e-ISJN: A4372-3114
p-ISJN: A4372-3115

ISSN: 2321-7782 (Online)
ISSN: 2347-1778 (Print)
Impact Factor: 7.327

Volume 7, Issue 5, May 2019

International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study

Available online at: www.ijarcsms.com

Controlling Robotic Module throughout Universe by using Microsoft Kinect Motion Sensor

S. Ganapathi Subramaniam[1]
BBA, MCA
Tamilnadu Open University
Chennai – India

Dr. A. Rajalaskhmi[2]
MCA, M.Phil, Ph.D
Tamilnadu Open University
Chennai – India

Abstract: ***For better interaction between Computer and Human we use gesture recognization (Microsoft's Kinect sensor). The Kinect is enlisted to construct skeletons in the 3D space using 20 body joints coordinates of an human. From this coordinates, 10 joints are required and 6 triangles have been contrived along with 6 respective centroids. The feature space correlate with the Euclidean distances between spine joint and the centroids for each frame. For ranking purpose, support vector machine is used using a kernel function. For several gestures it work effectively at the rate of 89.7%. we use RGB-D sensor for hand gesture recognition. To find the number of hands in the image the algorithm uses different method. Ten different static hand gestures are recognized, including all different composition of spread fingers. In addition six dynamic gestures are established by following the movements of an open hand. The main advantage of our approach is without the need of wearing any specific clothing or additional devices we can access freedom of the user's hands to be at any position of the image. Besides, the whole method can be executed without any initial training or calibration.Through the experiments we carried out among various users from different environments we find that the accuracy of the method which additionally can be run in real-time.***

Keywords: ***Kinect Sensor, Raspberry Pi, Motors, IoT.***

I. INTRODUCTION

We proposed a new technique for hand gestures recognition based on a RGB-D sensors.The algorithms also uses semantic information and colour to accurately identify any number of hands present in the image. Ten different static hand gestures are recognized, including all different combinations of spread fingers. The main advantages of this approach is to freedom of the user's hands to be at any position of the images without the need of wearing any additional devices or specific clothing. Besides, the whole methods can be executed without any initial calibration or training. Gestures can be expressed by suitable body movements of face, hands, head which can be used for controlling specific devices or transferring significant knowledge to the surrounding. Gestures can be of static type (certain pose or configuration, or still body posture) or dynamic type (movements of different body parts). We, the human being, communicate with the machines via direct contact mechanism. Now a day, instead of pressing switches, touching monitor screens, twisting knobs, raising voices, work can be simply done by pointing fingers, waving hands, movements of bodies and so on. Gesture recognition concerns about recognizing meaningful expressions of human motions, e.g. embroiling hands, arms, face, head and body. Thus, we have proposed this system for better human-computer interactions (HCI) using hand gestures for the recognition of gestures, we have used Microsoft's Kinect sensor Kinect is the official name of XBOX360 issued by Microsoft on June, 2010. The hardware portion of this sensor comprises of a RGB camera, an infrared (IR) camera, an IR projector and an array of microphone, which can produce RGB images, depth images and audio signals respectively. As far as the software tools are concerned, they are able to catch human motions in three dimensional (3D) spaces. Gesture recognition technology has been employed for several domains, like hand gesture, dynamic hand gesture tracking, posture recognition, sign language recognition, robot control, person identification, healthcare etc. Lai et al have proposed a paper where Kinect camera has been used to develop skeleton taken from human postures.

