

Gesture Recognition with Real World Environment using Kinect: A Review

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ABSTRACT: The important areas in the field of Human Computer Interaction are gesture recognition as it provides a natural way to communicate between Human and Machines. Gesture based Human Computer Interaction applications range from PC Games to Augmented reality and is recently being expanding in various fields. The central idea behind this work is develop a Gesture based HCI System using various development technology with Depth sensor. Here we are analyzing the various technologies which are providing a better way to deal with the Gesture Based Technology. The work is broadly classified into various modules which are Gesture Recognition and Hand Detection. For this we use Kinect Software Development Kit and its feature which while enable user to control various applications according to its need with certain precision. These papers present a review of Gesture Technology and will guide as a source to the researchers.

KEYWORDS: Human Computer Interaction (HCI), Kinect Sensor.

I. INTRODUCTION

The Human Computer Interaction devices such as Mouse and Keyboard become inadequate for an effective interaction with real time environment because the new application development needs advanced interaction technology. A Human interaction with the virtual world requires more natural device which can deal with this environment. The natural interface among them is Hand Gesture and Skeleton tracking and recently it has been major area of interest. The main idea of Gesture recognition research is to develop a system which will able to identify and control the application.

Hand Movement is the collection of various static posture to some dynamic move used to communicate with the other application. Recognition of hand gesture should be model into space and time domains. Hand is classified into static posture and dynamic which is called as Hand Gesture. The methodology regarding understanding of movement is going on and still in progress. The way gesture recognition used to help the impaired person to interact with computer. Gesture Recognition does not requires any instrument attach to body. The body gesture is read by the cameras instead of sensor attached to a device like Data glove. We can read facial and speech expressions by this gesture recognition technology.

This paper is divided into various sections. Firstly we will discuss regarding the Human Computer Interaction then in Second Section the methods for Gesture recognition. The flow architecture of Kinect and application interaction is given in Third section. Conclusion is given in fourth section along with References.

II. RELATED WORK

A. GESTURE RECOGNITION:

It is the process by which Gesture made by the human are used to convey the details data or for controlling device. In day-to-day life physical gesture is a powerful tool for convey information. This paper makes the suggestion that Gesture based input is a technique to communicate the information with the help of identifying special human gestures.

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The Gesture recognition is classified into two ways they are Glove based and Vision based methods.

(A)Glove Based Gesture Recognition:

The Data glove construct using optical and mechanical sensor connect to a glove which will convert finger flexion's into some electrical signals for identifying the hand posture. This technique blocks the ease of naturalness of the human interaction because it complex to carry load of cable which will be connected to the machine and the instrument is very expensive and difficult to handle. Fig. 1 Show the Glove Based System.



Figure 1 Glove Based System.

Using wireless device it's hard to calibrate and expensive and have to wear the glove to communicate with the Computer.

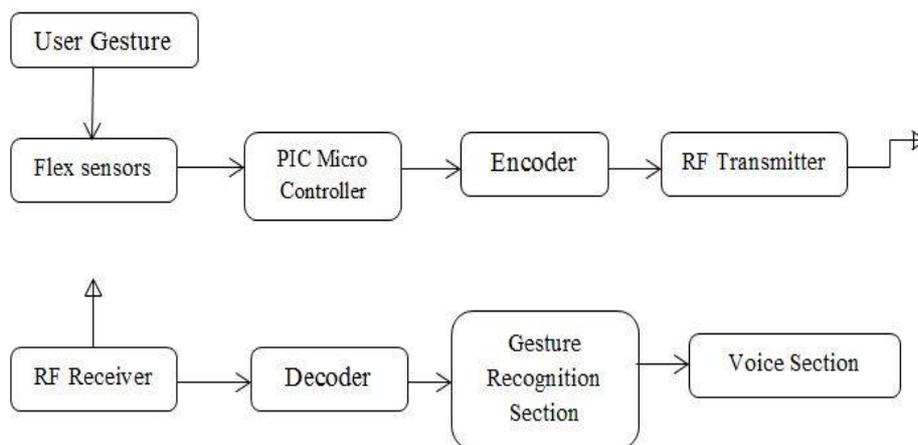


Figure 2 Work Flow Diagram of Glove Based System

Data Glove is implemented for capturing the Hand Gesture of a user and after capturing of gesture it transfer the information to the flex sensor which is fitted on the glove its specifies the length of each finger and the thumb for the generation of the output stream of data that consist of varying degree of bend. The Analog outputs from the sensor are given to the Microcontroller its process the signal and perform conversion of data into digital format.

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The RF and Encoder Transmitter are responsible for resulting digital signal to be encoded and transmit through RF System. The Receiver and Decoder RF receives the signal and given to the gesture recognition through the decoder. In the next stage Gesture is identified and transfers the information to the voice section for performing text to speech conversion and result out through output device.

