

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
CS543/ECE549: COMPUTER VISION

FACE DETECTION

- Project Proposal -

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PROJECT DESCRIPTION AND GOALS

Face detection (minimum goal)

We want to develop a project that can detect face from a picture and returns high precision face bounding box.

Outline of implementation:

1. Feature selection

First, we need to extract feature in a image. We reference the Viola and Jones framework using more than one rectangular area as features. And the feature value is decided by the sum of the pixels within clear rectangles subtracted from the sum of the pixels within shaded rectangles. These feature must satisfy some properties in order to be considered as a face area.

2. Creating an Integral Image

Integral image evaluates the rectangular features, computing a value at each pixel that is the sum of pixel values above and to the left of this pixel.

3. Training

Combine these rectangle features to form an effective classifier. Efficiently select the features and train the classifier.

4. Cascading Classifiers

The cascaded classifier is composed of stages each containing a strong classifier. The job of each stage is to determine whether a given sub-window is definitely not a face or maybe a face. When a sub-window is classified to be a non-face by a given stage it is immediately discarded. Conversely a sub-window classified as a maybe-face is passed on to the next stage in the cascade. If a sub-window passes more stages, it has higher chance containing a face.

Face track (maximum goal)

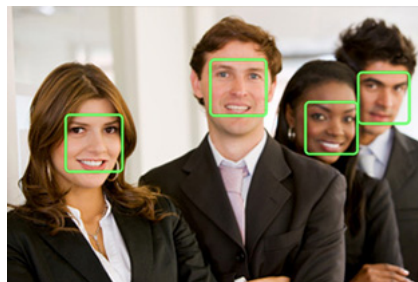
MEMBER ROLES

Each member in our group will be responsible to implement each part of our project and write his/her part in the report. We will read each other's part and give comments. We will assign each member the specific work to do later. We will search the resources individually and share what we find. The report will be wrote in Google doc, so that everyone is able to

modify it. We plan to meet twice a week to share our processes with members and to solve the problems that we meet together.

RESOURCES

We plan to find the image dataset on-line. The training images are human faces photos. The testing images should be individual human photos or group photos. The output image will be similar as the picture below. We will look for the papers and algorithms related to this topic.



Our implementation platform is python. We haven't decided if we are going to use the outside code. We have not found any outside code. We will try our best to implement by ourselves. If the implementation of a part is too hard, we may use and modify the code we found and cite it. The relevant resources we found for now are

- Viola-Jones object detection framework
- The Viola/Jones Face Detector
- The Viola Jones algorithm for face detection
- Rapid Object Detection using a Boosted Cascade of Simple Features
- Implementing the Viola-Jones Face Detection Algorithm
- Real time human face detection and tracking
- Github - Build Butler 2.0
- Github - Face Recognition using Haar-Cascade Classifier, OpenCV, and Python
- Github - Viola Jones

RESERVATIONS

The "minimum" goal that we are going to accomplish is the face detection to identify human faces in the digital images. There are many interesting topic related to faces, like face recognition, age detection, gender detection, expression detection. If we have time, we would like to do an addition work related to human faces. Our project is to detect faces in the images, we properly will implement addition function for it, like real-time face detection and tracking, which might be the difficult part to implement.

RELATIONSHIP TO BACKGROUND

We have little related experience with the knowledge needed for this project. The rectangle feature selection and the cascading classifiers in this project are new to us. We have some experience with python and have used the libraries like Numpy and Pandas before, but the libraries like Tensorflow and Keras are completely new to us. We have not decided the target libraries by now.