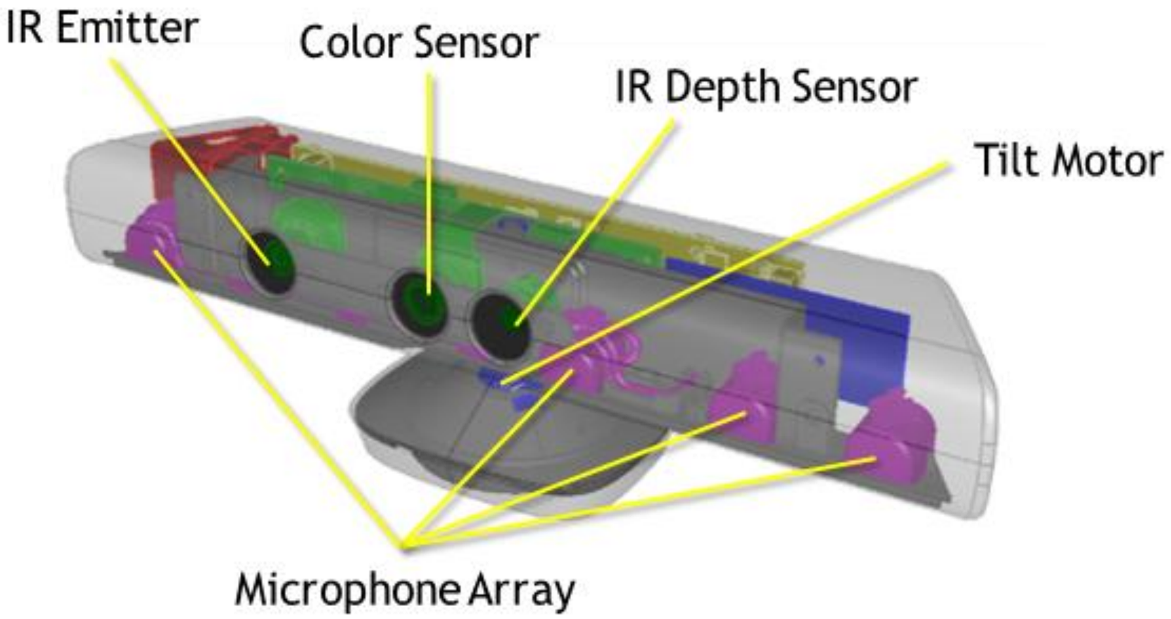


Fig 1:Kinect motion sensor

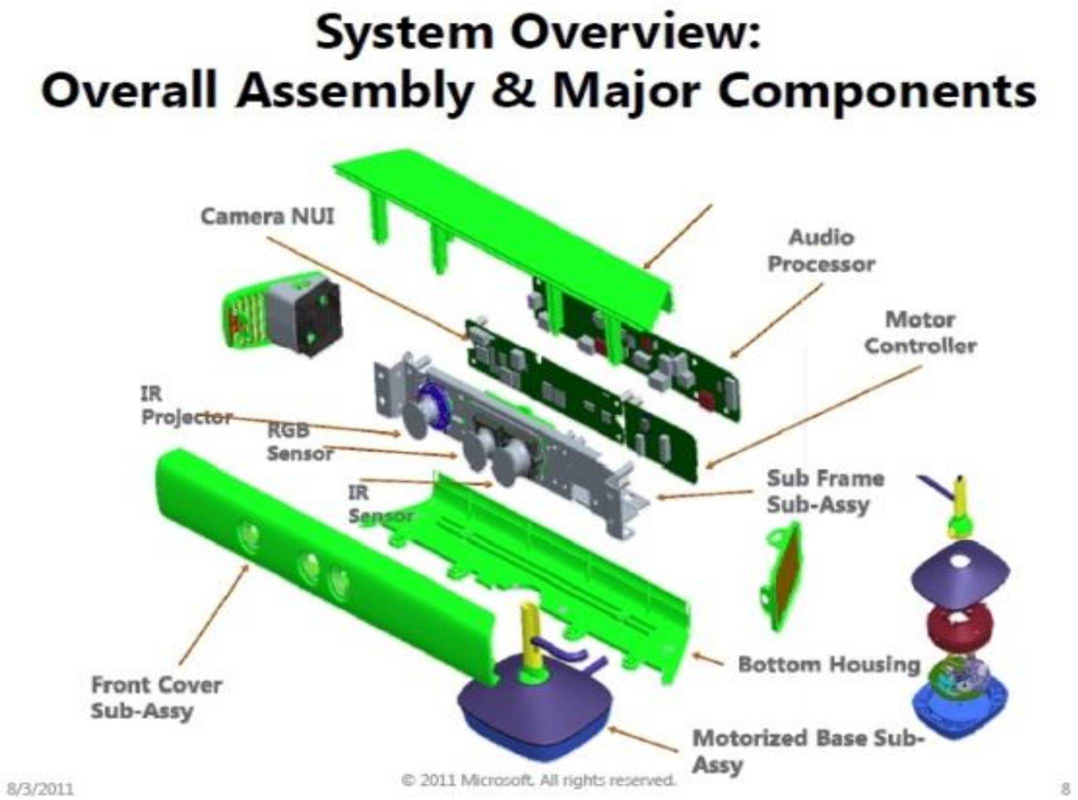


Fig 2:Kinect overview

II. RASPBERRY PI

A. EXTRA HARDWARE

We will need a Raspberry Pi contains a graphics chip and processor, various interfaces, program memory (RAM) and connectors are used for external devices. Some of these devices are mandatory, others are non-mandatory. It also needs storage, but a hard drive of the type found in a typical PC is not actually in keeping with the small-scale size of R Pi.

B. DISPLAY

Many LCD monitor and HD TV can be interfaced using a full-size 'male' HDMI cable, and with an inexpensive adaptor if DVI(Digital Visual Interface) is used. Older TV can be connected using via SCART (using a Composite video to SCART adaptor) or Composite video (a yellow-to-yellow RCA cable).

C. KEYBOARD AND MOUSE

The most common USB mouse and keyboard will work with the R Pi. Wireless mouse/keyboard should also perform, and only it need a single USB port for an RADIO FREQUENCY(RF) dongle. In order to use a Bluetooth mouse or keyboard you will need a Bluetooth USB dongle, which again uses a single port.

D. STORAGE FOR OS

You can make your own preloaded SD card using any suitable SD card (4GB CARD or above) you have to handle it. We recommend you use a new empty card to avoid clash over lost images. • Preloaded SD card will be currently available in the Raspberry Pi Shop.

E. CABLES

- We will require one or more cable to interface up your Raspberry Pi system.
- Audio cable (not needed if we using HDMI video connection to a TV).
- Video cable possibilities: o HDMI-A cable o HDMI-A cable + DVI adapter o Composite video cable o Composite video cable + SCART adaptor.
- Ethernet/LAN cable (Model B only).

F. POWER SUPPLY

This unit is powered by the micro USB connector. The power supply for Raspberry pi is 5V.

G. ADDITIONAL PERIPHERALS

We may decide we want to use various other devices with our Raspberry Pi, such as Speakers, Portable Hard Drives/ Flash Drives, etc.

H. USB HUB

To connect external devices such as keyboard, mouse ect. we use USB HUB.

I. INTERNET CONNECTIVITY

This may be via an USB WiFi adaptor or LAN/Ethernet cables (standard RJ45 connectors).

