

P04-B FINAL PRESENTATION

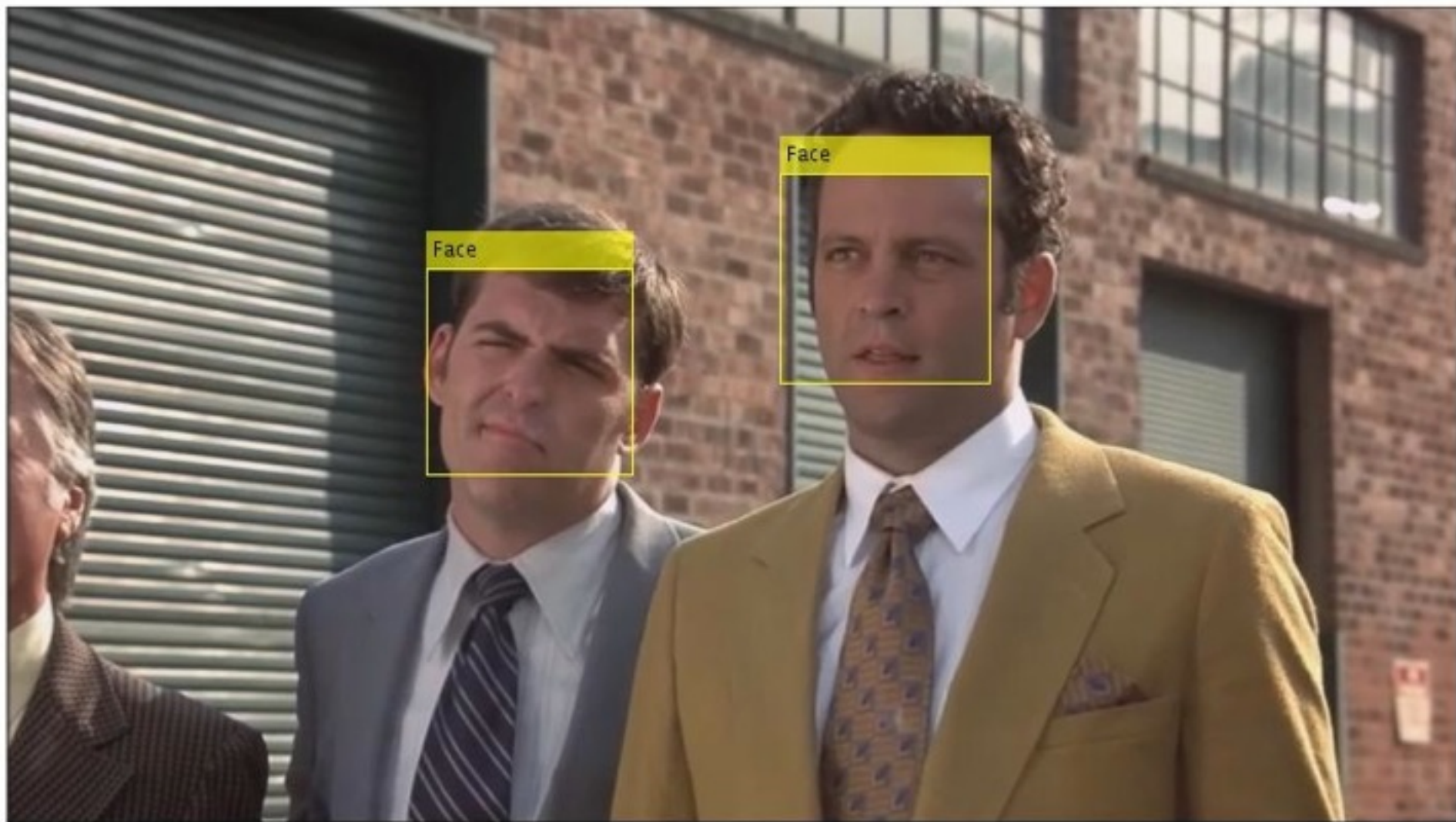
Cheryl Liu & Courtney Kobata

OVERVIEW

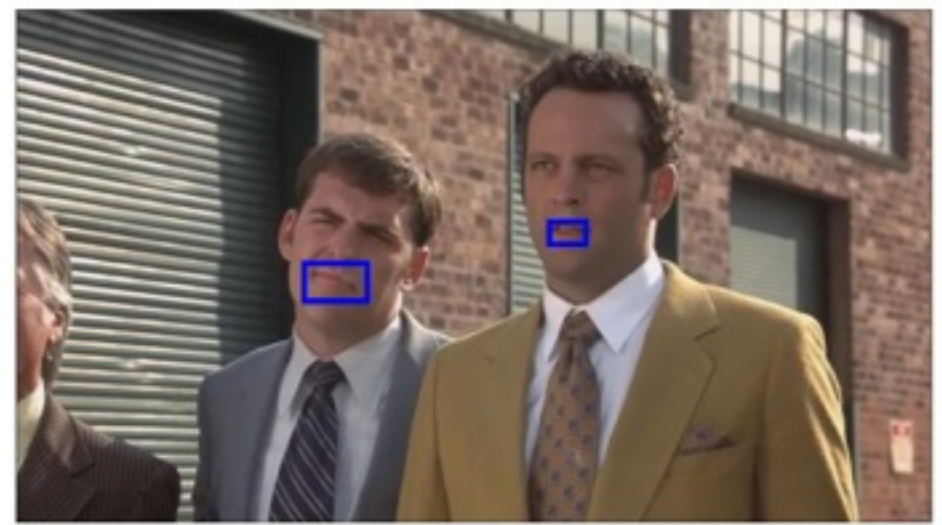
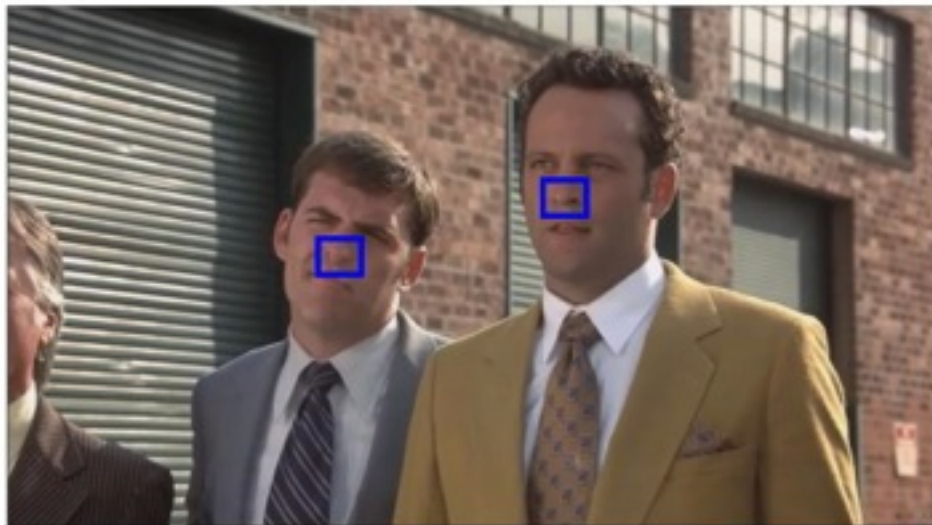
- Matlab CascadeObjectDetector to detect face bounding box
- Matlab CascadeObjectDetector to detect facial features within bounding box
- Create convex hull using outer points of facial features
- Warp faces to each other using TPS

IMPLEMENTATION

CASCADE OBJECT DETECTOR



CASCADE OBJECT DETECTOR



WHEN MISSING AN EYE

- mirror across centerline (nose and mouth)

