DEPARTMENT OF INFORMATION ENGINEERING
UNIVERSITY OF PADOVA

COMPUTER VISION

Final Project:
Gaze Detection

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Organization

- Faces and eyes features detection
- Pre processing phase
- Iris and sclera corners detection
- Gaze direction recognition

Faces and Eyes Recognition

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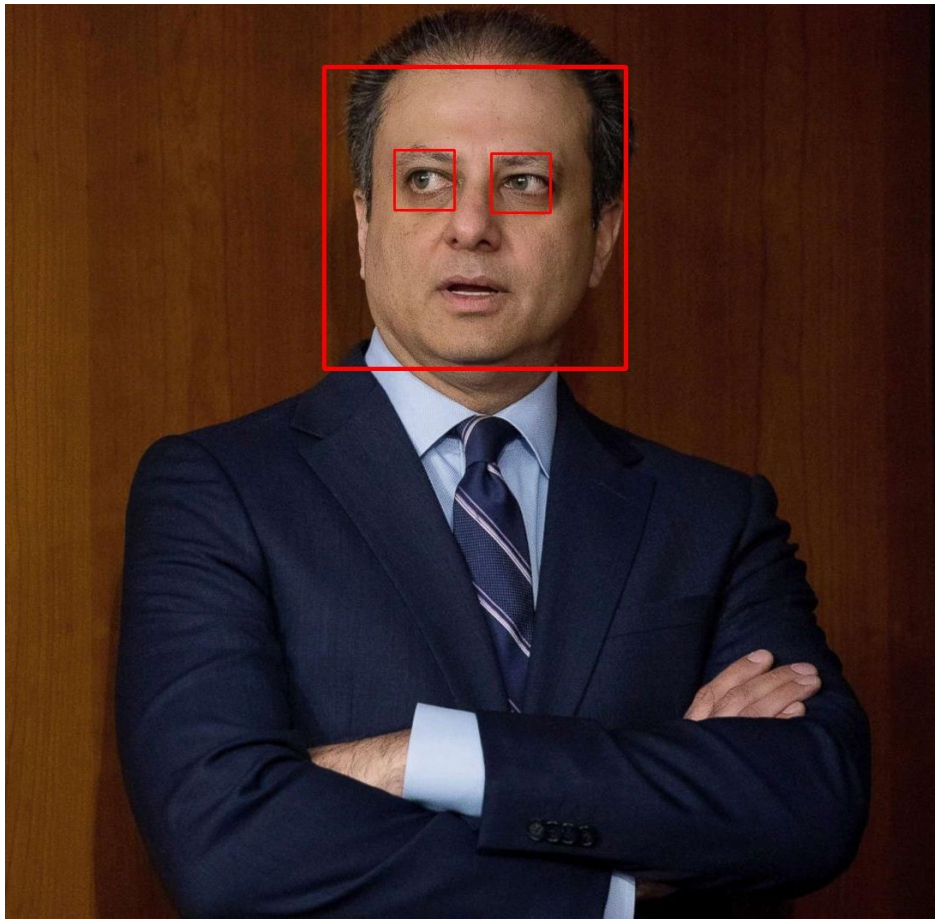
Firstly we extract the relevant features in the image and we organize them in an efficient way:

- Use Haar Feature-based Cascade Classifiers
- Organize eyes in 2D array (multiple faces)
- Crop the image



Pre-processing

- Convert to gray-scale
- Enhance contrast
- Select threshold for binary segmentation

Threshold computation

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Darker images require a higher threshold in order to obtain a good binary segmentation, so we proceed as follows:

- Compute the histogram
- Compute a weighted average of the histogram values of the image where the weight is the intensity
- Quantize the output value

Iris detection

- Select multiple thresholds around the optimal one (Watershed Multiple Thresholding)
- Apply binary segmentation
- For each threshold compute the barycenter of the black cluster
- Compute the average coordinates of the centroids

Threshold value

Corners detection

- Select multiple thresholds around the optimal one
- Compute the points corresponding to the minimum and maximum values of x in the black cluster
- Compute an average on the y values if more than one minimum/maximum is found on the same vertical axis

Threshold value

Gaze recognition

Finally, the direction is assigned accordingly to the following criteria:

- If the distance from the iris and the left corner is less than 45% of the distance between the two corners, the value RIGHT is assigned.
- If the distance from the iris and the left corner is more than 55% of the distance between the two corners, the value LEFT is assigned.
- Otherwise, STRAIGHT is assigned.

