High-speed Integration of Kinect V2 Data for Identification of Hand Gesture in Real time Movements

S.Chandrasekhar, N.N.Mhala

Abstract- Hand gesture recognition is extremely critical for human-PC connection. This manuscript presents a narrative constant strategy for human-hand gesture recognition. Here a framework for the discovery of quick gesture movement by utilizing a direct indicator of hand developments utilizing information combination technique. In our system, the hand area is removed from the foundation with the foundation subtraction strategy. At long last, the framework has been approved by methods for the Kinect v2 application actualized. The time requirement is recognized and the recognition is quick contrasted with other ongoing minutes. The timing analysis is compared , and the average time using data fusion method [1] is 63ms. By using fast integrating of data the average time is 45ms. The time taken for recognition of hand gesture is been improved. The experimental results are performed using Matlab tool.

Keywords- Gesture Recognition, Human Computer Interaction, Kinect V2 system

I. INTRODUCTION

Late years have seen a good development in novel gadgets and strategies for human– PC cooperation. This attract upon human and human correspondence modalities to acquaint certain instinct and simplicity with the HCI.
Application fields requiring hand signal Specifically, interfaces consolidating hand motions have picked up fame in numerous fields of utilization. The programmed visual understanding of dynamic hand movements and concentrate these in a system of an real time. An ongoing visionbased framework has produced, with this objective along with well-built identification of hand signals act upon with human analysis. The methods and investigation introduced are pertinent to numerous other acknowledgments in outwardly difficult genuine world settings The method is studied for a human-machine interface application within the Here two interrelated module are a unit in a job: In this only one that detects a hand within the county of
interface and performs user categorization, and another that performs signal appreciation. The possibility of the scheme is established by means of a taxing RGBD hand motion dataset composed underneath settings of generalenlightenmentdeviation and occlusion[2].

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The major usage of hand motion provides elegant dissimilar to bulky boundary devices for humancomputerinteraction. Numerous hand gesticulation acknowledgment strategy discrimination visual investigations are projected: grammar analysis, neural networks, the hidden Markov model (HMM). The appreciation of hand gesture base on HMM come up to consist of pre-processing stage for track the hand, localization of hand and spot of hand motion. Skin colour is one of the factor used to detect hand and the other the other factor is movement. The hand trailing formula finds the centroids of the moving hand regions, connects them, and produces a hand mechanical phenomenon. The gesture recognizing formula divides the mechanical phenomenon into real and vacuous segments[3].
FEMD in [4] used to measure the dissimilarities between the shapes and components of fingers are extracted to differentiate the hand gesture. In case of Human Computer interactions in real time applications FEMD is suitable. The qualitative and quantitative analysis is performed for hand base images where RGB and RGB-D units are used to review [5].

In this paper we propose a fast integrating of data which is obtained by Kinect v2, here we obtain the skelton data and also the depth is obtained by segmentation.

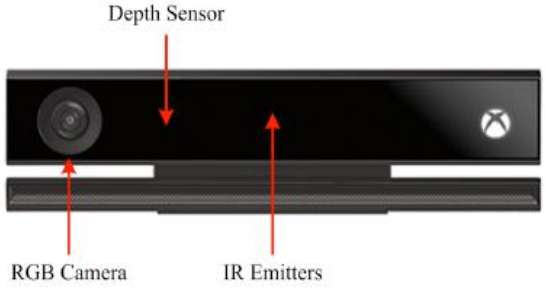


Fig 1. Kinect V2

II. IMAGE RECOGNITION AND SEGMENTATION

Both identification and segmentation are two factors to be given importance in image processing. The recognition is part mostly used in real time scenario and is termed to be once the difficult task to be accessed and this paper mostly focus on recognition. In specific, spatiotemporal options square measure evaluated in terms of speed, performance, and ranging generalization.

Although temporal segmentation may be a troublesome drawback additionally, during this work, we tend to use an easy segmentation of temporal gestures employing a hand presence detector, in order that the hand should leave the ROI among dissimilar gestures. Template matching is been used for hand recognition , in which the dissimilar distance will be calculated and is given by:

$$c = argmin\ MD(I, TP_c)$$

where MD is the moving distance of the input image I, with TP_c is the template of class c.

The process of recognition consists of image enhancement, features extraction and finally hand gesture recognition. In image enhancement process the input colour image which is an RGB image captured by the kinect V2 camera. The RGB image need to be converted into YCbCr, here Y deals with the luminance of the image , Cb and Cr are the different components which give the colour information. Here the boundaries of hands are obtained from the image.

