



Project Management and System Development

Real-time Gaze Estimation

Intermediate presentation – 11/06/18

Project supervisor: Benjamin Busam

Presented by: Matthieu Zhang

matthieu.zhang@polytechnique.edu

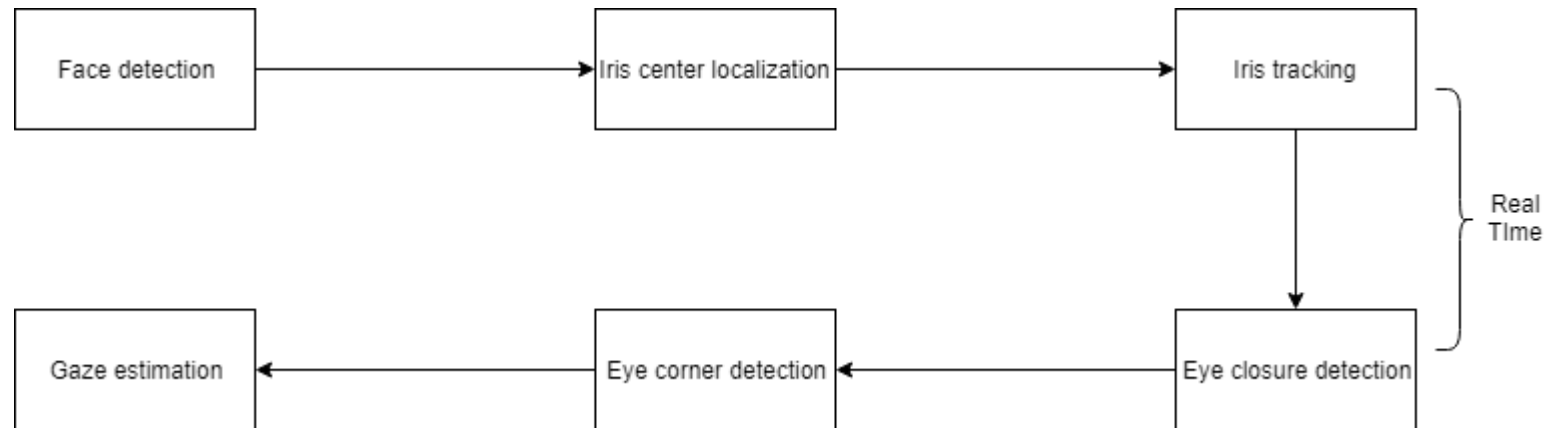
The project

- Using a simple camera, estimate the point of gaze of a subject in real time
 - Medical application static/dynamic
- Camera Intel RealSense D435
 - RGB + stereo depth resolution
- Geometric study of the problem
 - Reference points on the eye regions
 - Linear algebra using calibration points



Documentation

- Main basis: article talking about low resolution gaze tracking
 - Study of the different steps with methods proposed and other methods
- New methodology compared to first approach
 - Hybrid, Model-based for iris (Circle), Feature-based for corners

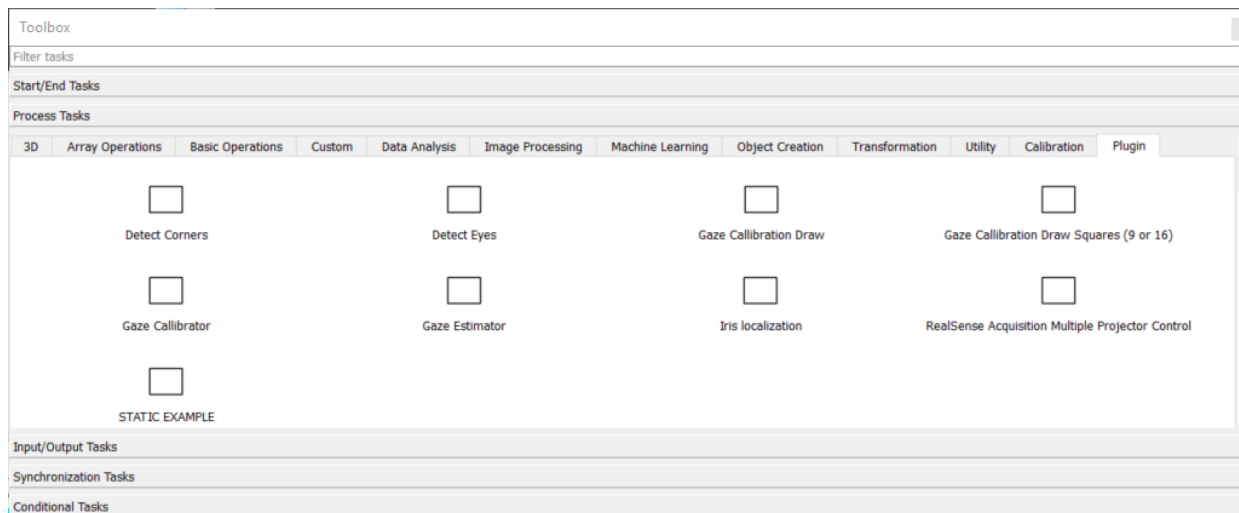
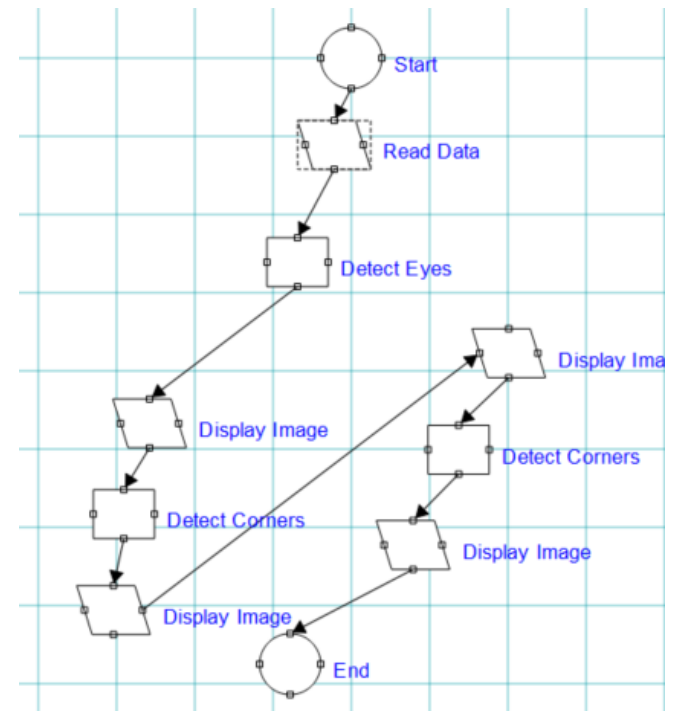


