RGB to HSV conversion

ALGORITHM
• Load image.
• Read each pixel from image.
• Separate RGB color for each pixel.
R = col & 0xff;
G = (col >> 8) & 0xff;
B= (col >> 16) & 0xff;
• Find minimum value and maximum value from R,G,B.
• Assign max to value.
• If value equal to zero then
assign hue=saturation =0.
set pixel in image again
if valueof (Lum) = 0 then output color is black i.e there is no brightness in the color hence Hue and Saturation will be zero.

Else
//Formula for finding Saturation.
Find saturation= 255 * (Max-Min)/value.
if saturation = 0 then
assign hue=0.
set pixel
end if
Else
if max equal to R then
//Formula for finding Hue.
hue = 0 + 43*(G-B)/(max-min).
End if.
If max is equals G then
hue = 85 + 43 * (B-R) / (max-min).
End if
If max is equal to B then
hue = 171 + 43*(B-R)/(max-min).
End if.
If hue<0 then
hue=hue+255.
End if.
End if.
• Set each pixel again on image.
end.
After this we get binary image

Distance transform method for gesture recognition

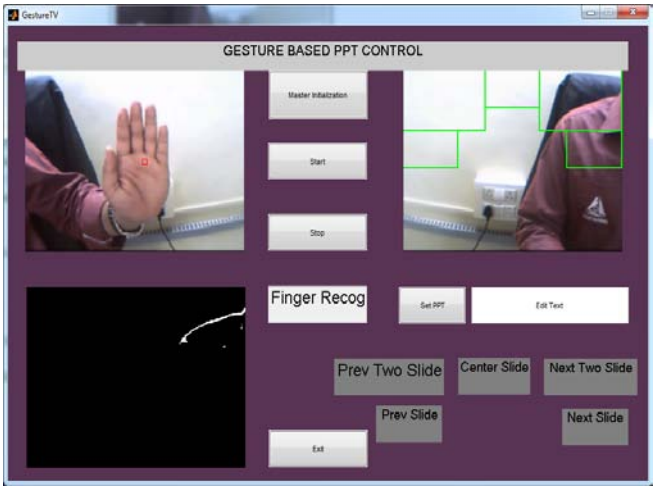
After segmentation the binary image is given to the distance transform method that recognizes the gesture. In this method firstly the centroid of palm is calculated by considering each pixel and calculating distance from nearest boundary. Therefore the pixel that is far from every boundary is chosen as centroid. Using this centroid active fingers are counted and if there is motion of hand, this is detected by motion of centroid from original position from a set of continuously captured images and the slide show is controlled that is PowerPoint presentation either goes to the next slide, previous slide or start after recognizing static gesture.

ALGORITHM
- Consider binary image.
- Check for all the pixels that are on boundary and assign it some value
- For each pixel in image an image other than boundary image

a. Calculate distance of that pixel from every pixel on boundary
- Assign some value for the pixel whose distance from every boundary pixel is maximum
- This pixel is the centroid of the image. Using this centroid slide show is controlled.

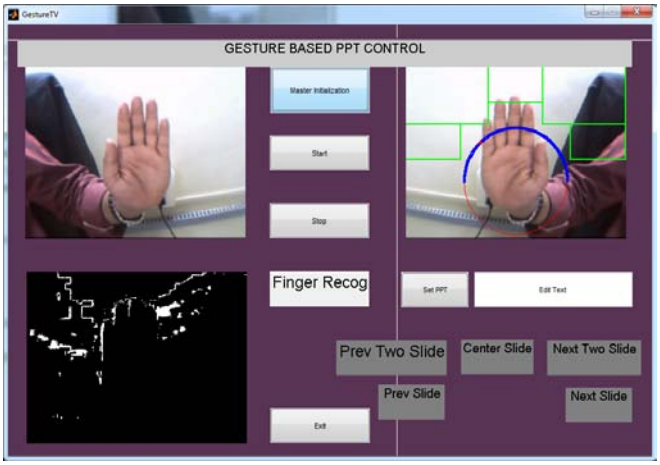
5. Results

Following snapshots illustrates the results achieved.
Initially we get the screen shown in snapshot 1.
It contains various buttons, like Master initialization, start, stop, previous slide, previous two slides, centre slide, next slide, and next two slides. In the screenshot can also see the button as Set PPT, it is used to select the ppt that we want to navigate.