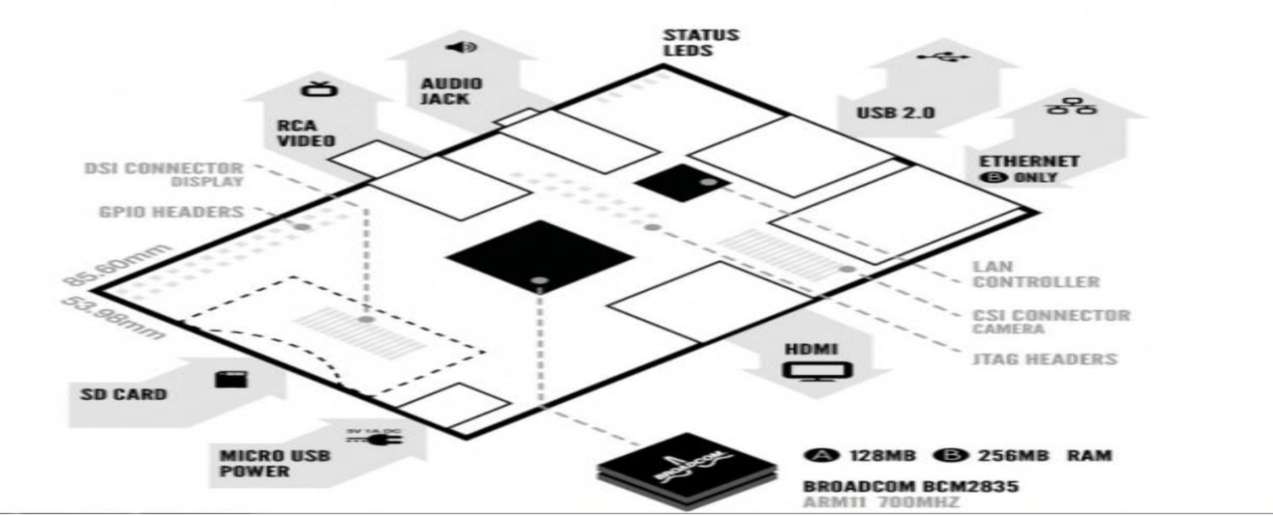


Fig 3: overview of Kinect motion sensor

Kinect And Raspberry PI

Fig 4: Kinect and raspberry pi

The standard vision-based hand segmentation methods are similarly based on colour filtering. These methods are seriously affected by the appearance of skin colour-like objects and by lighting conditions.

III. Algorithm for Hand Segmentation

Require:

- Skin region classification
- Skin region segmentation
- Depth filter
- Detect and remove faces
- Colour filter
- Hand extraction
- Classify the extremes of the arm
- Detect the wrist

IV. Microsoft Kinect

In recent, gestures recognition has been mutually dependent in various customer devices for the purpose of entertainment. An example of such device is leap motion,asus xtion, Microsoft's Kinect, which allows a user to use gestures that are typically relatively and intuitive simple to perform various tasks such as starting a movie, controlling games etc.

A. THE KINECT SENSOR

The Kinect sensor is a body motion-sensor input devices that was initially developed in November 2010 for use with the Xbox 360 and then introduced Xbox one but has recently been opened up for use with Windows PCs for commercial purposes to program or interact with the pc.

B. ARCHITECTURE

The Kinect works as a 3D camera by represent a stream of colourrd pixels with data about the depth of pixel. Each pixel in the images contains a value that represent the distance from the sensor to an object in that way. This sensor features provide developers the means for creating a immersive user experience through voice and touch-less, gesture and movement control although it does not inherently perform any recognition or tracking operations, leaving all such processing to software.

The Kinect sensor as shown in Figure 3 has the following properties and functions:

- An infrared (IR) emitter and an IR depth sensor used for capturing depth image of the object.
- An automatic tilt motor which allows the camera position to be changed without physical interaction and a three-axis accelerometer which can be used to determine the current orientation of the Kinect.
- The camera field of view as specified by Microsoft is 43° vertical by 57° horizontal In system can measure distance with a 1cm accuracy at 2 meters distance.
- An array of four microphones to capture positioned sounds.

V. IMPLEMENTING GESTURE BASED HCI SYSTEM USING KINECT

There are three key stages are involved in the developing of the proposed HCI system using Kinect motion sensor. First, the device must be able to track the skeletal operation of a user to detect the hand before any gestures can be recognized and processed it. Second, each gestures must be properly recognized on it. Third, gestures recognized must be interpret to carry out the action related to it. In general, these three key stages span around skeleton tracking and gesture recognition function of the body. This section discusses how this is achieved an processed.

A. CHOOSING OF PROGRAMMING LANGUAGE

Most Kinect-enabled applications are usually developed with C++, C#, or Visual Basic. This interface is developed using Windows Presentation Foundation (WPF) in C# which provides a more human readable codes and a more simplified syntax on it.

B. BODY DETECTION

The skeletal tracking features of Kinect combined with the NUI library allow users and their actions to be recognized. The most important aspect of developing a gestures based HCI system is to first track the user before any hand detection can occur. It does not detect any human; it simply sends the depth image to the host devices, such as an Xbox or pc.