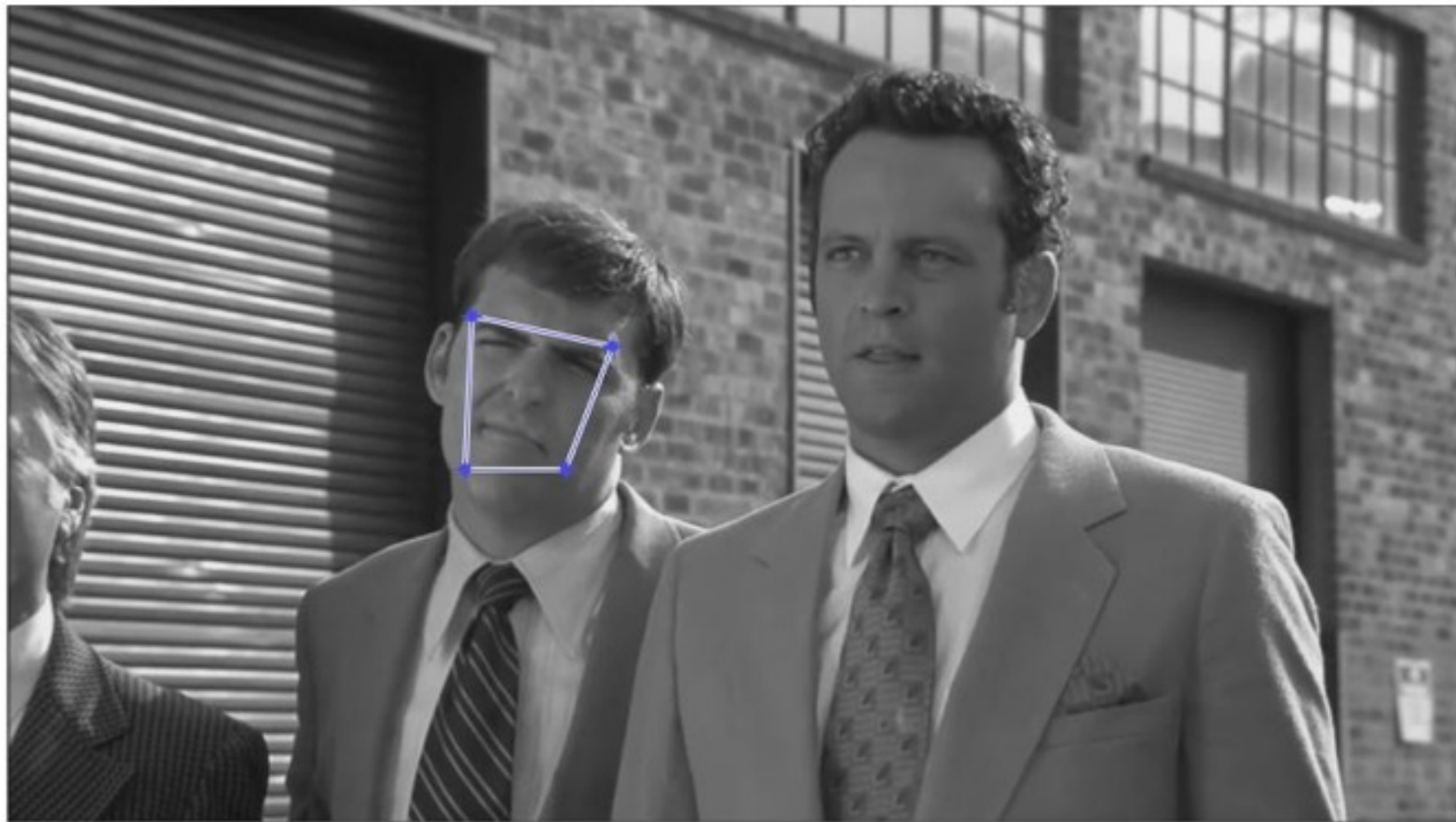


CONTROL POINTS

- top left eye
- top right eye
- bottom right mouth
- bottom left mouth
- nose center
- mouth center



CONVEX HULL



CUT & BLEND



WHY DOES IT LOOK LIKE
CRAP?

