King Fahd University of Petroleum and Minerals

ICS483: Hand gestures, Hand segmentation and classification

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1. Introduction.

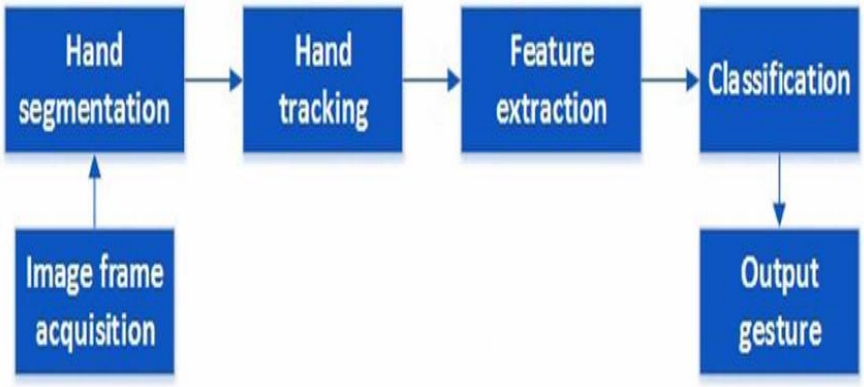
Hand segmentation is an important problem and can be utilized in different ways, in fact it is the steppingstone of gesture recognition. In addition, hand segmentation can be used to read sign language by interpreting different hand segmentation with other algorithm to detect hand motion.

2.Problem Description.

Hand-segmentation computer vision offers a simpler and cheaper way of figuring hand shape using images and videos taking advantage of cameras availability and replacing other expensive methods such as sensors.

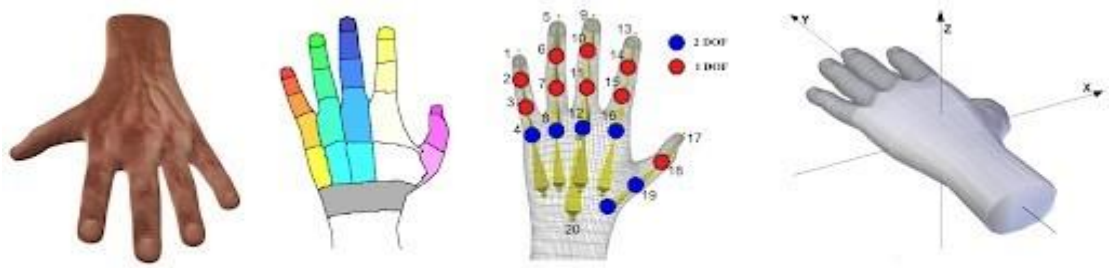
3. System Components.

There are many ways of implementing hand gesture and there are a common step for reaching the required results. First image frame acquisition then hand segmentation, tracking, feature extraction, classifying before getting the output. Ways of implementing are like Motion-Based, Color-Based and Motion-based recognitions.



3.1 Motion-Based Recognition.

This approach is used for detection purposes. AbaBoost algorithm is used to extract the frames and recognize the pattern. Hand detection gets center point and matching is the critical and unique steps.



3.2 Appearance-Based Recognition.

This approach uses the pattern of the hand and posture in every aspect and angle. It might use context free grammar to analyze the patterner detected and classify it. Methods like Canny and Sobel fit this approach.

