Monitoring risk of COVID-19

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Abstraction

- Goal : Scaling COVID-19’s risk degree
- Mask Detection (By two ways)
- Lip distance detection

Introduction

1. Mask detection by detecting position of eyes, nose, lips
2. Mask detection by detecting
3. Detect lip distance to find out potential risk of COVID-19

Mask detection

by detecting position of eyes, nose, lips

Algorithms

- Face detection
  - HOG face detector(dlib)
- 68 Landmark
  - shape predictor 68 face landmark trained with 300-W dataset(dlib)
- Haar Cascade
  - nose, mouth
  - we also check if a mask is properly worn

Problems

- Face occluded by mask
  - face detection doesn’t work
  - can’t rely on face detection

- Imperfect Haar Cascade Result
  - need to implement other methods

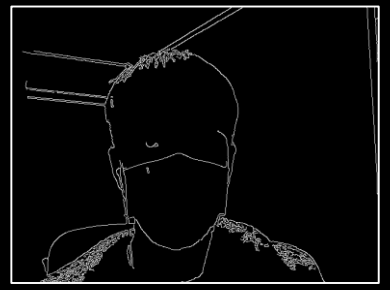
Mask detection

by OpenCV

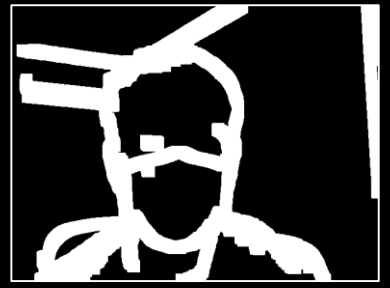
Algorithms

0. Base image

1. Find edges using cv2.Canny

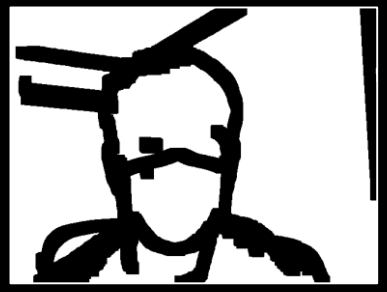


2. Link broken edge using cv2.dilate

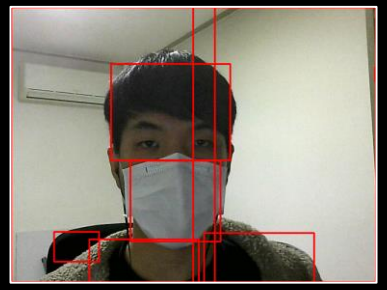


Algorithms

3. Reverse white and black



4. Find closed area using cv2.findContours
   (show with red boxes)

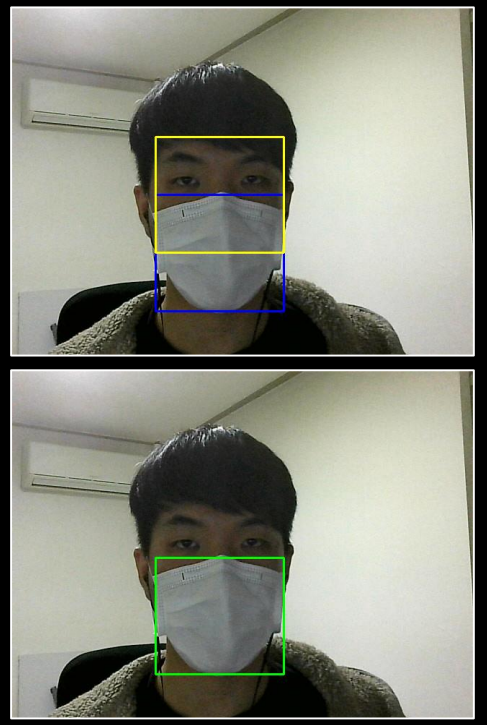


5. Accept contours with solid color and mask shape
   (show with blue boxes)

Algorithms

6. Find eyes in shifted area
   (show with yellow boxes)

7. If eyes are found, the masked face is detected
   (show with green boxes)



Detect Lip Distance

By shape_predictor_68_face_landmarks

Algorithms

- Dlib + shape_predictor_68_face_landmarks
  - Get ids of lips point in 68
- Calculate center coordinate of lower, upper lips (To get distance)
  - Calculated distance is stored in history variable
- Check whether he/she is talking
  - Based on standard deviation of lip distance history
  - Also, detect he/she is keep opening one’s mouth (Optional)

Conclusion & Further works

- **Mask detection (2 Ways)**
  - Two detecting methods are complementary
  - So that we can expect high efficiency

- **Lip distance detection**
  - Can categorize risk degree in more detail

- **Further work**
  - Scaling risk degree from 0 to 100
  - We need to weigh each of the factors carefully