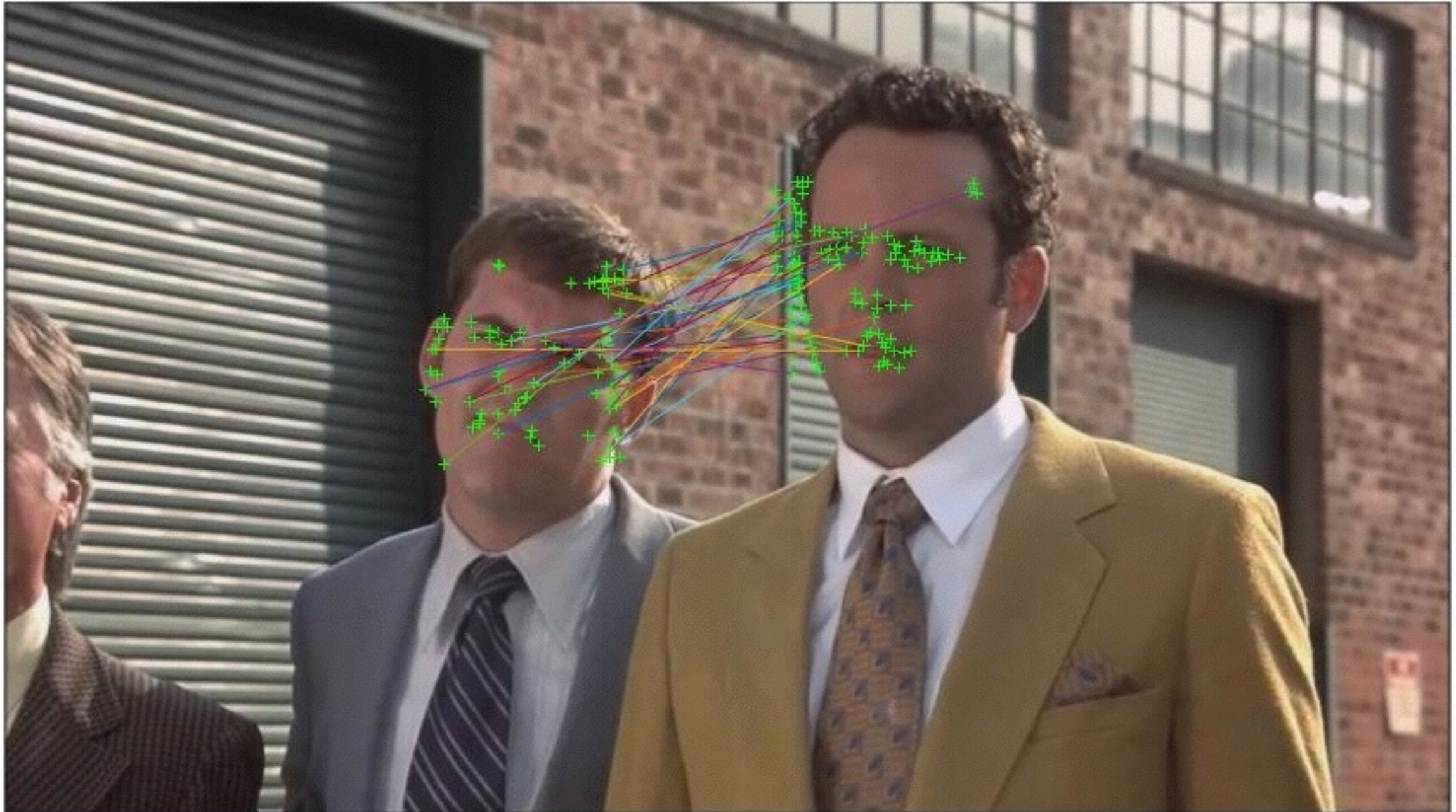
SIFT

- detect faces using `CascadeObjectDetector`
- detect features using `detectMinEigenFeatures`
- describe key point orientations to build descriptors
- match descriptors using `knnsearch`

SIFT

- find dominant orientation
 - find gradient and magnitude in 16×16 pixel box around feature
 - bin orientation (36 bins) proportional to gradient magnitude, with circular gaussian falloff
 - highest peak of histogram is the dominant orientation
- build 128 dimensional descriptor
 - compose 16×16 patch into 4×4 tiles
 - compute histograms of pixel gradient orientations (relative to dominant orientation) into 8 bins
 - proportional to gradient magnitude, circular gaussian falloff

SIFT



WHY DIDN'T THIS WORK

- matches gradient and orientation, which is good for pictures with the same features, but not for faces with different features

