

Comparison of Hand Gesture Techniques for Telemetry

Hitesh Yadav, Prof. (Dr.) Jannak Kumar B. Patel, Neeraj Gupta

¹Student, M.Tech. ECE, ASET, Amity University Haryana

²Professor & HOD, ECE-EEE, ASET, Amity University Haryana

³Assistant Professor, ECE, ASET, Amity University Haryana

ABSTRACT: *Gesture Signal acknowledgment has built up a ton in most recent couple of decades. It empowers Human Computer Interface (HCI) with no mechanical gadgets. Gesture Signal acknowledgment is a system for PCs to understanding human non-verbal communication, along these lines interacting a wealthier expression amongst machines and people than GUIs (graphical UIs), that limit the majority of input to keyboard and mouse. HCI makes PC working more easy and compatible. Gesture Signal might include hand; confront face detection and so on. This paper mainly centers on Hand Gesture Recognition. A hand motion gives an effective method for communicating ones thoughts with the PC collaboration framework. This paper accentuation on various hand signal methodologies, innovations and applications.*

KEYWORDS: *Image processing, hand gesture recognition, Pattern recognition, Human computer interaction, Human computer interface(HCI), Hand Gesture Recognition, Hidden Morkov Modal(HMM), Hue-saturation-value (HSV), Unit-Gradient Vector (UGV), support vector machine(SVM), Vietnamese Sign Language (VSL)*

INTRODUCTION:

Communication with the help of gestures has been wide employed by humans to specific their ideas and emotions. Gestures recognition refers to the process of characteristic gestures performed by human so machine will perform the corresponding action. Gestures are of two types which are known as static hand gesture and dynamic hand gesture [1]. A static gestures stand for still body posture and dynamic refers to movement of body part. Gestures can be done with any body part like head, face, arms, hands, etc. but most commonly we use hand to perform gesture like we wave hand to say 'good bye or hey'.

The recognition of hand gesture categorized in two types which are known as sensor based and vision based [2]. In sensor based technology the data collect and information we get from more than one sensor which is of different types. These sensors are attached with the hand and the data is collected from it then it is observed. The best example of the sensor based technique now days are Hand Glove [4]. The Hand glove technique is old technique for sensor detection. Sensor based recognition has certain drawbacks as they consider of hardware and software as well and this make little bit complex formation of setup. The different sensors which are used are Wiimote [wii controller], EMG sensors, accelerometer sensors [3], etc. Basically, Hidden Morkov Modal (HMM) is used for dynamic gesture recognition but recognition speed is less. In feature matching method we have to select a good feature like contour and measurement metric like Euclidian distance and hausdorff distance. Most widely used classifier are support vector machine (SVM) and Euclidean distance.

Literature Survey-

Nitin J. Janwe, Kishor K. Bhoyar [5] described key frame extraction technique based on intuition that higher the motion more the key frames required for summarization. They obtain the key frame by dividing the shot in parts of equal cumulative motion activity and selecting the frames located at the half way point of each sub segment. Furthermore they establish empirical relation between the motion activity of a segment and required number of key frames and compute them.

