Face Recognition System with OpenCV

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1 Introdction

In this hands-on session, we use Open-cv to implement face detection and recognition, face with mask detection, facial expression recognition and breathing mask recognition. In facial expression recognition, the facial expression of the currently detected face is displayed only when the face is not blocked. We have also added a breathing mask recognition function to the system so that when we detect that if users are not wearing breathing masks, the system will automatically announce to remind users to put it on.

2 Function

2.1 Face detection and recognition

In face detection and recognition, we first load the face database, the process is mainly to detect the face information and feature extraction in the database, the database will return all face feature information in the database after loading. After the initialization, real-time face detection and recognition will be carried out. Firstly, the video stream information will be put into the face detection function. In the face detection model, YUNet model is adopted to separate the faces in the images. Then the face information will be put into the feature extraction function, feature extraction we use the Sface model for feature extraction of face information, get a list of facial feature information. Next, the detected face information will be compared with the database face information, the comparison method is calculated by L2 distance, we set the threshold to 1.275, when the calculation result is less than or equal to this value, the correct matching result will be returned, and the current face identity information will be displayed in the window in real time, otherwise Unknown will be displayed.
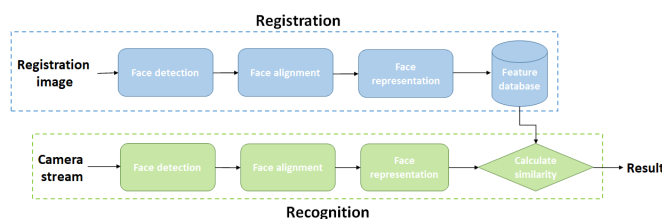
图 1: Face detection and recognition

2.2 Facial expression recognition

In facial expression recognition, we created a deep model to recognize six expressions: Angry, Disgusted, Fearful, Happy, Neutral, Sad and Surprised. We first gray-scale the captured video stream, then use the open-cv detectMultiScale method for face detection, put the detected face information into the depth model, and finally use the softmax function for classification output and real-time display of expression information.

2.3 Face with mask detection

Face with mask detection we adopt the traditional method, in this process, we first need to detect the face and then face occlusion detection. First, we use the Haar model to detect the position of the face in the image, and

then use the occlusion detection model to detect the detected face. The model outputs the confidence and prints out whether the face is blocked.

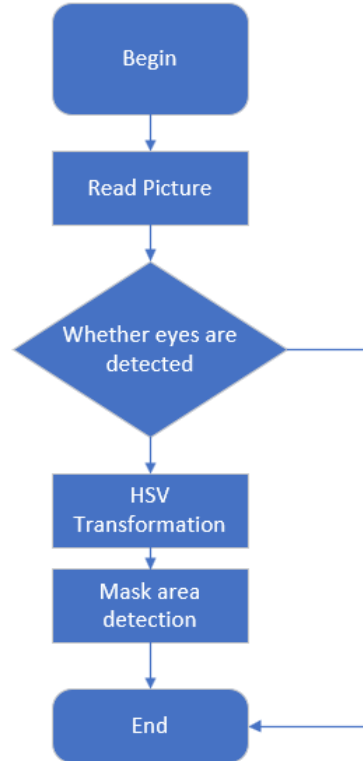## 2.4 Expression recognition mask detection and voice broadcasting

图 2: Expression recognition mask detection

We have implement the function of breathing mask recognition. When the face is detected, the system will detect whether the person is wearing a breathing mask. When the face is detected that the person is not wearing a breathing mask, the system will automatically announce the voice to remind people to put on the mask. In this section, we first need to take a background image without a face to initialize. In this link, the image is firstly Gaussian filtering, and then converted into HSV format, and then the Haar model is used to detect the face, and then the Haar model is used to detect the eyes in the face, so as to determine the eye position, determine the mask area according to the eye position, and calculate the area, determine whether the mask is worn according to the calculated area.