BAD BLENDING



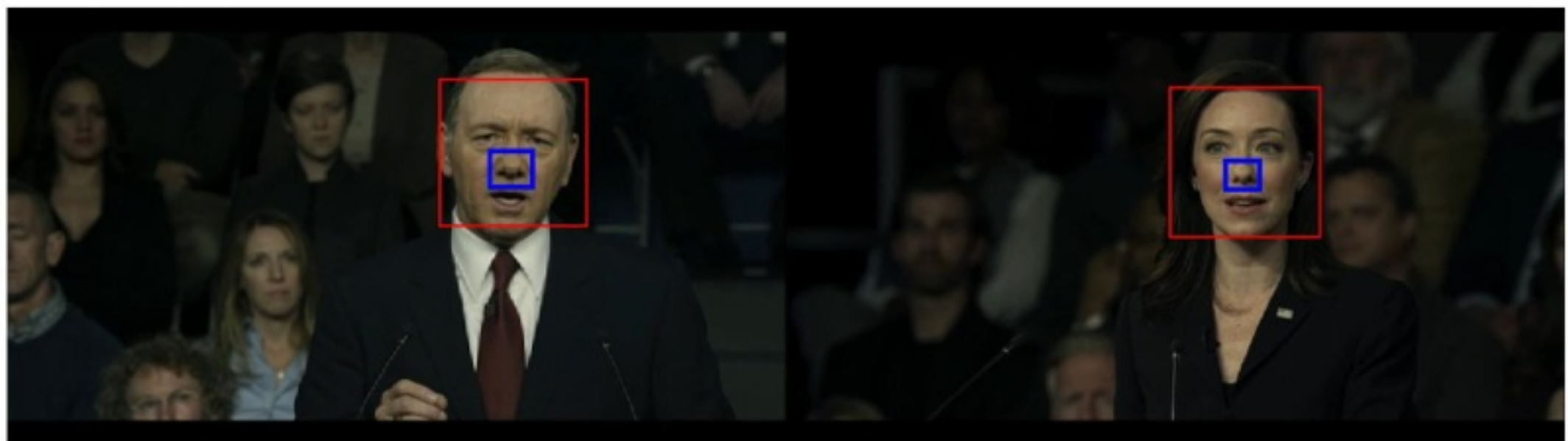
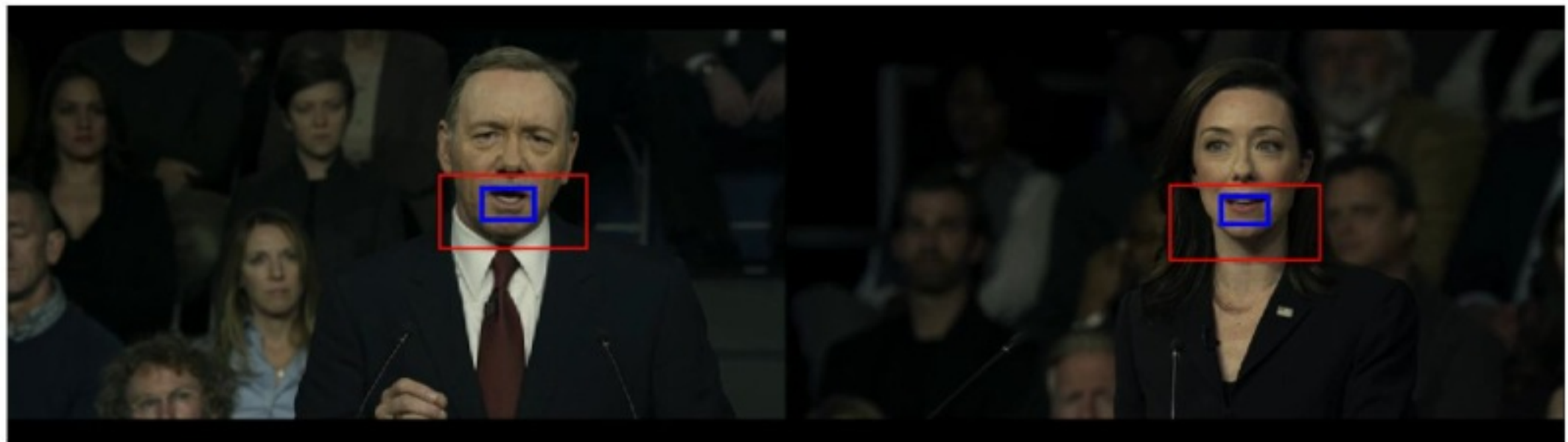
TROUBLE SHOOTING



