© 2018 IJSRSET | Volume 4 | Issue 4 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Hand Gesture Recognition System For Human Computer Interaction(HCI)

Nirali A. Patel[1], Swati J. Patel[2]
[1]M.E(I.T) Student, I.T Department, L.D College of Engineering, Ahmedabad, Gujarat, India
[2]Assistant Prof., I.T Department, L.D College of Engineering, Ahmedabad, Gujarat, India

ABSTRACT

Movement of Human Hands interpreted mathematically by gesture recognition system. In our Modern life, gestural medium plays an important role for interaction. For ultra-modern, pure and friendly interaction with devices, hand gestures are more reliable. Most favoured approaches of hand gesture recognition are Robotics, American Sign Language (ASL), Games, and Human Computer Interaction (HCI) etc. Even though a large amount of work has been performed in the gesture based human–computer interface, blind users still feel it is tough to interact with computers. The major obstacle is the lack of knowledge about blind user's preferences toward hand gestures. To get knowledge about blind user's preferred gesture, a user judgement study is carried out and most favourable gesture set is obtained. The performance and preference measure analysis mainly considered in selection of most favourable gesture. Learning, easiness, naturalness, and reproducibility, these four criteria involve in performance measure rating. These most favourable and easy gestures are used in developing dactylology which is used by blind users for easy cooperation with computer.

Keywords : Blind, dactylology, gesture-based interaction, hand/wrist posture, human–computer interface (HCI), reduced shape signature, rule based classifier

I. INTRODUCTION

Now A Days, We are living in digital World, Where Computers are essential for everyone's technology dependent life, and so human-computer interaction(HCI) is crucial in digitized society. Considering capacious usage of Computers, We required plain sailing and adequate technique to collaborate with computer. To input something into computer mainly keyboard and mouse is used. For uniting with computer, predominantly keyboard and mouse is used to input word, give direction and many other operations. Doing job with Keyboard and mouse is facile for sighted person. But for blind people, doing job with keyboard and mouse, to collaborate with computer is very troublesome. As we all know there are many devices that used by blind people to collaborate with world, like Screen Reader, Braille based device, speech to text based technique etc. These all techniques have some limitations, like with the use of Screen reader software read all the content displayed on the screen and then wait for user collaboration and for that blind people has complete knowledge of layout of keyboard which not provide comfort ability of interaction with the computer to the blind people. Braille based device contain only six dots and by combination theory, 2^6, we get 64 combination from six dot. We can map only 64 keyboard keys with these 64 combinations and our keyboard(windows) has 104 keys so this is not efficient way for collaboration with the computer for blind people. Also the Braille based devices are complex to understand. Speech to text base techniques are not efficacious in noisy environment.so hand gestures recognition provide coherent solution for collaboration. Here, I aimed to use reduced shape signature[1] method for gesture recognition which is given by Gourav Modanwal, and Kishor Sarawadekar.Here I add some extra keyboard key mapping with intra class gesture[1] using classification rule and also add dynamic gesture.

II. FLOW OF METHOD

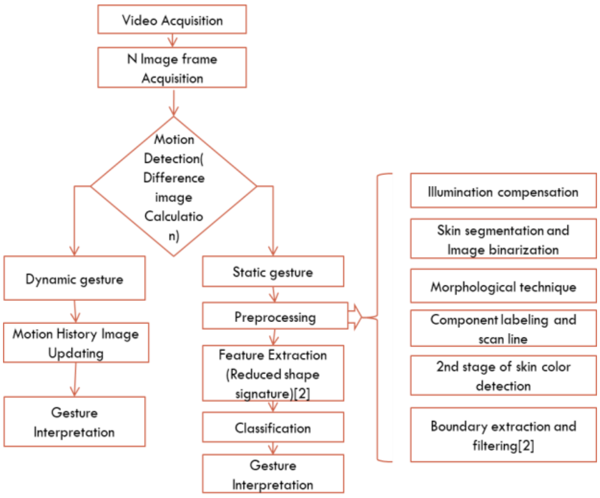


Figure 1. Process Flow chart

A. Motion Detection:

Motion estimated by calculating absolute difference between two frames and if the difference is above threshold value than consider that motion is detected.

B. Pre-processing

Illumination compensation: it reduces light condition.

Skin segmentation: skin color classified by cb and cr value ranges.

Binarization: Convert RGB image to binary.

Morphological Technique: Opening operation used to remove errors.

Component labelling and scan line: it scans an image from top to bottom, left to right and groups its pixels into different labels. Once scan is completed, pixels with equivalent labels are grouped into equivalence classes and a unique label is assigned to each class.

2nd Stage of Skin Color detection: it helps in eliminating noises that connect to the hand region but it often result in holes in hand region so region filling technique carried out.

Boundary Extraction and filtering: Boundary obtained by multiplying structuring element and then subtract original image from resulting image. Filtering is used to smoothen hand boundary.

