Evaluation and Development of Strategies for Facial Features Extraction for Emotion Detection by Software

Oral Report
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Carolina González-Restrepo
Sebastián Rincón-Montoya

Advisors:
Olga Lucia Quintero-Montoya - GRIMMAT
René Restrepo-Gómez – Applied Optics
Daniel Sierra-Sosa – Applied Optics

UNIVERSIDAD EAFIT

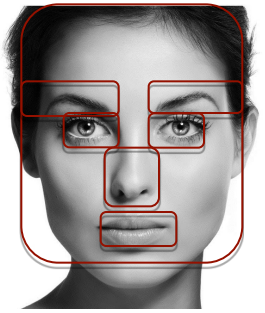
FACS

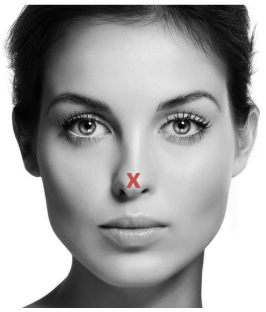
Facial Action Coding System

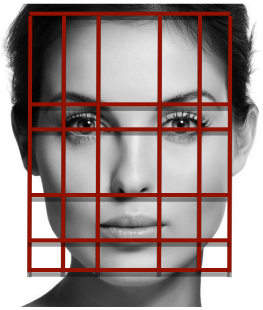
Each observable component of facial movement is called an Action Unit and every facial expression can be broken down into their constituent Action Unit. (Ekman & Friesen, 1977).

- 2011: Artificial intelligence model (Quintero, Mejía & Castro, 2011)
- 2014: Establishing points
  - Viola Jones (Viola & Jones, 2004)
  - Canon (Ricketts, 2002)
- Carlos Esteban Posada

Past Metodology



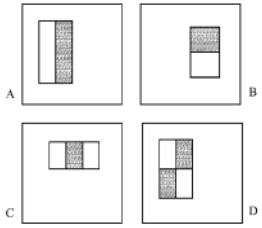




The empirical way of the canon establishment might affect the accuracy of the mark establishment and therefore the emotion detection. It also reduces the images that can be processed by the algorithm.

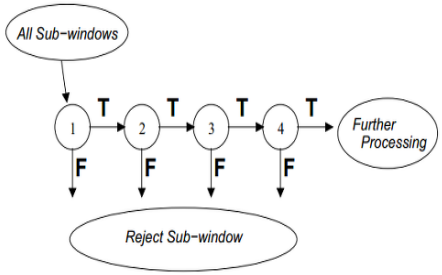
Python

Has an open toolbox (OpenCV) containing Viola-Jones detection algorithm, the advantage: Viola Jones algorithm is also available for retraining.