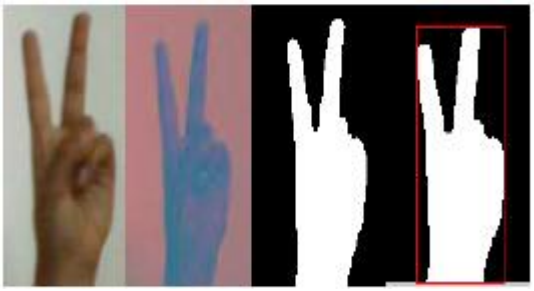


Fig 2. Example: Original image, YCbCr image, binary image and localized hand object

In feature extraction the centroid of the image is calculated. Based on the moment of the hand which is weighted average of the image pixels.

$$M_{ij} = \sum \sum_{xy} x^i y^j I(x,y)$$

where M_{ij} is the image moment and $I(x,y)$ is the intensity level of image with respect to x, y coordinates.

The example shown in fig 2 is a hand gesture detection system general process. With the Kinect v2 image form and its time-series curve, we have a tendency to currently gift a way to robustly acknowledge the hand gesture. This analysis was conducted to spot human hands in actual space .Given a set of videos, we have a tendency to centered on the matter of deciphering the outcome of human part gesture model so as to spot with totally different color. Depth pictures, as they're provided by a Kinect v2, suffer from quite uncommon noise. The distance calculation is best way. In this technique, the removal of background is done by identifying the minimum distance and maximum distances. For Minimum depth and Maximum depth, fix worth were used as following statement.

$$D_{min} = Fixed\ Value$$

$$D_{max} = Fixed\ Value$$

Here the important fixed values are the D minimum and D maximum values. Based on these values we are going to calculate the distance of the depth pictures. The given a set of videos are from the above shown are the very important ones to calculate the depth and image values.

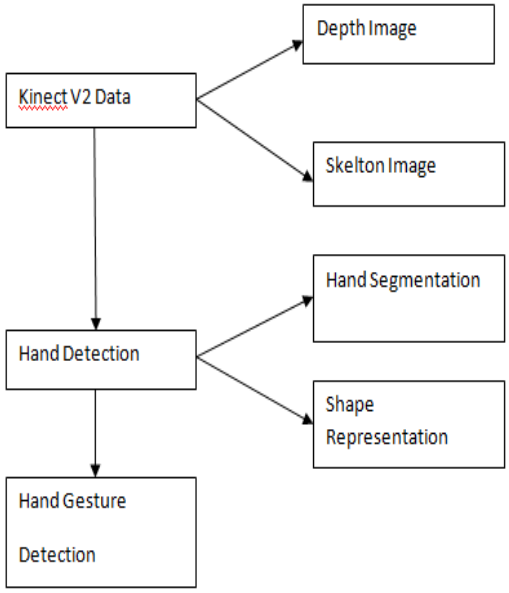


Fig 3. Hand Recognition Model

Powerful hand discovery is that the most troublesome disadvantage in building a hand gesture based association framework. There are numerous prompts that might be utilized: look uncertainly. shading, profundity, and setting. In issues like face discovery, the looks might be a magnificent marker. The mouth, nose and eyes unendingly appear inside a similar setup, with comparable extents, and comparable differentiations. Tragically, this isn't the situation for hand location; because of the high number of degrees of opportunity, and the subsequent shapes and shadows, the hand appearance can change

From the skeleton of kinect V2 image the hand region is segmented by cropping the image using coordinates by considering the centers. Inorder to detect the hand, the user should ensure that hands need to face the detector. Algorithm of proposed technique is shown below, these steps involves the process of gesture recognition .

Step1: Extract the counters from the binary image using Topological Structural Analysis by following the border lines of the image

Step2: Curve fitting operation is performed is done before obtaining the shape features from the image

Step 3: The convex shapes of the image are identified using the polygon curve

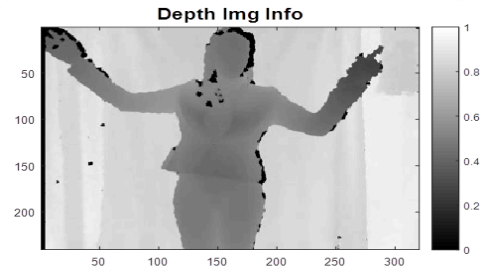
Step 4: The distance between the images are calculated using Manhattan distance.