(B) Vision Based Gesture Recognition:

In this method we uses one or more camera to recognized images of user hand gestures and lighting condition that will enhance gesture accuracy. The Vision based gesture recognition is future classified into different parts such as:

1. Infrared camera Based
2. Mono camera Based
3. Multi camera Based

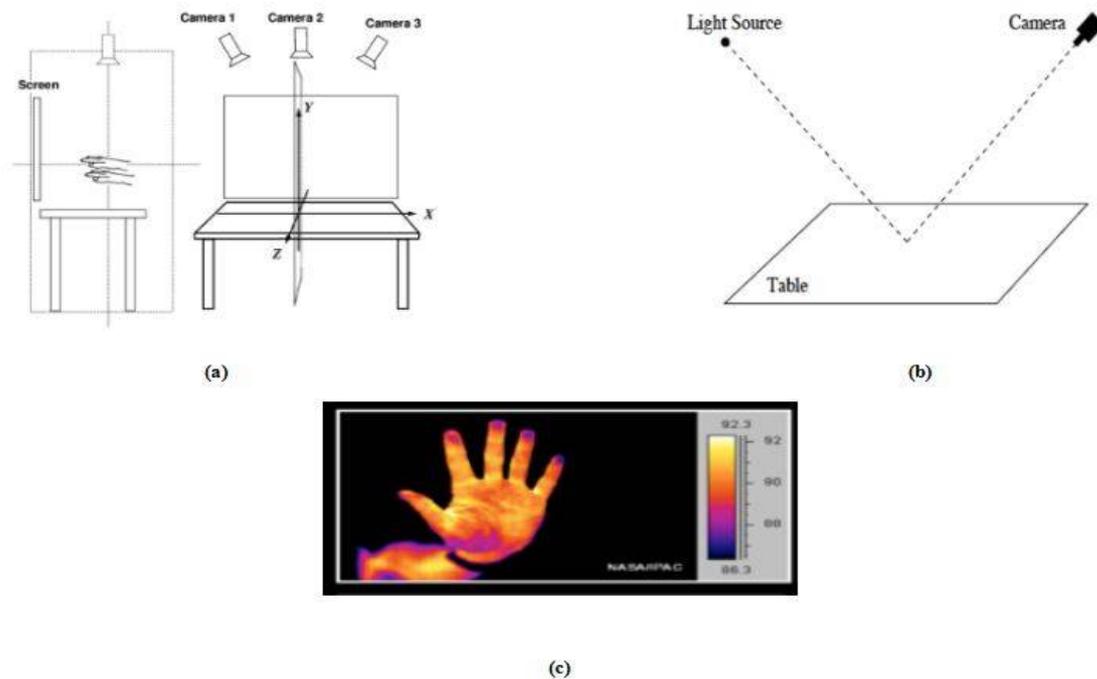


Figure 3:a) Multi camera b) Mono camera and c) Infrared camera based Gesture Recognition

Vision based method to hand Gesture Detection are the most natural way to build a HCI. It is difficult to build satisfactory things because of the limitation in machine vision. There are various challenges such as detection of movements of hand from a cluttered background then identifying the hand motions track the hand gesture and finally recognized it.

Vision based method have to deal with various parameters such as Numbers of Camera used i.e. stereo or multi view, Speed is fast enough or not to deal with real time, Environment is suitable or not with background and light, human requirement i.e. wearing particular equipment's and finally the low level extraction of shape, color etc. There is the loss of information when the 3D image is projected on 2D surface. To tackle this problem you can classify and match with predefined pattern for representation of the gesture

III. PROPOSED METHODOLOGY AND DISCUSSION

The objective of this paper is to develop a novel approach to the current problem of Gesture recognition. The work should satisfy various conditions:

1. First requirement is flexibility, and how it combines new application with the old application. The external programs should be easily used with the current applications. This will be benefit to the developers and users.
2. Second requirement is the real time performance. This is measured by fps (frames per second) which will give information about the refresh rate of the application. If the rate is long, then delay between the recognition and real action will be differ. If the gesture is carried at high rate then it will not be recognized at all.
3. Third condition is to practically sufficient to used. It should have appropriate gesture detection for practical use.
4. Fourth condition is robustness in which the system should be able to track, detect and recognized different gestures successfully under various lighting condition and cluttered background.
5. Finally the approach should be user independent in which system must be able to work for various users rather than particular user.