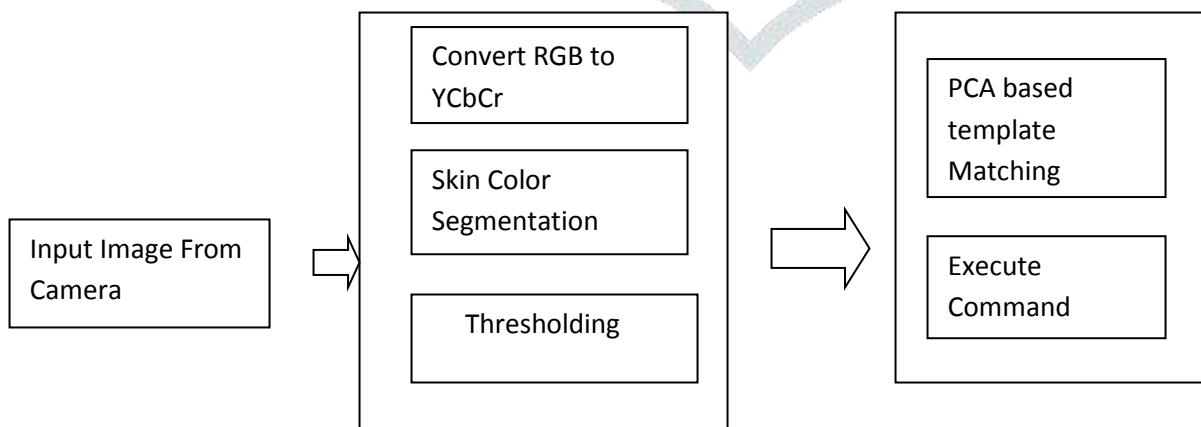
Yunyu Shi, Haisheng Yang, Ming Gong, Xiang Liu, and Yongxiang Xia [7] described sequential search algorithm that bypasses the process of temporal video segmentation is proposed for key frame extraction in MPEG videos. They aim at providing an efficient, real-time and fully automatic way of extracting key frames in videos, where not only the laborious task of offline video database indexing is avoided, but also query video processing is performed in the same manner as the reference video database. Significant reduction in computational cost is achieved by exploiting DCT coefficients in feature extraction. Mandeep Kaur Ahuja, Dr. Amardeep Singh introduced [6] hand gesture recognition technique which utilizes an FPGA based smart camera for gesture analysis is discussed. The experiment is performed using number based features as the system is modeled on FGPA board and requires less effort for computation. The features used for experiment are -area of hand, hand gesture representing number, radial profile and angular position. For image processing and hand segmentation, illumination compensation technique and skin color segmentation model is utilized keeping in view the changing background. Xing-fang, Huang, & Jiang-she Zhang [7] described on the local adaptive noise reduction operator based on a location shifting procedure. The proposed method aims at removing noise from images while preserving features. Performance of the method is illustrated by simulation and real images, which show an encouraging improvement compared with other methods. The advantages of the proposed method are its non-iterative feature, explicit formulation, and, consequently, its numerical simplicity.

1. Table representing the summary of literature survey

SI. No	Author and Journal	Findings	Research Gap
1.	Mandeep Kaur Ahuja, Dr. Amardeep Singh, "A Survey of Hand Gesture Recognition",	Introduction of hand gesture recognition technique which utilizes an FPGA based smart camera for gesture analysis.	Skin color segmentation model using HSV and YCbCr model can be

	International Journal of Advance Research in Computer Science and Management Studies, Volume 3, Issue 5, May 2015	<ul style="list-style-type: none"> The features used for experiment are - area of hand, hand gesture representing number, radial profile and angular position. For image processing and hand segmentation, illumination compensation technique and skin color segmentation model is utilized keeping in view the changing background. 	discussed in future work of image processing using FPGA based smart camera.
2.	Nitin J. Janwe, Kishor K. Bhojar, "Video Key-Frame Extraction using Unsupervised Clustering and Mutual Comparison"	In this paper the authors describe key frame extraction technique based on intuition that higher the motion more the key frames required for summarization. The key frame is obtained by dividing the shot in parts of equal cumulative motion activity and selecting the frames located at the half way point of each sub segment.	The empirical relation between the motion activity of a segment and required number of key frames can be established and then computed.
3.	Yunyu Shi, Haisheng Yang, Ming Gong, Xiang Liu, and Yongxiang Xia, "A Fast and Robust Key Frame Extraction Method for Video Copyright Protection", Journal of Electrical and Computer Engineering Volume 2017 (2017)	A sequential search algorithm that bypasses the process of temporal video segmentation is proposed for key frame extraction in MPEG videos. They aim at providing an efficient, real-time and fully automatic way of extracting key frames in videos, where not only the laborious task of offline video data base indexing is avoided, but also query video processing is performed in the same manner as the reference video database.	Significant reduction in computational cost can be achieved by exploiting DCT coefficients in feature extraction.
4.	Xing-fang, Huang, & Jiang-she Zhang, "Edge-Preserving Filtering for Grey and Color Image", In Proc. of the IEEE/Computer Science and Information Engineering	The detail study on the local adaptive noise reduction operator based on a location shifting procedure is done. The proposed method aims at removing noise from images while preserving features. The advantages of the proposed method are its non-iterative feature, explicit formulation, and, consequently, its numerical simplicity.	The scope of explicit formulation in image processing can be worked upon in the future work.

Block Diagram of hand Recognition:-



A) Input Camera Image : For the input the image is provided with help of camera . Cameras can webcam or mobile phone camera or depth camera depending on our requirement.