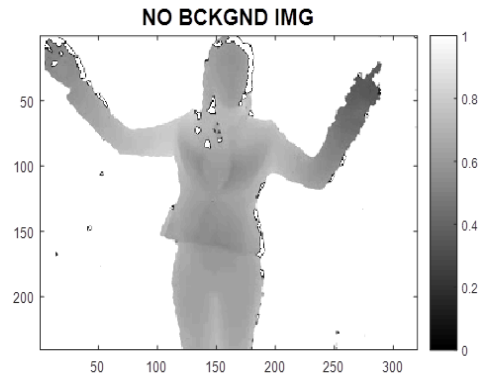
Step 5: Hand recognition results are obtained

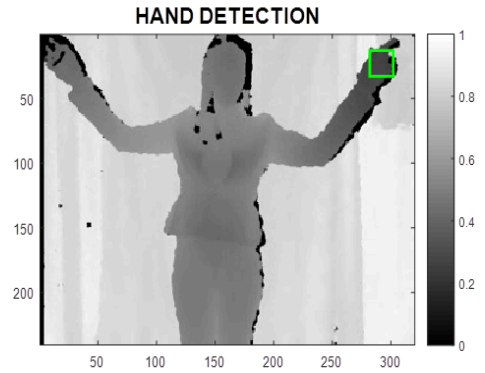
III. EXPERIMENTAL RESULTS

In order to obtain effective recognition rate and check the time taken for recognition, two cases are considered and evaluated. The case 1 the input image is captured from Kinect v2 camera. The depth of image information is obtained , later the background of the image is extracted and finally hand detection is done. The same is performed on second image.

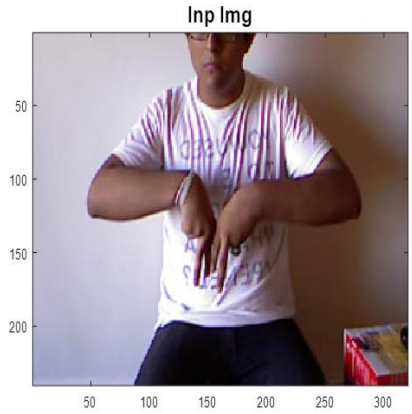
Case 1:

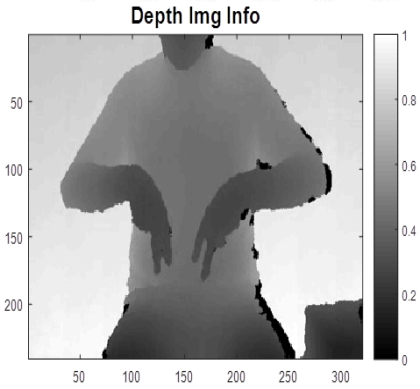


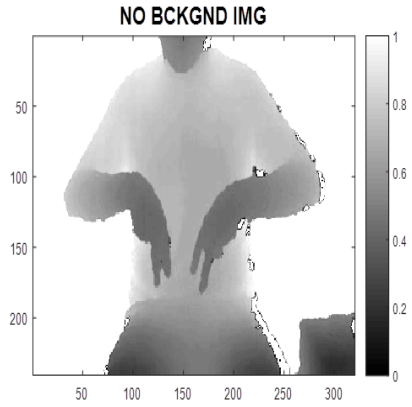


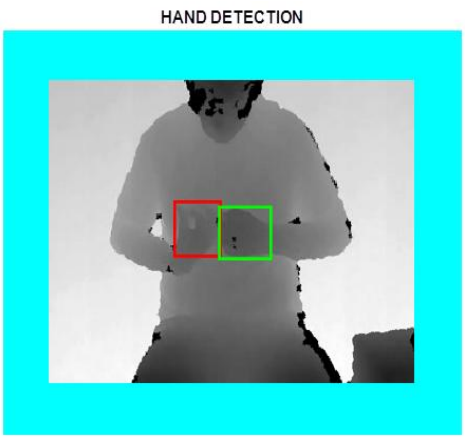


Case2:









The experimental results shows 98% accuracy in identification within a time of 45.3milli seconds. The implementation of the proposed system provides the level of implementation implementation ease. The experiment is performed using Matlab tool.

	Average Time
Image case 1	45.3ms
Image case 2	44.2ms
Pose 2[1]	60.5ms
Pose 4[1]	63ms

Therefore , two cases have been considered and conducted experiment on two participants. Thus the aim of this paper is to obtain high accuracy and rate of recognition to be high considering the time factor for identification of hand gesture. It is observed that second participant recognition rate is 1.1ms fast compared to first contributor.