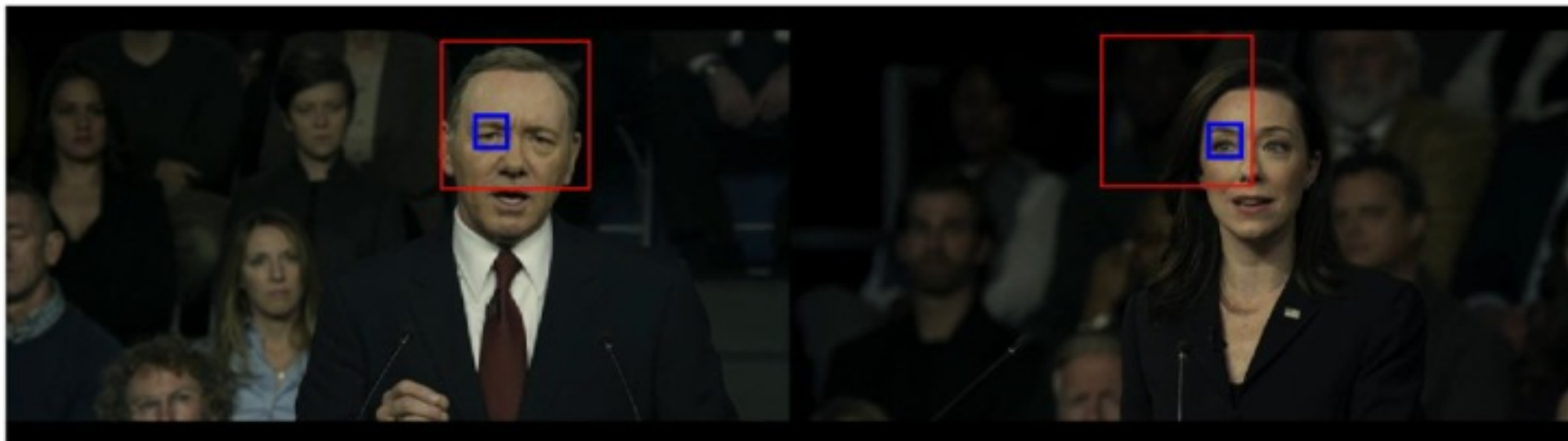
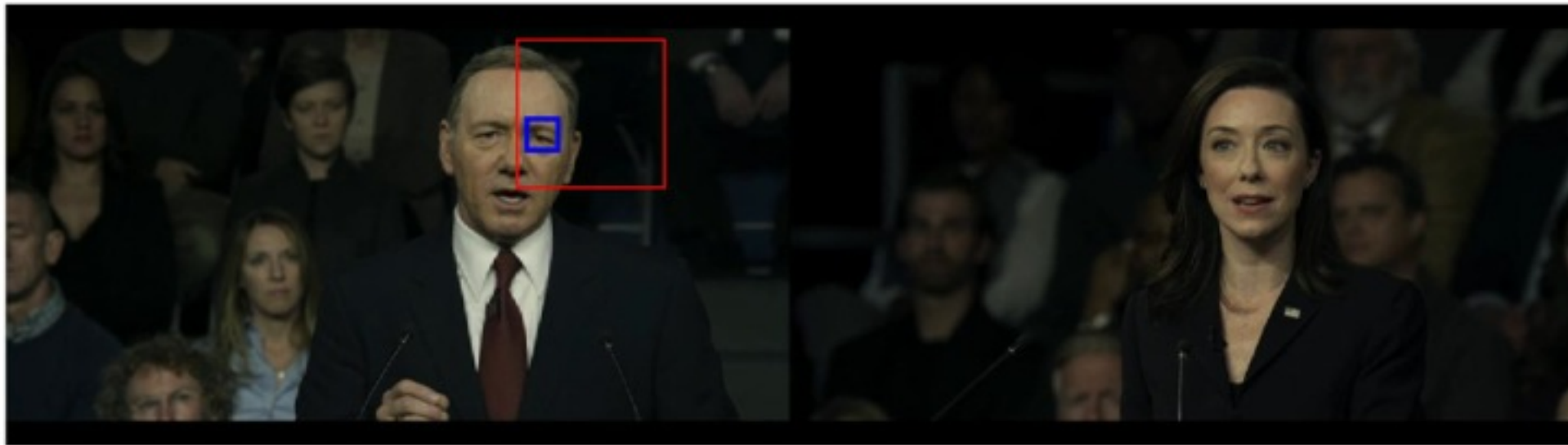
PROBLEM I: BAD DETECTION