Results

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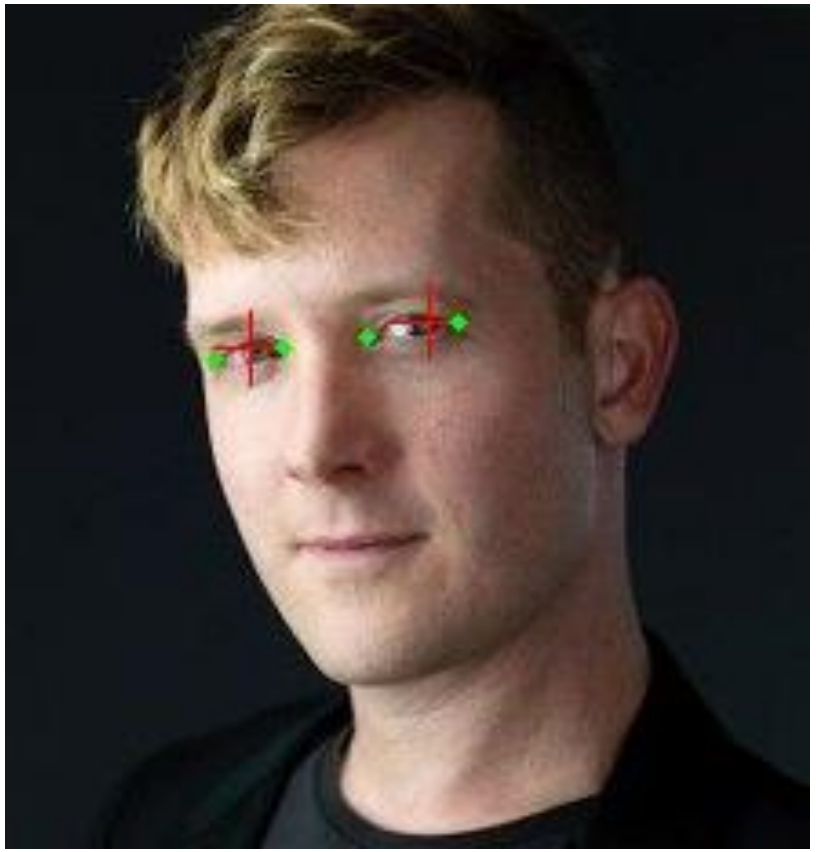
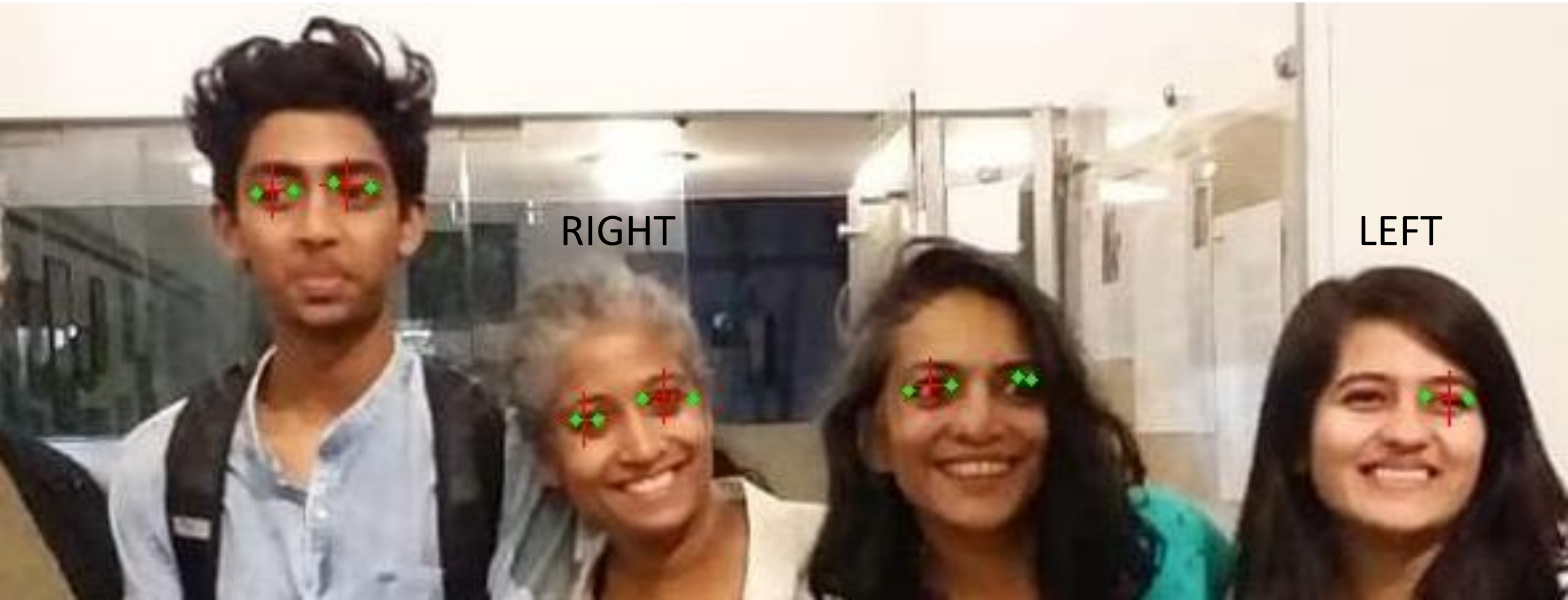
RIGHT

