

Controlling Multimedia Applications Using Hand Gesture Recognition

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Abstract - Hand gesture recognition in aspect to human-machine interface is being developed vastly in recent days. Because of the disturbance of lighting and background being not plain, many visual hand gesture recognition systems operate or show successful results only in restricted background. To recognize the various hand gestures, we will build a non complex and with greater speed motion history image related system. In our system, we mainly focus on applying pointing behaviour for the human machine interface. Now days, the gesture recognition has been a new developmental and experimental thing for most of the human related electronics. This system allows people to operate electronic products more conveniently. In our system, a gesture recognition method is to be build which will be an interface between human machine interaction i.e. HMI. In our system we propose some non-complex algorithm and hand gestures to decrease the hand gesture recognition complexity and would be more easy and simple to control real-time computer systems.

Key Words: Human-Computer interaction, Gesture Recognition

1. INTRODUCTION

With the development in Computer Vision and Human Machine Interaction the Computer holds most important role in our daily life. Human Computer Interaction can provides several advantages with the introducing the different natural forms of device free communication. Gesture recognition is one of the several types of them to interact with the humans gestures are the natural form of action which we often used in our day to day life. But in computer application to interact humans with machine the interaction with devices like keyboard, mouse etc. must be requires. As the various hand gestures are frequently used by humans so the aim of this project is to reduce external hardware interaction which is required for computer application, and hence this causes system more reliable for use with ease.

This paper implements gesture based recognition technique to handing multimedia application. In this system, a gesture recognition scheme is been proposed as an interface between human and machine. In our system we represent some low-complexity algorithm and some hand gestures to decrease the gesture recognition complexity and which becomes easier to control real-time systems.

2. EXISTING SYSTEM

Many various systems have been developed that are being controlled by gesture. These systems consist of games, sign language recognition, all these systems can be controlled by facial gestures, hand gestures can also control mouse.

A system was developed in 2012 that recognizes seven various hand gestures consists of various gestures such as up, and down, right, and left, cross and round. Three various modules were built in this system to recognize various hand gestures. Signals by MEMS 3-axes accelerometers were been given as input to the system. The gesture of the hand in three perpendicular directions is been detected by 3 accelerometers and been transmitted to the system by Bluetooth. Segmentation algorithm has been applied and finally the gestures are recognized and compares with the gesturers already been saved in the system. People get daily information about news weather etc with the use of the internet. To get these above information people have to use mouse and keyboard which can be prevented by this system. An article was been presented in 2011 by Ginu Thomas, A Review of Various Hand Gesture Recognition Techniques in which he compared the results achieved by several hand gesture recognitions techniques present. The various techniques used are edges method, and pixel by pixel comparison, orientation histogram. A database has been used that store various static hand gestures inputs. These inputs were the subset of ASL i.e. American sign languages. Filtering of the input image has been done to remove the noise present in the input image and then segmentation was done to the input image to analyze it. The input image was then converted into feature vector and then it was compared with the stored, trained set of hand gestures. A system developed by Anupam Agrawal in 2010 had various used hand gestures to operate the VLC media player application. The K nearest neighbour algorithm has been used to recognize the various hand gestures. A VLC media player system that has been controlled by various hand gestures consists of play, and pause, Full screen, and stop, increase volume, and decrease volume features. Lucas Kanade Pyramidal Optical Flow algorithm has been used to detect hand gestures from the input video. This algorithm present in the system detects moving points in the input received by the input video. After this K-MEAN has been used to locate the centre of the hand. Using this centre point also known as centroid of the hand,

hand is been recognized. The above mentioned system used a database that consists of various hand gestures and then input image was been compared with this saved image and accordingly the purposed output command was been performed by VLC media player.

3. LITERATURE SURVEY

In 2015, Chong Wang, "Super pixel-Based Hand Gesture Recognition with Kinect Depth Camera" proposed the system which uses kinect depth camera. It is based on a compact representation in the form of super pixels, which efficiently capture the shape, texture and depth features of the gestures. Since this system uses kinect depth camera, the cost of system is more.

In 2014, Swapnil D. Badgujar, "Hand Gesture Recognition System" proposed the system which recognize the unknown input gestures by using hand tracking and extraction method. This system is applied to recognize the single gesture. There is assumption of stationary background so that system will have smaller search region for tracking. This system only control mouse with the finger using it on web cam.

In 2014, Viraj Shinde, Tushar Bacchav, Jitendra Pawar and Mangesh Sanap developed "Hand Gesture Recognition System Using Camera". They focus on using pointing behaviors for a natural interface to classify the dynamic hand gesture, they developed a simple and fast motion history image based method. This paper presents low complexity algorithm and gestures recognition complexity and more suitable for controlling real time computer system. It is applicable only for the application Of power point presentation.

In 2014, N. Krishna Chaitanya and R. Janardhan Rao presents "Controlling of windows media player application using hand gesture recognition", this system uses various hand gestures as input to operate the windows media player application. This system uses single hand gestures and its directional motion which defines a particular gesture for the above mentioned application. In this system decision tree has been used for classification. This system only supports windows media player application and not any others.