- problem:
 - mouth detected as nose
 - left eye detected as right eye
- solution:
 - tighter bound box around mouth
 - bound boxes around right and left eyes

BETTER BOUND BOXES

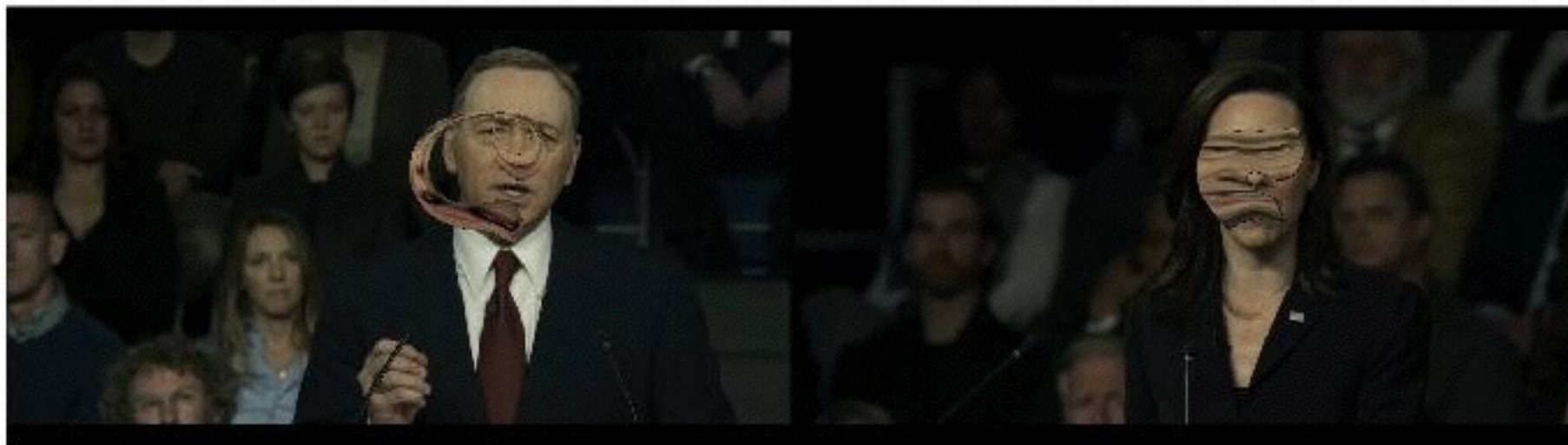


BETTER BOUND BOXES

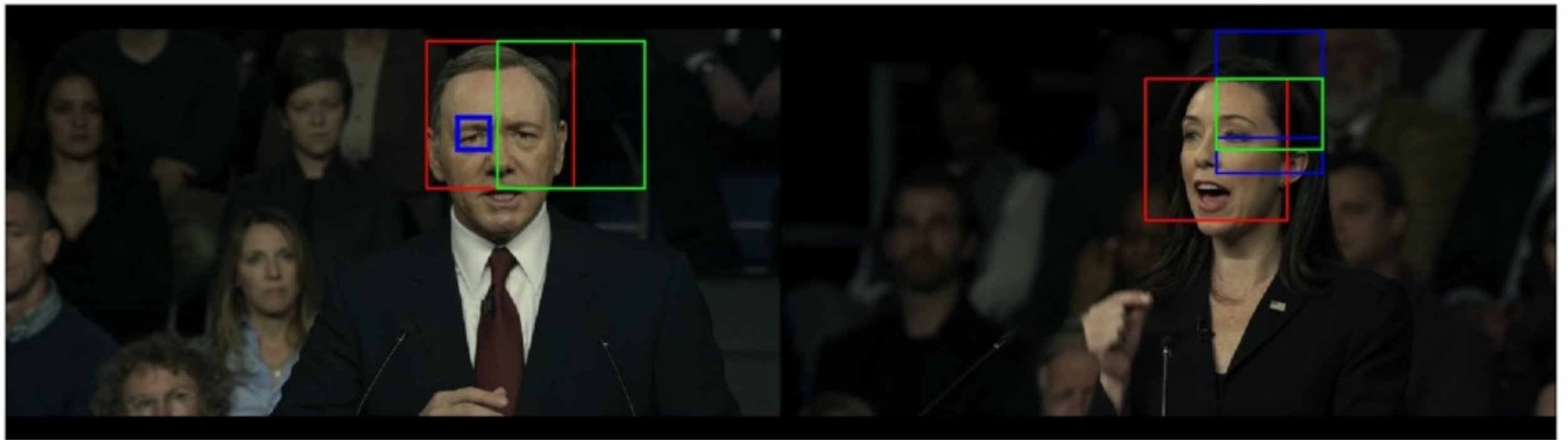


PROBLEM 2: PERFECTLY SYMMETRIC FACE

- infinite slope of reflection line