Snapshot 1: Initial Screen

We can see three segments showing three different screens. First screen is used for master initialization, next is actual image captured through webcam and the last shows the binary image that is obtained using skin color segmentation algorithm. When the hand is detected, immediately is marked with circle as shown in snapshot 2.

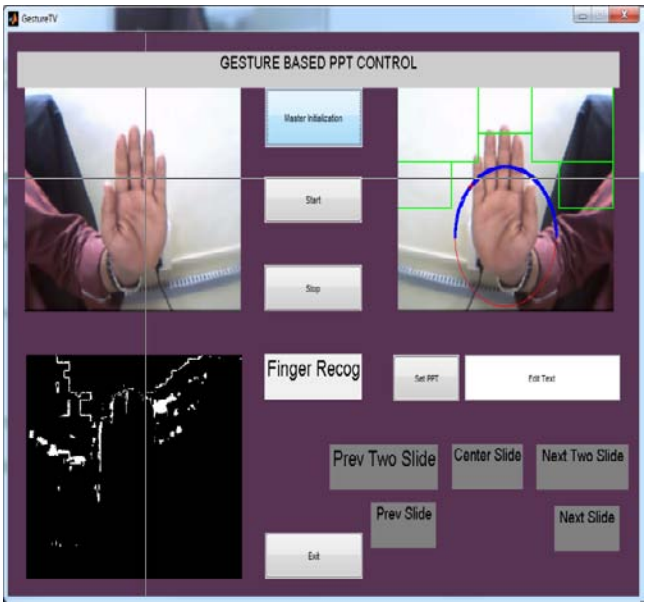


Snapshot 2: Detection of hand

Initially we do master initialization as shown in below snapshot 3.

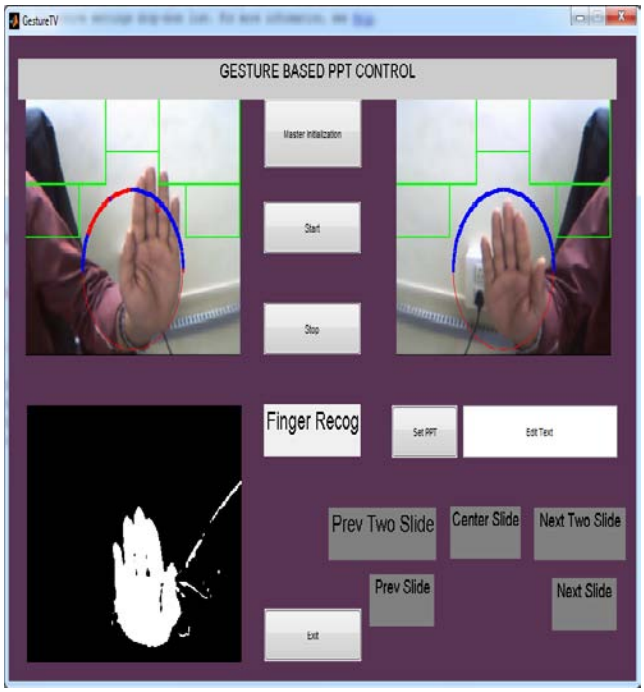
For this we drag to the point that is concentrated on the hand region.

This master initialization is done so that it can recognize hand of different skin tone.