In 2012, Ram Rajesh J., Sudharshan R., Nagarjunan D. and Aarthi R., "Remotely controlled PowerPoint presentation navigation using hand gestures" developed the system in which slides of power point presentation are controlled without using any marker and gloves. In this system the developer used the segmentation algorithm for hand detection. After detecting hand calculation is for active figures. If the fingers are not stretched properly while making a gesture then application did not work properly.

In 2012, Ruize Xu, Shengli Zhou and Wen J. Li, "MEMS Accelerometer Based Non specific-User Hand Gesture Recognition", had build a system which can recognize various hand gestures such as up, and down,

right, and left, cross and round. Three various modules were developed that recognizes various hand gestures. The Signals by MEMS (MicroElectromechanical System) 3-axes accelerometers were provided as input. The motion of the hand in three perpendicular direction is been detected by three accelerometers and send to the system by Bluetooth. Segmentation algorithm was been applied and finally the various hand gestures were recognized by matching gestures that were already saved in the system. People mostly prefer the internet to have daily update on weather, news etc. So for this purpose they perform keyboard and mouse operations. This system gives less accuracy in finding the terminal points of gestures due to small size of database of hand gesture.

In 2010, Anupam Agrawal and Siddharth Swarup Rautaray, "A Vision based Hand Gestures Interface for Operating VLC Media Player Application" system, in that the K nearest neighbour algorithm has been used to recognize the various gestures. VLC media player features that were operated by hand gestures includes play, and pause, Full screen, stop, increase volume, and decrease volume. Lucas Kanade Pyramidal's Optical Flow algorithm has been used to recognize hand from the input video. This above mentioned algorithm recognizes moving points in the input image. Then K-means was been used to find the center of the hand. Using this centre, the hand is recognized. This system uses database that consists of various hand gestures and then the input was compared with this stored image and accordingly VLC media player was controlled. The present application is less robust in recognition phase.

In 2006, Erol Olgur and Asanterabi Malima, build a "A Fast Algorithm for Vision-Based Hand Gestures Recognition for Robot Control" which controlled robot using hand gestures but considered limited gestures. Firstly segmentation of hand region was carried followed by locating the fingers and then finally classifying the gestures. The algorithm used is invariant to translation, rotation and scale of the hand. This system is applicable to robot control application with reliable performance.

In 2003, Ahmed Elgammal, Vinay Shet, Yaser Yacoob and Larry S. Davis presents "Learning Dynamics for Exemplar-based Gesture Recognition". This system addresses the problem for recognizing the dynamics for exemplar based recognition system. It processes the non-parametric HMM (Hidden Markov Model) approach that uses HMM with arbitrary states to identify the gestures in a vast exemplar distribution. This reduces the want for long and training of HMM observation model. The approach is based on recognition each gestures as a series of learned body gestures (exemplar).

In 2002, Lars Bretzner, Ivan Laptev and Tony Lindeberg, "Hand Gesture Recognition using Multi-Scale Color Features, Hierarchical Models and Particle Filtering", they published algorithms for hand tracking, hand posture recognition. In this system, on each input image multi-

scale colour feature detection is carried out. By using particle filtering, with an layered sampling referred as hierarchical layered sampling hands are been detected and also tracked. Overall body poses of a person are captured for different gestures.

4. PROPOSED SYSTEM

4.1 HSV Scale Image

First the image is captured by the web-cam, then various image processing is done on it. The original image is then converted into HSV ie Hue Saturation and Value. This is done to detect the portion of the hand and separate it from the background. HSV defines a type of color space. Value is defined as brightness. In HSV, hue represents a color. In this system we have considered Hue in a range from 0 to 20. Saturation indicates the range of grey in the color space. We have considered saturation range from 55 to 255. Value is brightness of the color and varies with color saturation. In this system we have considered a range from 0 to 255 for Value, when the value is 0 the color space will be totally black. With the increase in the value, the color space brightens and shows various colors.

4.2 Threshold Image

In this module we have obtained threshold image using HSV ranges of colour detection. Here we find the biggest contour for hand detection. FindBiggestContour() with the use of OpenCV function i.e. cvFindContours() to make a list of various contours. In order to binary threshold image, a contour is a region of white pixels. Each region is approximated by a bounding box, and the contour corresponding to the largest box is taken and transmitted.

4.3 Filtered Image

In this module we extract the noisy pixels detected other than hand border. By calling extractContourInfo () we extract noisy pixels and analyze the contour.