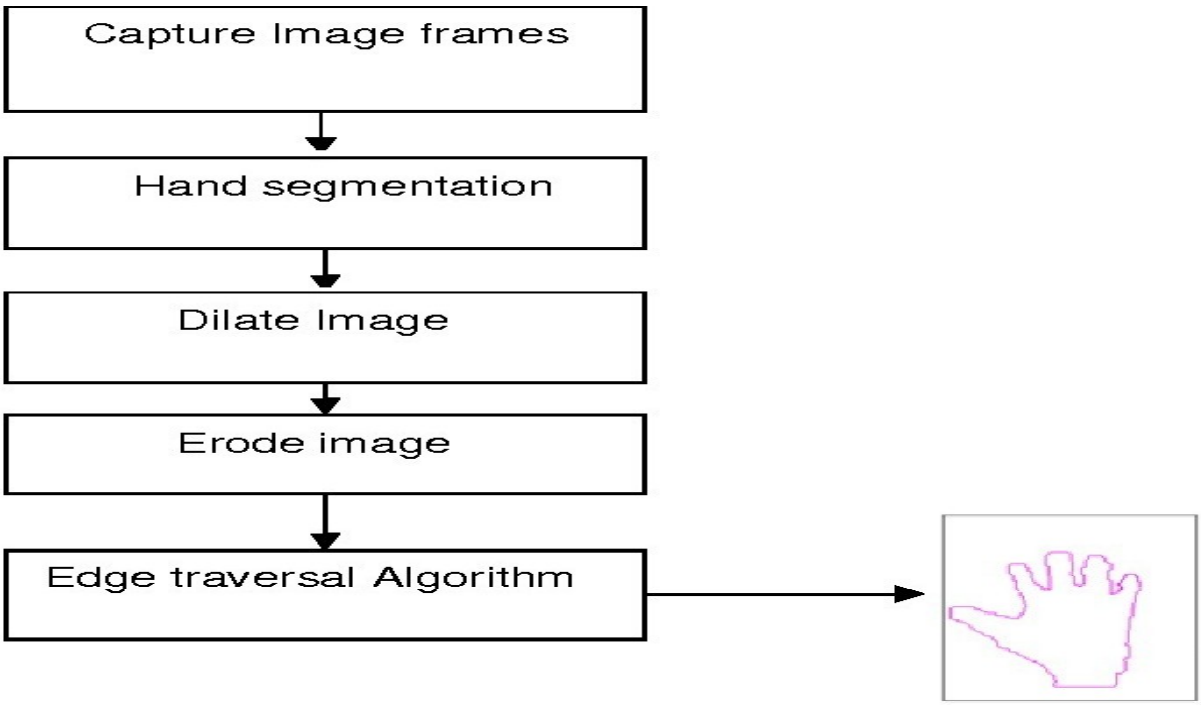
3.3 Color-Based Recognition.

Color-Based is a method that is one of the most known and used, it uses a camera to track motion and observes the image. It detects the skin by color segmentation where is pixels are classified into a skin or non-skin and filter everything out with the hand remaining in the end.

4. Proposed System.

The system is used to real time identified hand segmentation.

The system starts by fetching the image after that it will do a skin mask that will do a threshold based on skin color.
Thin it will remove nose by using open CV dilate and erode.
It will then outline the hand after that it will Estimate the Finger. First it will find the gap between fingers using Convexity Defects then using cosine theorem for fingers height.
Lastly it will migrate the result and show it.



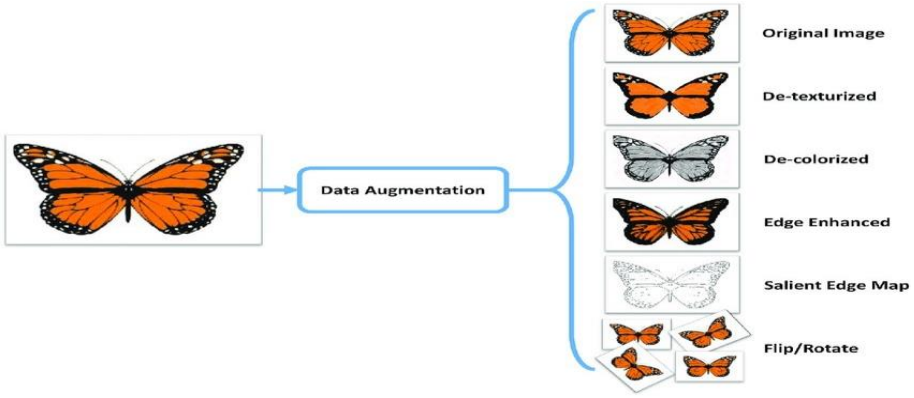
4.1 Dataset.

EgoHands (Set of videos of using googles showing two persons interactions).

EgoHands+ (Images of hands next to faces).

- In addition we can use Image augmentation to create more images.

Around 1.3GB in total.



5. Experimental Results.

Refers to the HTML file.

6. Conclusion.

Hand gesture is a non-verbal approach man use to communicate either in a support way or in a full way to transfer words. It can be an easy and effective way to create a computer-human interaction since it is far simpler than talkative languages.

7. Resources.

https://www.researchgate.net/figure/Basic-block-diagram-of-hand-gesture-recognition-system_fig1_282660916

https://www.researchgate.net/publication/230731594_On_the_segmentation_and_classification_of_hand_radiographs

https://www.researchgate.net/publication/343152408_Hand_Gesture_Recognition_Based_on_Computer_Vision_A_Review_of_Techniques