The Eye Tracking Software

As mentioned before, Nayon's eye tracking software was initially based on The EyeWriter 2.0 software approach with the usage of infrared video oculography. However, because we encountered deprecated codes and outdated libraries in their software, we were not able to refer to it. Instead, we decided to use a more simplistic approach which still uses OpenCV library and Visual C++, and that tracks the eye by finding the center position of the iris contour.

Our eye tracking algorithm consists of 3 main steps: (1) Capture the image from the webcam and use image filtering to reduce image noise, (2) Find contours using Canny edge detection, (3) Find circles with specified thresholds using Hough Circles Transformation and its center coordinates in a 2D space.

(1) The image from the webcam is passed to a frame matrix in which it allows it to be modified. In order to reduce image noise and facilitate the search for contours, the frame is converted from RGB to a grayscale image and OpenCV's gaussian blur filtering is applied.
(2) OpenCV's Canny Edge Detection allows the input of an image and the output of its contours drawn in another matrix. This functionality has as its parameter the minimum and the maximum threshold which is key to the eye tracking accuracy as it filters which pixels are detected as edges.
(3) The contour frame is passed to OpenCV's Hough Circles Transformation which finds contour of circles regarding their minimum and maximum radius. The optimal parameters are not set to a specific setting because it relies on the proximity of the person's face.