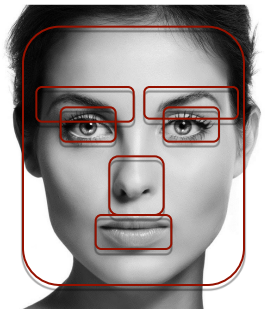
Feature Extraction

Classification Function

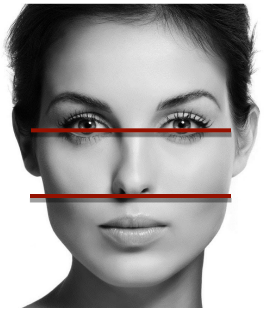


Cascade Classifier

☆ Eye detection for people with glasses



¾ module

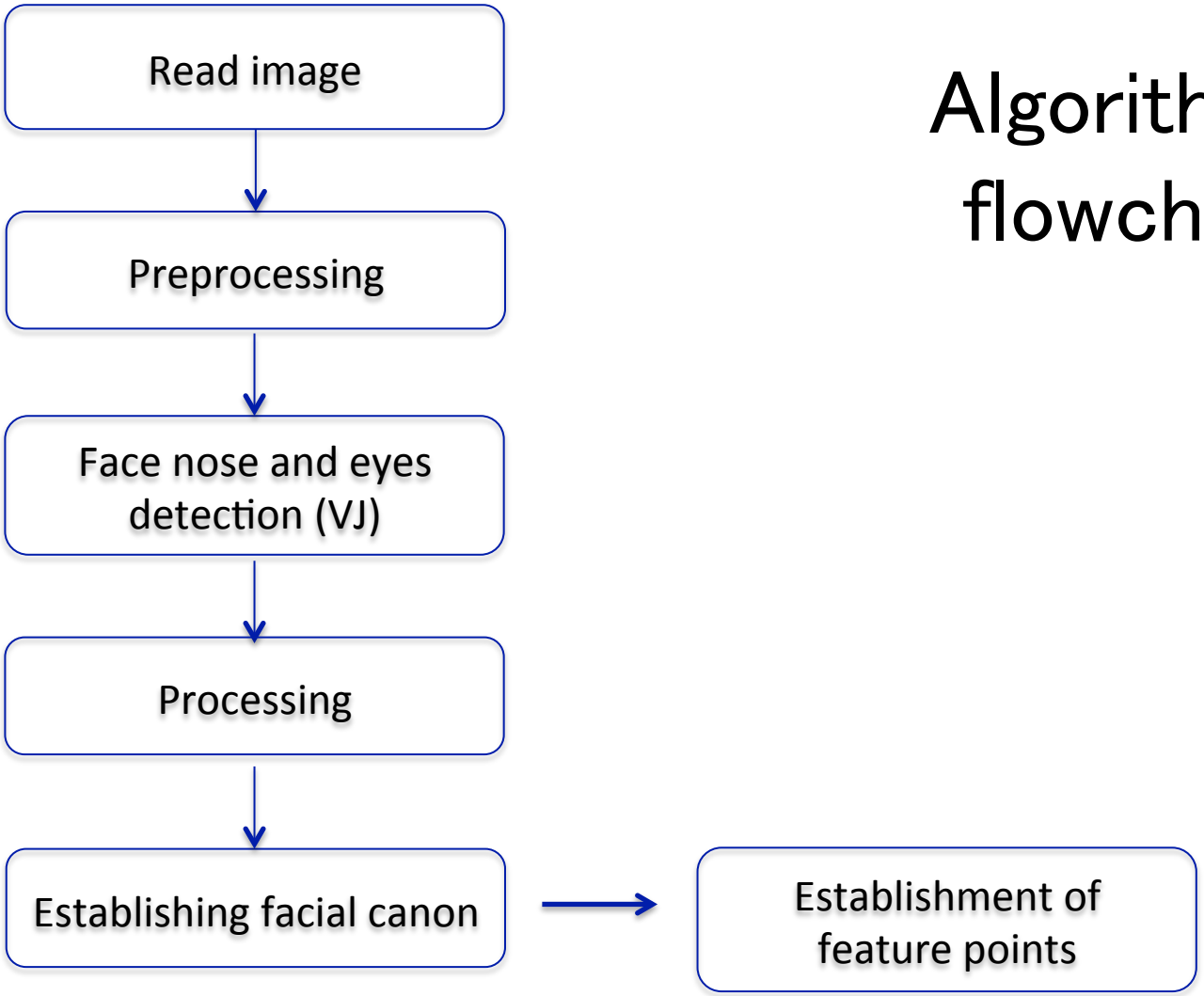


Canon

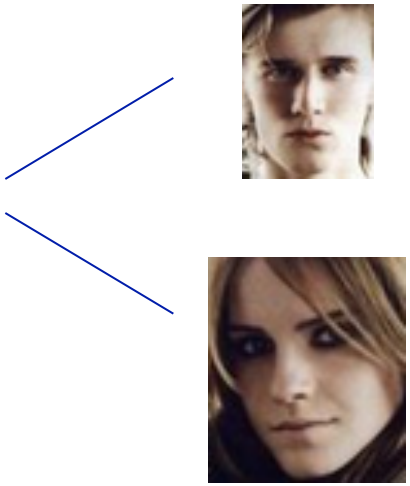
Minimize the error by building it starting from specific points