- B) Hand Tracking and Segmentation: We have to track hand because there can be some other object in front of camera apart from hand. This can be done with the help of Skin segmentation. Generally, hand is located with the help of rectangular bounding box. Segmentation also consist of various other steps like erosion and dilation for connecting the boundaries.
- C) Feature Extraction: It consist of extraction of desired features according to our requirement. In hand gestures features related to shape of hand, posture of hand, no. of fingers and direction of fingers etc. are extracted.
- D) Training Database: Database is trained for a set of postures. There an be many hand postures but system will recognize only the trained posture. There can be different methods of training database like Template Matching, Neural Network.
- E) Classification and Recognition: Classification can be done with the help of different classifier such as Support Vector Machine (SVM). Depending upon the extracted features and trained data, image is classified in different categories.
- F) Gesture Recognized: When the gesture feature is executed, corresponding action is taken depending on Hand signal give as a input image.

Table2. Algorithmic techniques for Hand Gesture Recognition

Techniques	Uses	Advantages	Disadvantages
Features Extraction	Glove Based	It is a layered architecture and recognizes both postures and gestures.	Cost of computation is high.
Template Matching	Vision and Glove Based	Vision and Glove based	Not work for large posture set.
Principal Component Analysis	Vision and Glove Based	It recognizes 25-35 postures.	It requires more training.
Active Shape Model	Vision Based	It is real time recognition and both postures and gestures	It tracks only the open hand.
Linear Fingertip Models	Vision Based	It is simple and have good recognition accuracy.	It is not real time and applicable only for small set of postures.
Pixel Count Method	Vision Based	It is very simple and have good accuracy.	Work only for 5 gestures
Casual Analysis	Vision Based	It uses the information about how human interact.	Limited gestures recognized with no orientation.
Morphological operations	Vision Based	It is invariant to rotation and size of image.	Needs more pre-processing and efficient only in noise free background.
Scanning method	Vision Based	It have optimum execution time and more accuracy.	Background should be clear.

APPLICATIONS OF HAND GESTURE RECOGNITION SYSTEM

Applications of static gesture recognition system are as follows-

- Recognition of Numbers: Recently, numbers starting from 0-9 can be recognized using hand gesture in such a way that humans and computer can interact with each other
- Robot Control: hand gesture recognition can be used to control the robotic actions
- Television Control: The devices used in television can be controlled with the help of hand posture and gesture
- Biomedical Field: There are a many application of Hand Gesture Recognition in medical field.

Conclusion

Hand Gesture recognition is advantage for physically impaired people and deaf people but also applied in various other field like virtual environment, robotics, telemetry, medical research and games. The hand information changes according to the distance between the camera and hand. It also depends on the quality of camera used which ultimately affects the system performance in terms of accuracy. The hand recognition depends on the background and intensity of the light So, we have to make a trade-off between the accuracy and cost of the system according to our requirement. A comparative study of various Hand recognition techniques is given in this paper which done through skin color segmentation, with the help of blob analysis and contagious area method

REFERENCE :

- [1] Sushmita Mitra, and Tinku Acharya , “Gesture Recognition: A Survey” , *IEEE Transactions on Systems, Man, and Cybernetics* , vol. 37, no. 3, pp . 311-324, May 2007.
- [2] Xu Zhang, Xiang Chen, Yun Li, Vuokko Lantz, Kongqiao Wang, and Jihai Yang, “A Framework for Hand Gesture Recognition Based on Accelerometer and EMG Sensors” , *IEEE Transactions On Systems, Man, And Cybernetics—Part A: Systems And Humans*, Vol. 41, No. 6,1064-1076, November 2011

- [3] Arpita Ray Sarkar, G. Sanyal, and S. Majumder, "Hand Gesture Recognition Systems: A Survey", *International Journal of Computer Applications*, vol. 71, no.15, pp. 0975 – 8887, May 2013.
- [4] Haitham Hasan , Sameem Abdul-Kareem, "Human-computer interaction using vision-based hand gesture recognition systems: a survey" , *Neural Comput & Applic*,2013.
- [5] Nitin J. Janwe, Kishor K. Bhojar, "Video Key-Frame Extraction using Unsupervised Clustering and Mutual Comparison"
- [6] Mandeep Kaur Ahuja, Dr. Amardeep Singh," A Survey of Hand Gesture Recognition", *International Journal of Advance Research in Computer Science and Management Studies*, Volume 3, Issue 5, May 2015.
- [7] Xing-fang, Huang, & Jiang-she Zhang, "Edge-Preserving Filtering for Grey and Color Image", In Proc. of the IEEE/Computer Science and Information Engineering
- [8] Yunyu Shi, Haisheng Yang, Ming Gong, Xiang Liu, and Yongxiang Xia,"A Fast and Robust Key Frame Extraction Method for Video Copyright Protection", *Journal of Electrical and Computer Engineering* Volume 2017 (2017).