- solution: make slope very large

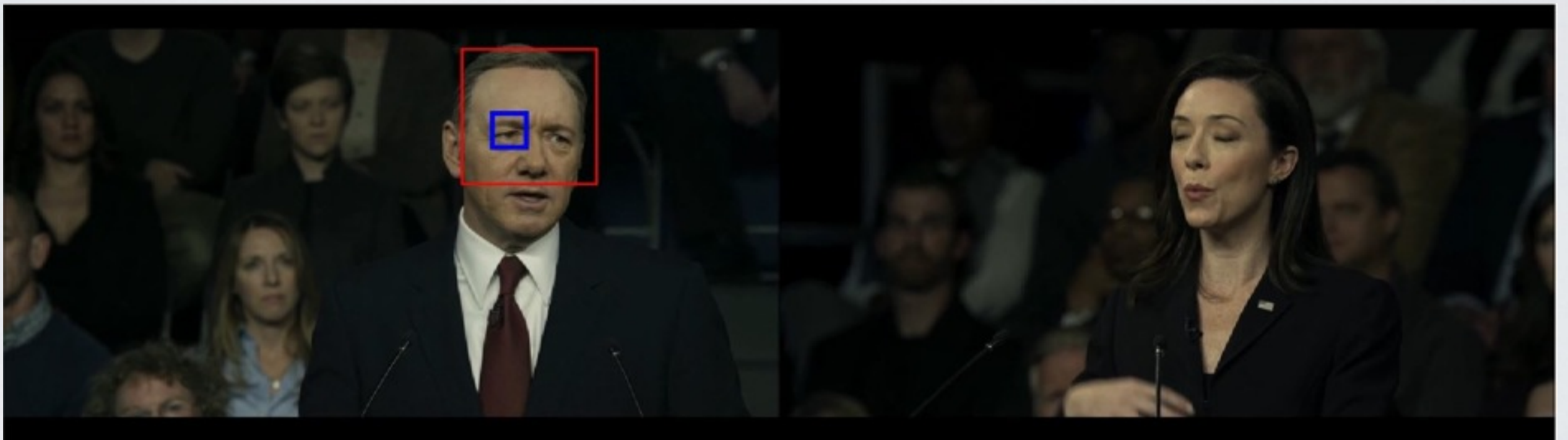


PROBLEM 3: INCORRECT BOUNDING BOXES



PROBLEM 4: EYES CLOSED

- solution: try-catch statement



PROBLEM 5: FACE TURNED



WHAT WE LEARNED

- SIFT is not the right thing to use for face feature matching
- use visual tools to debug
- it takes a lot of tuning to detect facial features

OTHER GEMS