STRAIGHT



LEFT

Results



Results

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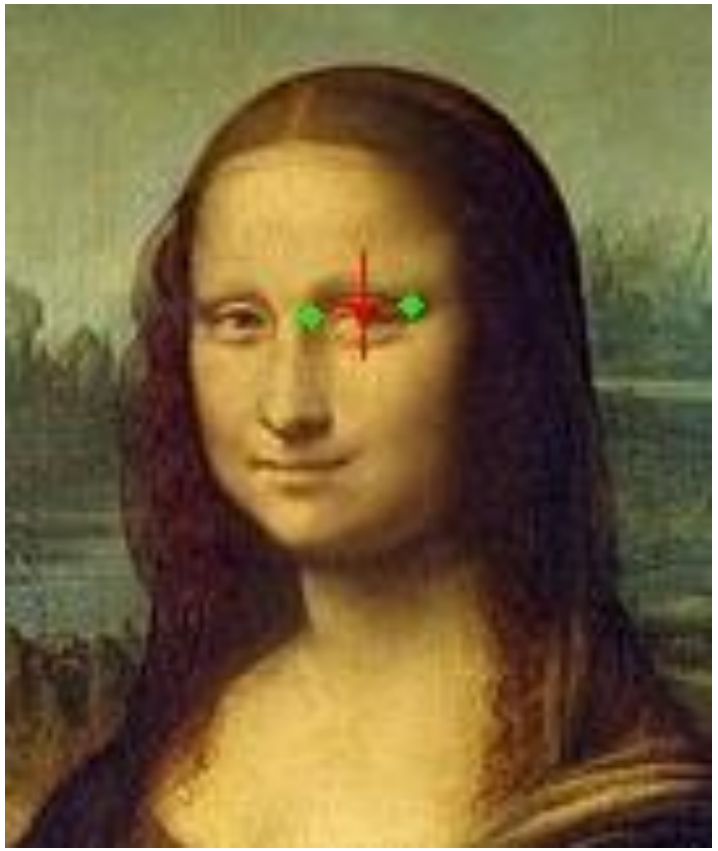
STRAIGHT



STRAIGHT

RIGHT

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Thank you for your attention