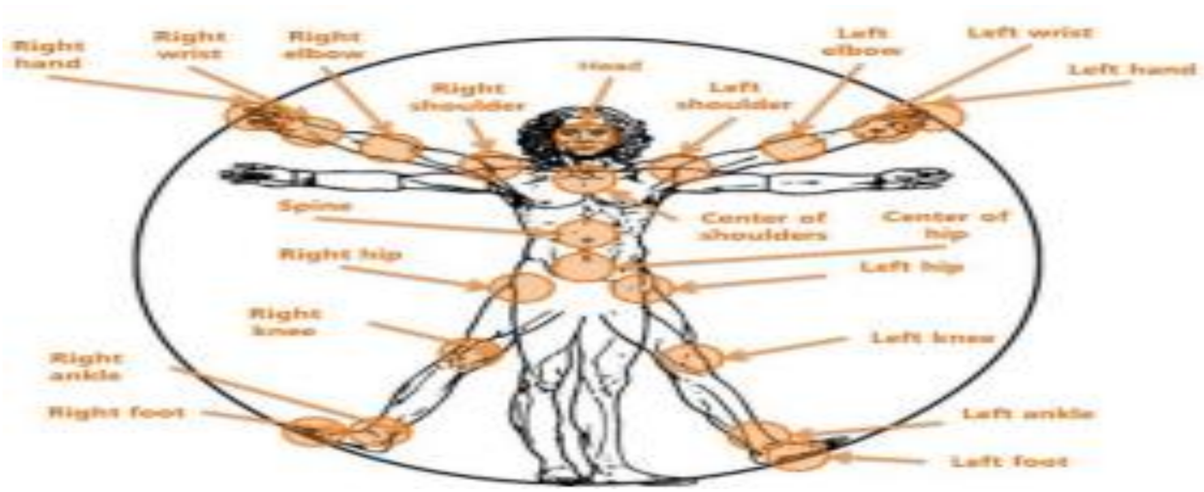
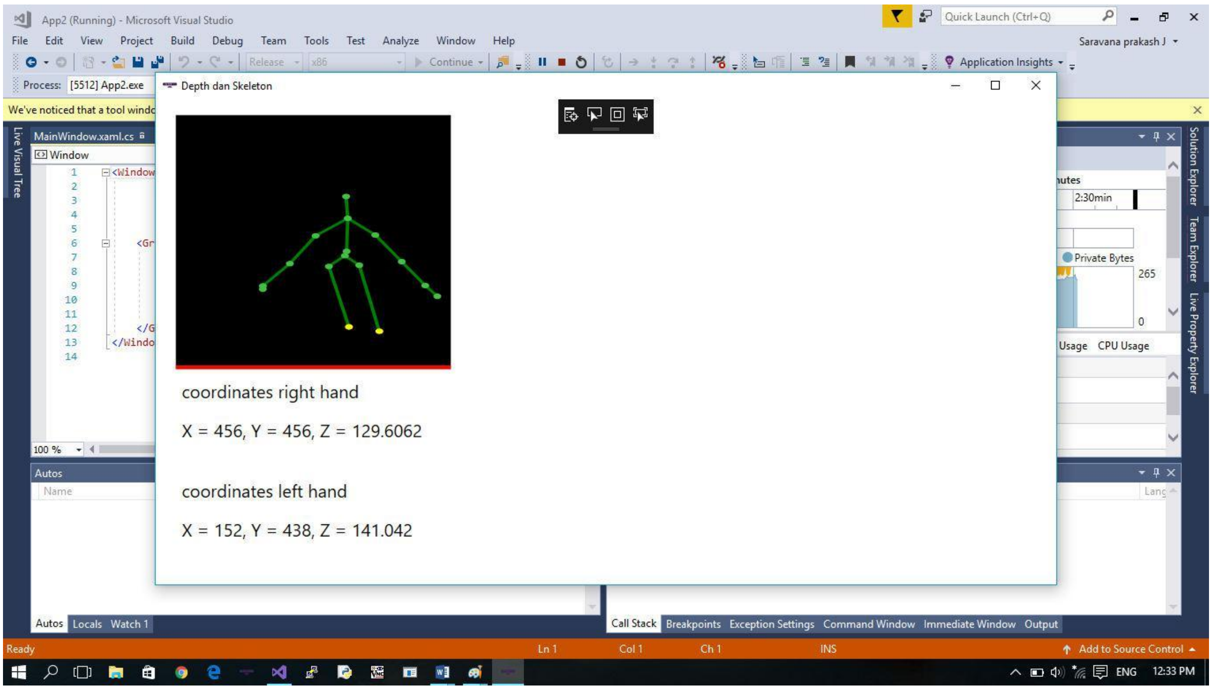


Figure 5: Tracked joints of a user

With the help of skeleton tracking, an application can locate twenty (20) skeletal joints or coordinates of a user standing and ten upper-body joints (head, shoulders, wrists, elbows, and arms) of a user sitting directly in front of the Kinect motion sensor. Figure 5 shows the various joints or coordinates relative to the human body.