The work proposes a novel human computer interaction system, which uses hand gestures as input for communication and interaction. The system is starts with capturing images from a Microsoft Sensor. Several systems in the literature have strict restrictions such as using particular gloves, uniform background, long-sleeved user arm, being in particular lightning conditions and using particular camera parameters. These restrictions destroy the recognition rate and naturalness of a hand gesture recognition system. The performances of those systems are not strong enough to be used on a real time HCI system.

Computer Vision technique avoids the usage of makers for hand gesture recognition which leads to a clear vision of the machine using some visual information from the Kinect sensor [1]. Kinect is used for the recognition of hand gesture and you can easily detect the user at a time. It work well with the cluttered environment and give you a better performance rather than using the normal cameras for recognition purpose.

Kinect Hardware:

Kinect Device [1] is developed by Primes Sense Firm which acquires 3D sensing Technology. It consists of various components in it like IR camera, Color Camera and infrared Projector. The IR camera is used for distance ranging device like the camera autofocus works.



Figure 4 Kinect Device

1. Motorized Tilt it is the pivot which adjust the sensor attached to it and it can titled up to 27 degree up or down for capturing the objects.
2. Depth Sensor it include two components in it such as IR camera and IR Projector both used to create the depth mapping along with the information regarding the distance between the objects and camera. The range to capture the object is from 0.8m to 3.5m and it also include the output rate of frames is 30 frames/sec.
3. RGB camera is active at 30Hz and it consists of three basic colors for representation .Kinect can produce a high resolution image at speed of 10 frames/ sec. The depth Image resolution is 640*480pixels.

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IV. CONCLUSION

Our aim is to review various techniques of designing a vision based hand gesture recognition system with a high recognition rate along with real-time performance. The existing system is invariant against previous strict restrictions on the human environment and can be used for real time HCI systems. Usually, these interaction systems have two challenges: Hand detection and Skeleton recognition. Hand detection must be done before gesture recognition. Once the hand is detected clearly in the current image, the skeleton recognition process is started around the detected hand. Gesture recognition especially hand gestures is applicable over a wide spectrum of topics such as medicine, surveillance, robot control, teleconferencing, sign language recognition, facial gestures recognition, games and animation. The statically parameter are compared with the previous system and the propose system is fulfilling requirement regarding the precision of Gesture detection with any cluttered background.

REFERENCES

- [1] P. Sawai and Prof. V. Shandilya, "Gesture & Speech Recognition using Kinect Device – A Review", International Journal SSRG, pp.84-88, 2016.
- [2] Z. Zhang, "Microsoft Kinect sensor and its effect", IEEE Multimedia Mag., Vol. 19, Issue no. 2, pp. 4-10,2012.
- [3] W. Hoff, K. Nguyen, "Computer vision-based registration techniques for augmented reality", Proceedings of Intelligent Robots and Computer Vision XV, Vol. 2904, pp. 538-548, 1996.
- [4] Ling Shao, Jungong Han, Dong Xu and Jamie Shotton, "Computer Vision for RGB-D Sensors: Kinect and Its Applications", IEEE Transcation on Cybernetics, Vol.43, Issue no. 5, pp. 1314-1317, 2013.
- [5] Tashev I, "Kinect development kit: a toolkit for gesture- and speech based human-machine interaction", IEEE Signal Process Mag, pp. 129–31, 2013.
- [6] J. Sung, C. Ponce, B. Selman, and A. Saxena, "Human activity detection from RGBD images", in Proc. Association for the Advancement of Artificial Intelligence, pp. 47–55, 2011.
- [7] Vladimir I. Pavlovic, R. Sharma & T. S. Huang, "Visual interpretation of hand gestures for human-computer interaction: A review", IEEE Trans. Pattern Analysis and Machine Intelligence., Vol. 19, Issue no. 7, pp. 677 -695, 1997.
- [8] Kai Nickel, Rainer Stiefelbogen, "Visual recognition of pointing gestures for human-robot interaction", Image and Vision Computing, Vol. 25, Issue no. 12, pp. 1875-1884, December 2007.
- [9] K. Schindler and L. van Gool, "Action snippets: How many frames does human action recognition require?" in Proc. Computer Vision and Pattern Recognition, pp. 1–8, 2008.
- [10] I.Tashev, "Recent advances in human machine interfaces for gaming and entertainment", Int. J. Inform. Technol. Security, Vol. 3, Issue no. 3, pp. 69-76, 2011.
- [11] S. Lazebnik, C. Schmid, and J. Ponce, "Beyond bags of features: Spatial pyramid matching for recognizing natural scene categories", in Proc. CVPR, Vol.2, pp. 2169–2178, 2006.
- [12] J. Shotton, A. Fitzgibbon, M. Cook, "Real-Time Human Pose Recognition in Parts from a Single Depth Image", Proc. IEEE Computer Vision and Pattern Recognition, pp. 1297-1304, 2011.