Feature extraction: Reduced shape signature[2] Intra class-1 gesture

1(A) 1(B)

Figure 2. Sample of intra-class gestures having two fingers with different distribution

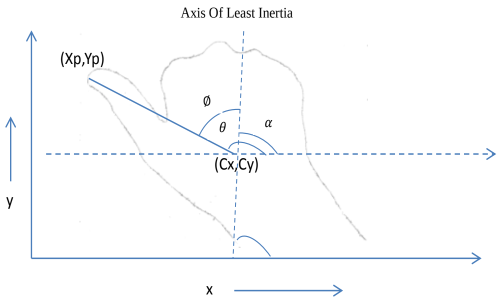


Figure 3. Illustration of Intra-Class Gesture having 1 finger Extraction

$$\theta = \tan^{-1}\left(\frac{X_p - C_x}{Y_p - C_y}\right) \quad , \quad Slope = \left(\frac{X_p - C_x}{Y_p - C_y}\right)$$

$$\alpha = \frac{1}{2}\tan^{-1}\frac{b}{a-c}, \frac{-\pi}{2} < \alpha < \frac{\pi}{2}$$

Where

$$a = \sum_{i=0}^{N-1}\left((x(i) - C_x)\right)^2$$

$$b = 2\sum_{i=0}^{N-1}(x(i) - C_x) * \left(y(i) - C_y\right)$$

$$c = \sum_{i=0}^{N-1} \left(\left(y(i) - C_y \right) \right)^2$$

$$if\ \theta \geq \alpha\ , calculate\ \emptyset = \theta - \alpha$$
$$if\ \theta < \alpha\ , calculate\ \emptyset = \alpha - \theta$$

Examining the value of ∅ (with some threshold value) and area ratio (with some threshold value) ,we extract the 1 finger intra-class gesture.∅ is rotation invariant.

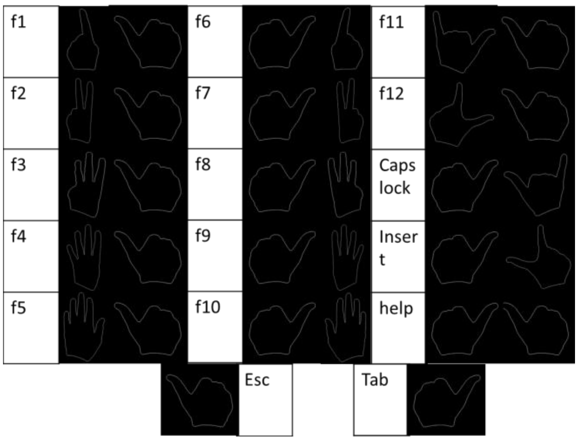


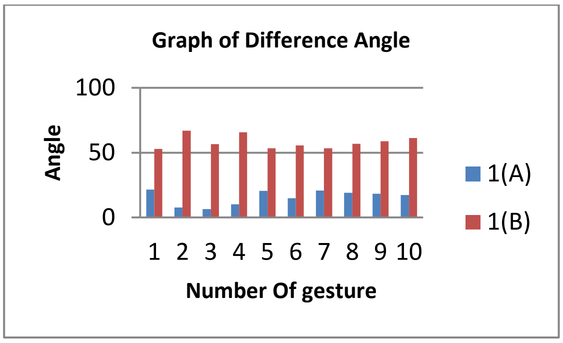
Figure 4. Double handed gesture symbol

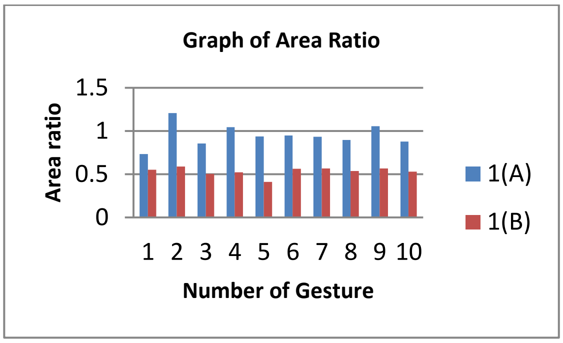
Classification:

Inter class gestures are classified by calculating peak value for intra class classification rules are as follow,

Table 1. Classification Rule For Intra-class gesture recognition

Classification Rule	
Angle < 35 & Area Ratio<0.65	Gesture 1(A)
Angle>35 & Area Ratio>0.65	Gesture 1(B)





Here,

Area Ratio =a1/a2;

a1=Area of triangle made by 3 point, peak point, centroid and center of largest hand boundary circle

a2=Area of Largest hand Boundary circle

Angle=Angle between Axis of least inertia and line with peak point and centroid

Dynamic gesture recognition:

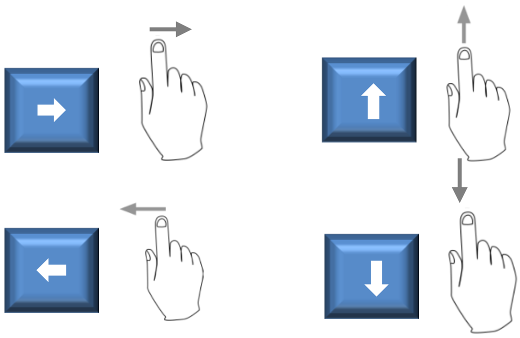


Figure 5. Dynamic gesture sample

Dynamic gesture recognition achieved by considering motion information. Variations encompassed by frames could be cumulated in motion history image. Four measure of direction are defined for calculating quantities in each area. Here, if the left component is brighter than the right component, the counter of left direction would be expanded by one. It concluded that the hand move in left direction.