After skeleton tracking is done, the position of each joint or coordinates in 3D space is returned by the NUI library in the format of X, Y and Z coordinates expressed in meters according to the skeleton tracing space coordinate system.

VI. Output



VII. Conclusion

In this project we propose a system that controls the Robotic module remotely by sending human gestures. This project will overcome the system which controls the Robotic module through wired medium.

References

1. Kurtenbach, G. & E.A. Hulteen. Gestures in Human-Computer Communication.In: The Art and Science of Interface Design, Laurel, B. (Ed.). Reading, Mass:Addison-Wesley Publishing Co., Wasley, pages 309-317, 1990.
2. Kawade Sonam P & V.S. Ubale. Gesture Recognition - A Review. In OSRJournal of Electronics and Communication Engineering (IOSR-JECE), pages 19-26.
3. Zimmerman, T., Lanier, J., Blanchard, C., Bryson, S. and Harvil, Y. A HandGesture Interface Device. In Proceedings of CHI 87 and GI, pages 189-192, 1987.
4. Dipietro, L., Sabatini, A. M., & Dario, P. Survey of glove-based systems and themapplications. IEEE Transactions on systems, Man and Cybernetics, Part C:Applications and reviews, 38(4), pages 461-482, 2008.
5. Untitled photograph of Data-glove]. Retrieved March 10, 2013, from:http://www.digitalrune.com/Support/Blog/tabid/719/EntryId/100/ScatteredInterpolation-ndash-Example-2-Interpolation-of-Animation.aspx
6. Matthew Turk. Gesture Recognition. In the Handbook of Virtual EnvironmentTechnology, Chapter 10, 2012.
7. Porta, M. Vision-based user interfaces: Methods and applications. Elsevier,International Journal Human-Computer Studies, 2002(57), pages 27-73, 2002.
8. Rafiqul Zaman Khan & Noor Adnan Ibraheem. Hand Gesture Recognition – ALiterature Review. In International Journal of Artificial Intelligence &Applications (IJAIA), Vol.3, No.4, July 2012.
9. Untitled photograph of Kinect]. Retrieved March 10, 2013, from:http://buildsmartrobots.ning.com/profiles/blogs/building-a-kinect-based-robot-forunder-500-00
10. Mark Theodore Draelos. The Kinect Up Close: Modifications for Short-RangeDepth Imaging, pages 11 -15, 2012.
11. About Kinect. Retrieved from http://stackoverflow.com/tags/kinect/info.
12. David Katuhe. Programming with the Kinect for Windows Software DevelopmentKit, page 3, 2012.

13. "Kinect develop overview," Microsoft, 2012, system requirements for Kinect WindowsSDK.Retrieved: http://www.microsoft.com/enus/kinectforwindows/develop/overview.aspx
14. Zhou Ren, Junsong Yuan & Zhengyou Zhang. Robust Hand Gestures RecognitionBased on Finger-Earth Mover's Distance with a Commodity Depth Camera, 2012.
15. Daniel James Ryan. Finger and gesture recognition with Microsoft Kinect, (n.d).
16. Murphy Stein(n.d.)Retrieved
17. Rob Miles. Start Here! Learn the Kinect API, 1st Edition, 2012.
18. Untitled Photograph of Kinect Sensors on Human Body Retrieved March 10,2013
19. Samet Erap. Gesture-Based PC Interface with Kinect Sensor, 2012.

AUTHOR(S) PROFILE

S.Ganapthi Subramaniam, was born in 1989.He was Completed BBA at Tamilnadu open University in 2015. He was studying the final year MCA at tamilnadu open university.

He published journal in international journal and conference.

Dr. A. Rajalakshmi, received the Master of Computer Application and M.Phil from

Anna University in 2009 and St.Peter University in 2010.

She is completed Ph.d from Bharathiyar University in 2016.

She is having 8.5 years teaching experience in respective fields.