4.4 Calculate Center Of Gravity

In section, the box surrounding the contour is used to receive a centre. This is enough as the underlying shape is a rectangular card, due to which the contour and box are almost same. Therefore, a rounding box around a hand can simply have other COG or angle from the hand itself; in such case, it is very important to analyze the hand contour other than a rounding box, by using moments. In this system we used spatial moments to obtain the

CentreOfGravity of an input binary image. This same method can be used to a contour to obtain its center or centroid. In this we can calculate second ordered mixed moments, which will give info about the spread of pixels around the centroid. Second order moments can be brought together to return the angle of the contour's major axis with respect to the x-axis. The OpenCV moments notation, the m () moments function takes following two arguments, a and b, which are been used as powers for x and y. The I() function is the intensity for the pixel defined by its (x, y) coordinate. s is the no of pixels that make up the shape. Then we take the contour, then is the angle of its major axis to the horizontal, with the +y-axis pointing downwards.

The m() function, it can be presented as that as below-Identifying the fingertips is been identified in the 1st row in the code, a convex hull is been wrapped round the contour by the OpenCVs cvConvexHull2() and this polygon is matched to the contour by the cvConvexityDefects() to find its flaws. The fingertips are been saved in a tipPts [] array, and the finger fold in foldPts[], and depths in the depths[]. The analysis mostly generates too many problems, thus reduceTips () is been called at the end of findFingerTips(). It then carries out two simple tests to filter out problems that are not fingertips. It removes points having shallow defect depths, and coordinates having too big an angle between the neighbouring fold points reduceTips() saves the other remaining tip points in the global fingerTips list. Thus, we get output as follows:

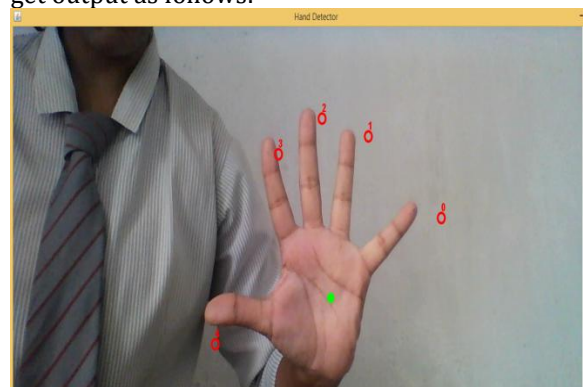


Fig -1: Numbered Fingertips

5. CONCLUSIONS

In proposed work, the gestures are used to control the multiple applications like PDF reader, multimedia player and power point presentation by avoiding the physical contact with mouse and keyboard. By using the gesture commands any one can use the system to operate different applications. In some previously implemented system the costly 3-D sensors like kinect are used for gesture recognition. To reduce the cost we are using simple web camera. The separate training set

is not require to recognize the gestures, so there is no need to maintain any database for storing the frames of images. Our focus in future is on the extending the gestures for the gaming and voice for mute.

REFERENCES

Chong Wang, Zhong Liu and Shing-Chow Chan "Superpixel-Based Hand Gesture Recognition With Kinect Depth Camera", *IEEE Trans. Multimedia*, vol. 17, no. 1, Jan. 2015.

Swapnil D. Badgujar, Gourab Talukdar, Omkar Gondhalekar and Mrs. S.Y. Kulkarni "Hang Gesture Recognition System", *International Journal of Scientific and Research Publications*, vol. 4, Issue 2, Feb. 2014, pp. 2250-3153.

Viraj Shinde, Tushar Bacchav, Jitendra Pawar and Mangesh Sanap "Hand Gesture Recognition System Using Camera", *International Journal of Engineering Research & Technology (IJERT)*, Vol. 3, Issue 1, January - 2014.

N.Krishna Chaitanya and R.Janardhan Rao "Controlling of windows media player using hand recognition system", *The International Journal Of Engineering And Science (IJES)*, Vol. 3, Issue 12, Pages 01-04, 2014.

Ram Rajesh J., Sudharshan R., Nagarjunan D. and Aarthi R. "Remotely controlled PowerPoint presentation navigation using hand gestures", Proc. of the Intl. Conf. on Advances in Computer, Electronics and Electrical Engineering, 2012.

Ruize Xu, Shengli Zhou, and Wen J. Li "MEMS Accelerometer Based Nonspecific-User Hand Gesture Recognition", *IEEE International Journal*, vol. 12, no. 5, May 2012.

Anupam Agrawal and Siddharth Swarup Rautaray "A Vision based Hand Gesture Interface for Controlling VLC Media Player", *International Journal of Computer Applications*, vol. 10, no. 7, Nov. 2010.

Asanterabi Malima, Erol Ozgur, and Mujdat Cetin "A Fast Algorithm for Vision-Based Hand Gesture Recognition for Robot Control", Turkey, 2006.

Ahmed Elgammal, Vinay Shet, Yaser Yacoob, Larry S. Davis. Learning Dynamics for Exemplar-based Gesture Recognition. In *Proceedings of the Fifteenth International Conference on Computer Vision and Pattern Recognition*, pages 571{578. IEEE, June 2003.

Lars Bretzner, Ivan Laptev, Tony Lindeberg. Hand Gesture Recognition using Multi-Scale Color Features, Hierarchical Models and Particle Filtering. In *Proceedings of the Fifth International Conference on Automatic Face and Gesture Recognition*, pages 423{428. IEEE, May 2002.

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