IV. CONCLUSION

In many real time applications hand gesture recognition is one of the most important factor and is difficult to identify and accurate results need to be obtained. In this paper, Kinect V2 images are considered to perform the experimentation. An ongoing hand recognition calculation on profundity pictures was proposed and is endeavored to evacuate foundation subtraction dependent on separation technique likewise hands with various coulters has distinguished. An information combination based hand gesture recognition show by intertwining profundity data and skeleton information. In view of the exact division and following Kinect V2, the model can accomplish constant execution, which is quicker than the best in class hand gesture recognition techniques. In view of the exploratory outcomes, the proposed model is precise and proficient and enhanced in time of recognition

REFERENCES

1. Yuhai Lan, Jing Li, Zhaojie Ju (2016), Data Fusion-based Real-Time Hand Gesture Recognition with Kinect V2, 978-1-5090-1729-4/16/ 2016 IEEE
2. Yoon H, Soh J, Bae Y, Seung Yang H (2001) Hand gesture recognition using combined features of location, angle and velocity. Pattern Recog 34(7):1491---1501
3. E. Ohn-Bar and M. M. Trivedi, "Hand Gesture Recognition in Real Time for Automotive Interfaces: A Multimodal Vision-Based Approach and Evaluations", IEEE Trans. Intelligent Transformation Systems, vol. 15, no. 6, pp. 2368-2377, 2014.
4. Z. Ren, J. Yuan, J. Meng, and Z. Zhang, "Robust Part-Based Hand Gesture Recognition Using Kinect Sensor", IEEE Trans. Multimedia, vol. 15, no. 5, pp. 1110-1120, 2013.
5. P. K. Pisharady, M. Saerbeck, "Recent Methods and Databases in Vision-based Hand Gesture Recognition:A Review", Computer Vision and Image Understanding, vol. 141, 152–165, 2015.
6. U. Mahbub, H. Imtiaz, T. Roy, M. Rahman, M. Ahad, "A Template Matching Approach of One-shot-learning Gesture Recognition," Pattern Recognit Letters, vol. 34, 1780–1788, 2013.
7. El-Baz A, Tolba A (2013) An efficient algorithm for 3d hand gesture recognition using combined neural classifiers. Neural Computing and Applications pp 1---8
8. Mithun George Jacob , Juan Pablo Wachs, Context-based hand gesture recognition for the operating room, Pattern Recognition Letters, 36, p.196-203, January, 2014
9. Trail S, Dean M, Tavares T, Odowichuk G, Driessen P, Schloss W, Tzanetakis G (2012) Non-invasive sensing and gesture control for pitched percussion hyper-instruments using the Kinect. In: 12th International Conference on New Interfaces for Musical Expression. NIME'12
10. Celebi S, Aydin A, Temiz T, Arici T (2013) Gesture recognition using skeleton data with weighted dynamic time warping. Computer Vision Theory and Applications. VISAPP
11. Livingston M, Sebastian J, Ai Z, Decker J (2012) Performance measurements for the microsoft Kinect skeleton. In: Proceedings of the 2012 IEEE Virtual Reality Workshops, pp 119–120
12. Yoon H, Soh J, Bae Y, Seung Yang H (2001) Hand gesture recognition using combined features of location, angle and velocity. Pattern Recog 34(7):1491–1501.
13. P. K. Pisharady, M. Saerbeck, "Recent Methods and Databases in Vision-based Hand Gesture Recognition:A Review", Computer Vision and Image Understanding, vol. 141, 152–165, 2015.
14. A. Erol, G. Bebis, M. Nicolescu, R.D. Boyle, X. Twombly, "Visionbased Hand Pose Estimation: A Review", Computer Vision and Image Understanding, wol. 108, 52–73, 2007.
15. E. Ohn-Bar and M. M. Trivedi, "Hand Gesture Recognition in Real Time for Automotive Interfaces: A Multimodal Vision-Based Approach and Evaluations", IEEE Trans. Intelligent Transformation Systems, vol. 15, no. 6, pp. 2368-2377, 2014.

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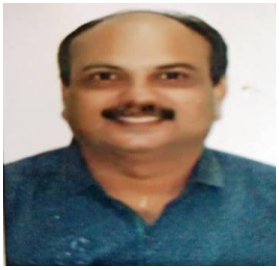

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