III. RESULT ANALYSIS

From 250 gestures, 243 intra class gestures are correctly recognized. So 97.2% of recognition rate achieved. Dynamic gestures are correctly recognized at rate 95%.

IV. CONCLUSION

From this method 15 more keys of keyboard are map to the gestures. And also provide flexibility of complicated and dynamic background. Dynamic gesture provides facility of comfort ability even if the blind people not get correct judgement about position of hand.

In Future, we can add more dynamic gesture.

V. REFERENCES

[1]. G. Modanwal and K. Sarawadekar, "Towards hand gesture based writing support system for blinds," Pattern Recognit., vol. 57, pp. 50-60, 2016.

[2]. G. Modanwal and K. Sarawadekar, "Development of a new dactylology and writing support system especially for blinds," in Proc. 13th Conf. Comput. Robot Vis., 2016, pp. 362-369.

[3]. Chung-Ju Liao, Shun-Feng Su, Ming-Chang Chen "Vision-based Hand Gesture Recognition System for a Dynamic and Complicated Environment" ,2015.

[4]. S.M. Hassan Ahmeda, Todd C. Alexanderb, and Georgios C. Anagnostopoulosb "Real-time, Static and Dynamic Hand Gesture Recognition for Human-Computer Interaction"

[5]. Siddharth S. Rautaray • Anupam Agrawal "Vision based hand gesture recognition for human computer interaction: a survey",2014

[6]. Sumpi Saika,sarat saharia,"A survey on vision based dynamic gesture recognition"IJCA,2016.

[7]. Y. Wu and T. S. Huang, "Vision-Based Gesture Recognition: A Review," in Gesture-Based Communication in Human-Computer Interaction, Springer Berlin Heidelberg, 1999, pp. 103-115.

[8]. C. Shan, T. Tan and Y. Wei, "Real-time hand tracking using a mean shift embedded particle filter," Pattern Recognition, vol. 40, no. 7, p. 1958-1970, 2007

[9]. M. Panwar and P. S. Mehra, "Hand Gesture Recognition for Human Computer," in International Conference on Image Information Processing (ICIIP), 2011.

[10]. K. Silanon and N. Suvonvorn, "Finger-spelling recognition system using fuzzy finger shape and hand appearance features," in Digital Information and Communication Technology and it's Applications (DICTAP), 2014.

[11]. A. Kuznetsova, L. Leal-Taixe and B. Rosenhahn, "Real-Time Sign Language Recognition Using a Consumer Depth Camera," in Computer Vision Workshops (ICCVW),, 2014.

[12]. M. Panwar, "Hand gesture recognition based on shape parameters," in Computing, Communication and Applications (ICCCA), Dindigul, Tamilnadu, 2012

[13]. Anant Atray," Automatic Hand Gesture Recognition",2015

[14]. Moniruzzaman Bhuiyan, Rich Picking," A Gesture Controlled User Interface for Inclusive Design and Evaluative Study of Its Usability", Journal of Software Engineering and Applications, 2011, 4, 513-521

[15]. Guillaume Plouffe and Ana-Maria Cretu, "Static and Dynamic Hand Gesture Recognition in Depth Data Using Dynamic Time Warping ",2015

[16]. Paulo Trigueiros, Fernando Ribeiro, Luis Paulo Reis," Vision-based Gesture Recognition System for Human-Computer Interaction" ,2015

[17]. Krishna Rathi, Dinesh Patil, Sayli Bhavsar, Ketaki Jadhav, Prof. Saurabh V. Thakur," Gesture Human-Machine Interface (GHMI) in Home Automation",2017

[18]. Mobile device to cloud co-processing of ASL finger spelling to text conversionONLINE].Available at: https://www.researchgate.net/publication/283969533_Mobile_device_to_cloud_coprocessing_of_ASL_finger_spelling_to_text_conversion.

[19]. Pramod Pisharady, M.S.(2015,December),"Recent methods and databases in vision-based hand gesture recognition: A review"Accessed on:12 october 2017,available at: www.researchgate.net

[20]. Shaun K. Kane, Jacob O. Wobbrock, Richard E. Ladner "Usable Gestures for Blind People: Understanding Preference and Performance",may,2011.