- G. Anjith & R. Aurobind (2016). *Fast and Accurate Algorithm for Eye Localization for Gaze Tracking in Low Resolution Images*, IET CV 2016



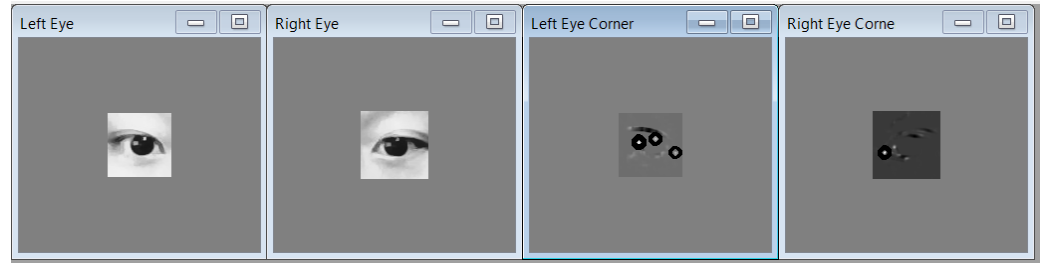
Framos GUI

- Creation of plugins (C++)
 - Tasks using Framos object equivalent of actual object (FramoImagePtr for Mat in OpenCV)
- GUI for creating sequences of plugins
 - Multi-threading
- Input/ Output data on a blackboard
 - Displays, input values...
 - Thread-safe global variables



Main field of study

- Low quality image detection
 - Need to find adapted algorithms
- Eye corner detection
 - Harris corner methods
 - Works well in some cases but sometimes hard to distinguish the right corners
- Gaze estimation
 - Calibration on 3x3 or 4x4 grid of points
 - Measure of Iris center to Eye corner vectors (IC-EC)
 - Learning algorithm to find position of point = $f(\text{IC-EC})$
 - Polynomial regression or RBF kernel (Gaussian kernel) for non-parametric regression



- G. Santos & H. Proenc (2011). *A Robust Eye-Corner Detection Method for Real-World Data*, IEEE Biometrics Compendium
- D. Vukadinovic & M. Pantic (2005). *Fully Automatic Facial Feature Point Detection Using Gabor Feature Based Boosted Classifiers*, IEEE



Project timeline deadlines

- Delays
 - Time to make FIS framework ready to use underestimated
 - Iris localization not compatible with actual version of the framework
 - Plugin issues with new camera
 - Need to explore different types of algorithms considering some constraints

Reevaluation of timeline
needed

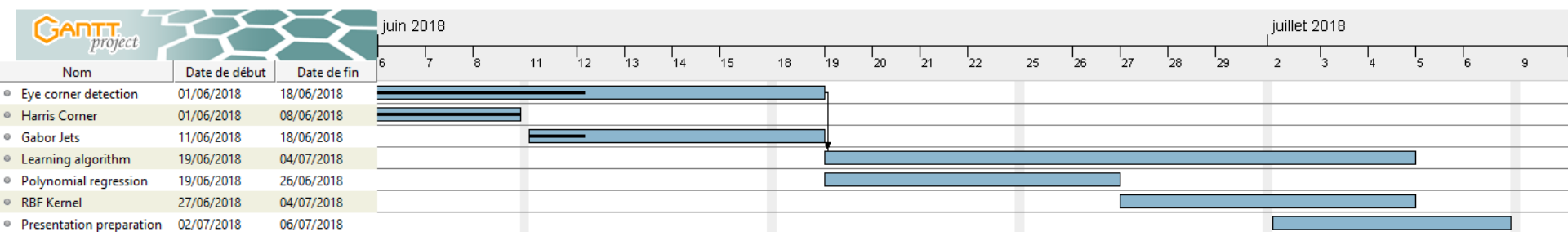


<https://www.disneyclips.com/imagesnewb/alice4.html>, 10/06/18



Next steps

- First half of June
 - Exploring algorithms for corner detection
- Second half of June
 - Make iris localization compatible with version of framework/OpenCV
 - Perform the learning algorithms
 - Tests
- Presentation preparation beginning of July



- Iris center detection: L. Schwarz, F. C. Pacheco & M. A. Sovierzoski (2012). *Pupil and Iris Detection in Dynamic Pupillometry using the OpenCV Library*, 5th International Congress on Image and Signal Processing (CISP 2012)
- GANTT diagram: <https://www.ganttproject.biz/>





Real-time gaze estimation — Matthieu Zhang

Questions ?