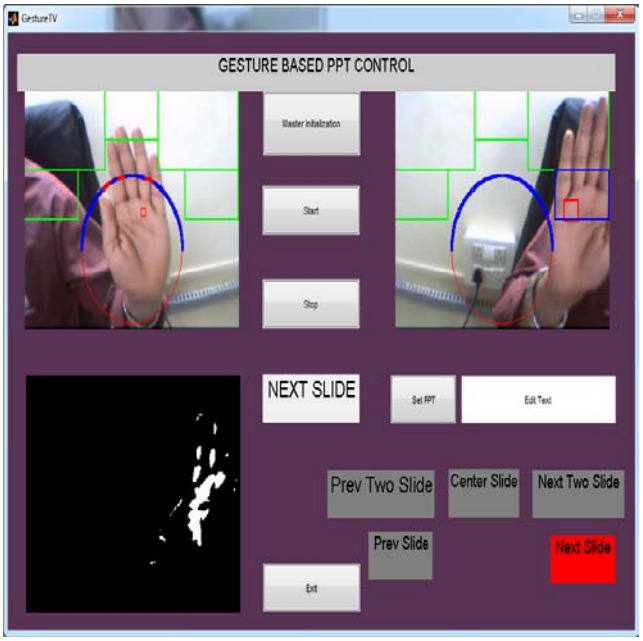
Snapshot 3: Initialization of hand region

We can see in snapshot 3 that we have segmented the region, as shown in green color.



Snapshot 4: Displays the binary image of the hand

As shown in snapshot 4, whenever we drag our hand in segment as shown we can see that Next slide button is triggered. This means we navigate to next slide.



Snapshot 5: Displays that the next slide button is triggered after gesture recognition

Snapshot 5, Displays that the next slide button is triggered after gesture recognition

Comparison between distance transform method and circular profiling method for centroid detection is shown in below graph that results distance transform method is better in performance than circular profiling method.

6. Conclusion

The presented gesture recognition system recognizes both static and dynamic gestures. Gestures are recognized using distance transform method along with skin color segmentation algorithm. The presented method does not require any training phase to identify the hand gestures. Hence does not require storage of images in database to recognize the hand gestures. A recommended future work would include, increasing the number of gestures along with speech recognition that make it interesting and easy to navigate power point which will include creating slides, adding contents etc. Furthermore gestures can be used to control various applications like adobe reader, paint and add further by controlling computer using gestures.

References

[1] Dnyanada Jadhav, L.M.R.J. Lobo, "Hand Gesture Recognition System To Control Slide Show Navigation", IJAIEM, 2014
[2] Ruize Xu, Shengli Zhou, Wen J. Li, "MEMS Accelerometer Based Nonspecific-UserHand Gesture Recognition", IEEE, 2011.
[3] Sheng-Yu Peng, Kanoksak Wattanachote, Hwei-Jen Lin, Kuan-Ching Li, "A Real time hand gesture recognition system for daily information retrieval from Internet", IEEE Fourth International Conference on Ubi-Media Computing, 2011
[4] Ginu Thomas, "A Review of Various Hand Gesture Recognition Techniques", 2011.
[5] Siddharth Swarup Rautaray and Anupam Agrawal, "A Vision based Hand Gesture Interface for Controlling VLC Media Player", International Journal of Computer Applications, 2010.
[6] Yikai Fang, Kongqiao Wang, Jian Cheng, Hanqing Lu, "A Real-Time Hand Gesture Recognition Method", IEEE, 2007.
[7] Yikai Fang, Jian Cheng, Kongqiao Wang, Hanqing Lu, "Hand Gesture Recognition Using Fast Multi-scale Analysis", IEEE, 2007.
[8] Asanterabi Malima, Erol Ozgur, "A Fast Algorithm For Vision-Based Hand Gesture Recognition For Robot Control", IEEE, 2006.
[9] Ahmed Elgammal, Vinay Shet, Yaser Yacoob, Larry S. Davis, "Learning Dynamics for Exemplar-based Gesture Recognition", IEEE, 2003.
[10] Lars Bretzner, Ivan Laptev, Tony Lindeberg, "Hand Gesture Recognition using Multi-Scale Color Features, Hierarchical Models and Particle Filtering", IEEE, 2002.
[11] William T. Freeman, Craig D. Weissman, "Television Control by Hand Gestures", 1994.

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