☆ Incline planes

Algorithm's flowchart



Re-Scaling

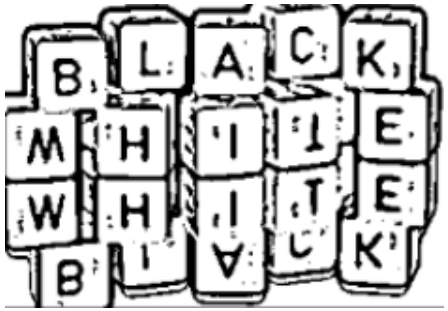


In order to standardize proportions in every face.

Given different Viola Jones detections (most probably in different sizes), rescale them to (*480, 480*) *pixels*

Useful functions

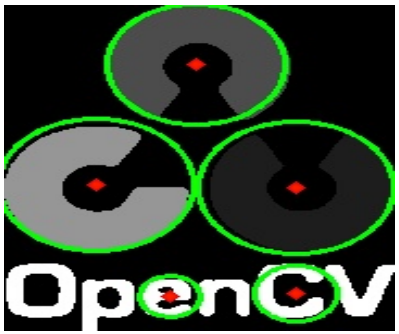
- Binarization: defining a threshold, if the intensity of the pixel is higher than the threshold, then the new pixel intensity is set to a Maximum Value. Otherwise, the pixels are set to 0.
- Adaptative Gaussian Threshold: calculating thresholds for several image regions. Convolution with a Gaussian window.



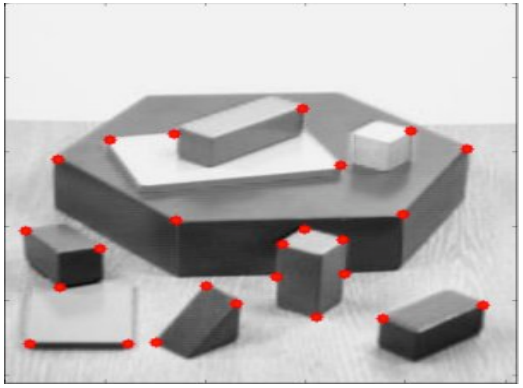
- Blur: filtering the image so it can eliminate what we called noise. Smooths the image.

