp, which is done to the help of dimmer i.e., dimmer can be used to reduce external light intensity which may help to avoid light signal disrupting with actual hand gesture signal that user gives to leap motion sensor.

IV. BLOCK DIAGRAM

A. Transmitter:

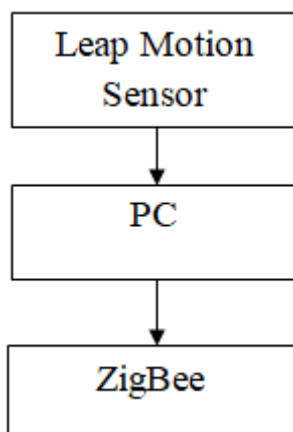


Fig 2

B. Receiver:

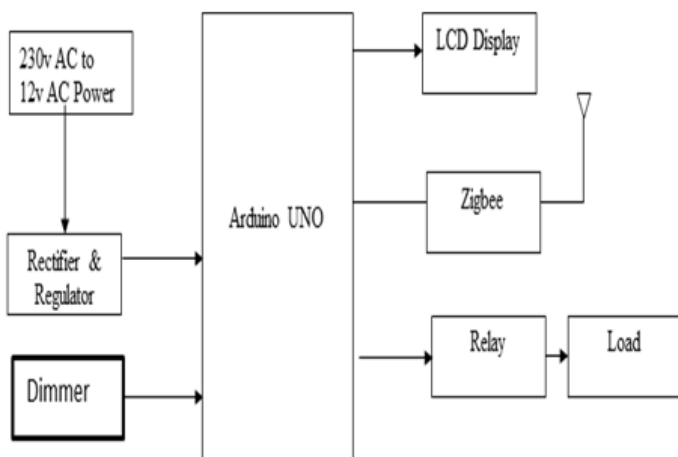


Fig 3

V. BLOCK DIAGRAM DESCRIPTION

In this project, ARM 7 microcontroller is used. This is the 32 bit microcontroller. Controller placed in receiver section. ZigBee, LCD display and relay these are interface to the controller. In transmitter side leap motion sensor is placed and interface with pc. The leap motion data's transmitted through ZigBee. In receiver side, the receiver ZigBee receive the transmitted data. Then the controller controls the devices through relay. LCD display is interfaced for displaying the current status.

VI. GESTURE RECOGNITION

In order to understand how gesture recognition works, it is important to understand how the word gesture is defined. In it's most general sense, the word gesture can refer to any non-verbal communication that is intended to communicate a specific message. In the world of gesture recognition, a gesture is defined as any physical movement, large or small, that can be interpreted by a motion sensor. Gesture recognition is an alternative user interface for providing real-time data to a computer. Instead of typing with keys or tapping on a touch screen, a motion sensor perceives and interprets movements as the primary source of data input.



Fig 4

VII. CONCLUSION

In this paper, we have presented the design and implementation of a system that help users to communicate with their smart homes just by using simple gestures. The proposed system uses ZigBee protocol to control smart home appliances. Another advantage of this system is that it consumes very less power and hence cost is low. Each device can be designed with very low price than many ZigBee based controllers available in the market. Due to low cost, user can use several such devices around the smart home to control appliances.

In summary, this system represents a way for a user to interact with their smart home using simple hand gestures. This system will not replace other voice or mobile based smart home system like Google Home, Amazon Alexa e.t.c., to control smart homes.

These leap motion sensor is programmed by orion beta software for tracking of hand movements. This can be extended to collect gesture based commands for different persons and apply Artificial Intelligence (AI) principles for learning and improving the controls based on gestures of different individuals.

FUTURE WORK

In future, this system can be extended by adding of RSSI to know where exactly each device is placed in the home. In addition the leap motion sensor is programmed by orion beta software for tracking of hand movements upto 2.6feet.

Collecting gesture based commands for different persons and apply Artificial Intelligence (AI) principles for learning and improving the controls based on gestures of different individuals. Hidden Markov model can be used for this.

REFERENCES

- [1]. Waqqas M. Khan and Imran A. Zualkernan, Member, IEEE1 proposed “SensePods: A ZigBee-based Tangible Smart Home Interface” in IEEE January 15, 2018.
- [2]. International Journal of Medical Informatics 91 (2016) 44–59 “Smart homes and home health monitoring technologies for older adults: A systematic review” by Lili Liua, Eleni Strouliab, Ioanis Nikolaidisc, Antonio Miguel-Cruza d, Adriana Rios Rincona
- [3]. International Journal of Advanced Research Foundation, Volume 3, Issue 2, February 2016. “An Enhanced Fall Detection System for Elderly Person Monitoring using Consumer Home Networks”
- [4]. International Energy Agency. World Energy Outlook 2014. IEA Paris.
- [5]. Blanchard, R. E.,Williams, S. R., Bliss, M., Clowes, M., Mohammed, A., & Pancholi, R. (2014). Educating the World: A Remote Experiment in Photovoltaics. In *1st International Conference*
- [6]. Williams, S.R., Blanchard, R. E., Mohammed, A., Bliss, M., Pancholi, R., & Clowes, M. (2014). The Development of a remote laboratory for distance learning at Loughborough University. In *HEA Annual Conference 2014* .
- [7]. Accelerometer-based gesture recognition via dynamic-time wrapping affinity propagation & compressive sensing in (2010) IEEE by Ahmad Akl, Shahrokh Valaee.