Useful functions

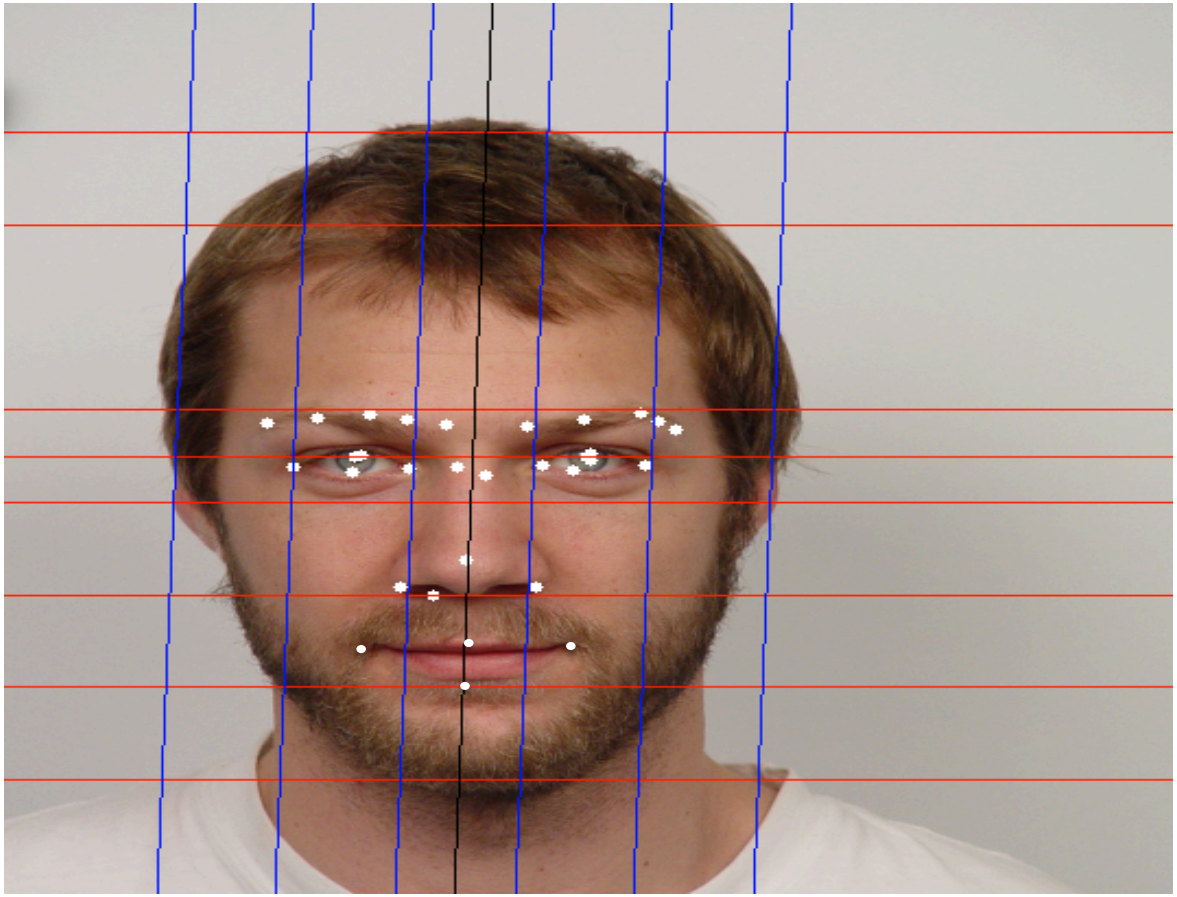
- Hough Transform: applying the Hough gradient method to detect circles in the images. *(Liu & Qian & Lin, 2010).*



- Shi Tomasi: detecting corners in the face such as the eyebrows, mouth and eyes. *(Shi & Tomasi, 1994)*



Results



What is next?

Optimize the parameters using:

Optimization

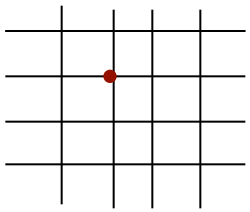
Objectives

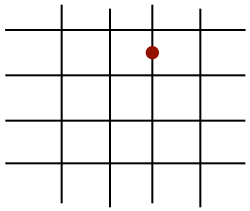
- ✓ To improve the past methodology, seeking for a more robust algorithm to extract features from noisy images.

- To search the state of art.
- To study different pre-processing techniques for images
- To design and use filters in images.
- To verify whether different features can be treated as noise.
  - *Compare results with a physical approach.*

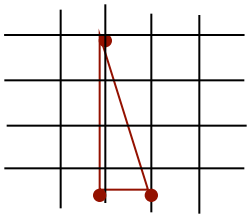
Physical strategy?

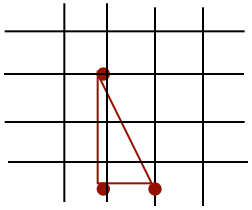
- Spatial coordinate





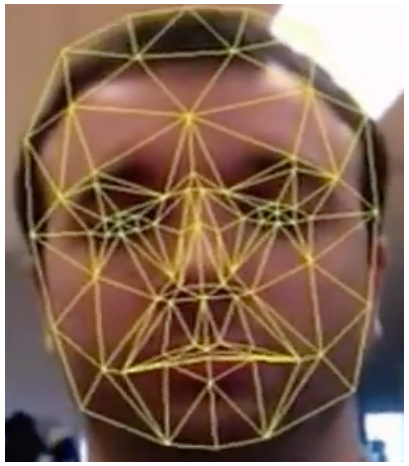
Union of spatial coordinates





How?

Facial mesh: connecting some of the feature points. As it follows:
(Nasser & Mohammad, 2009)



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