3   Result
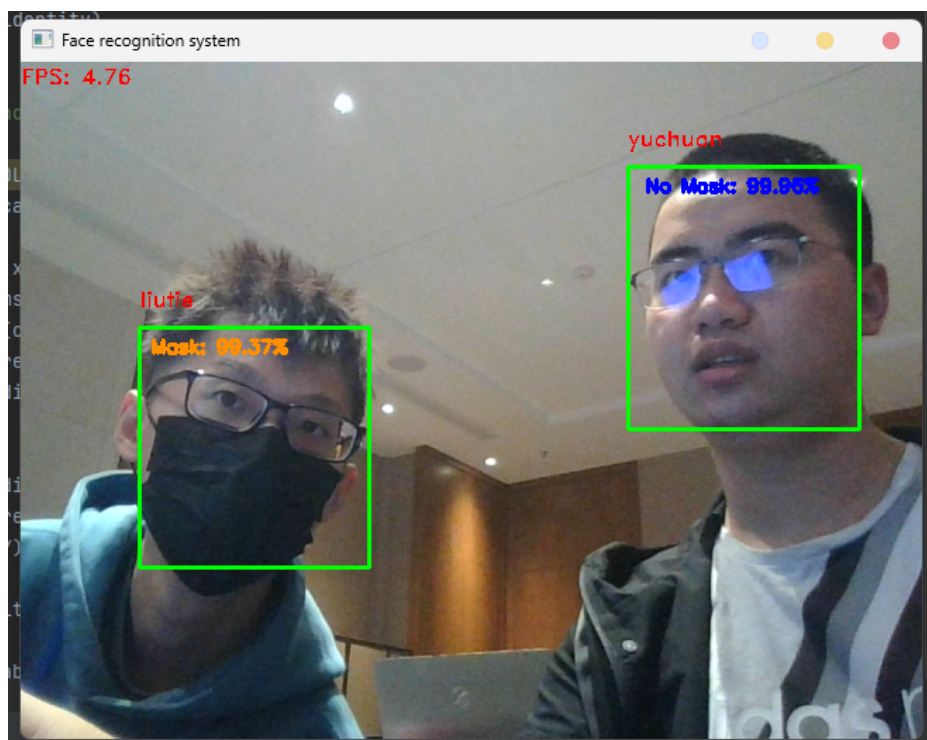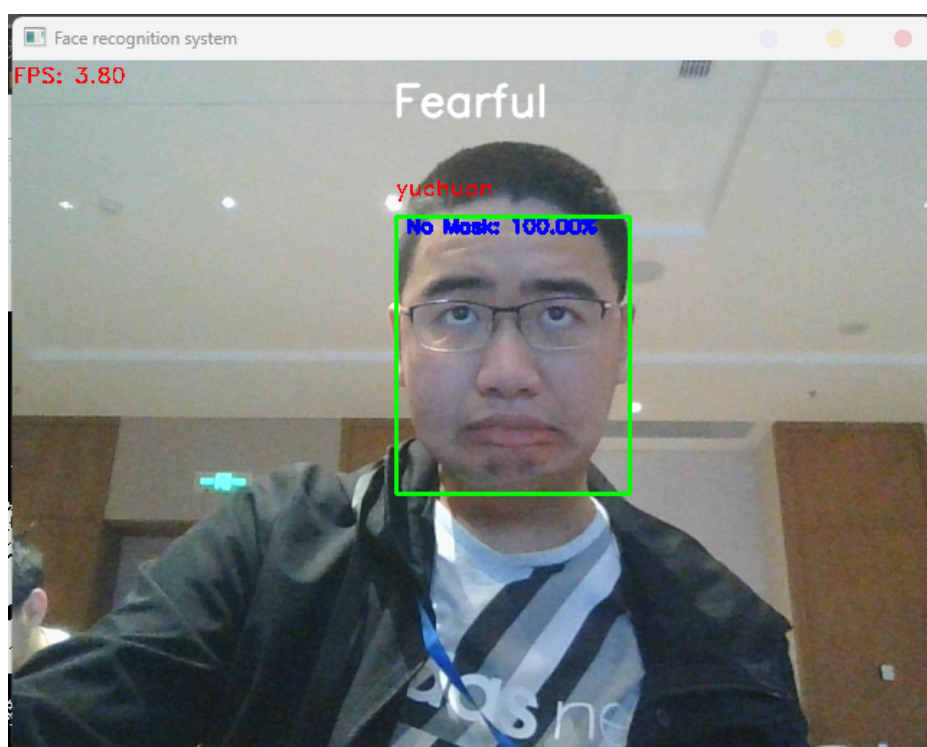

图 3: Initialization

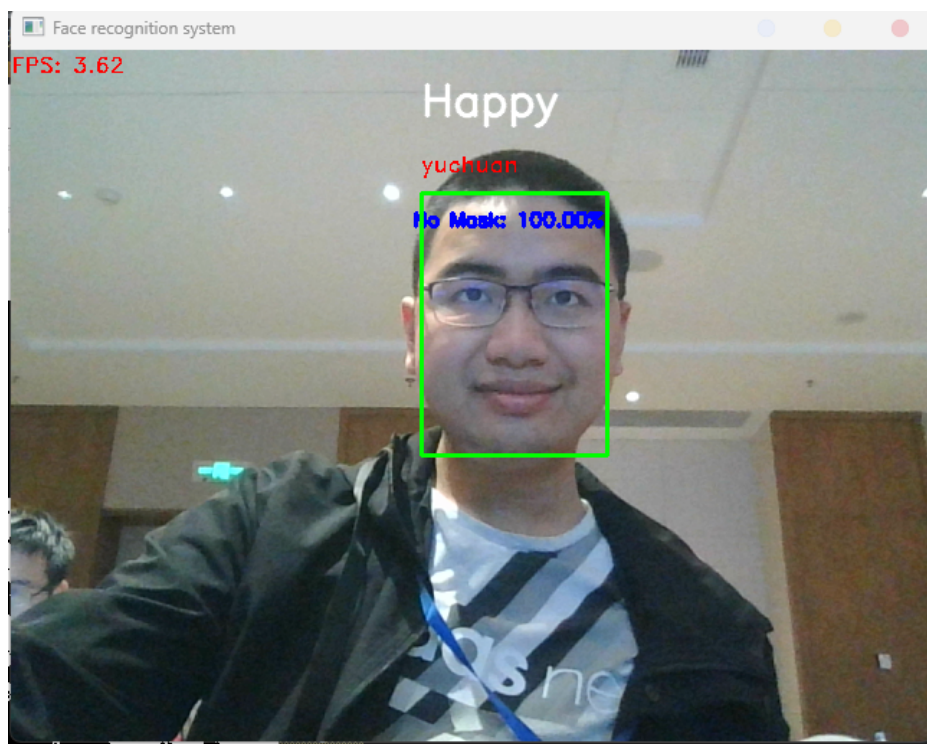图 4: two persons

图 5: face with fear
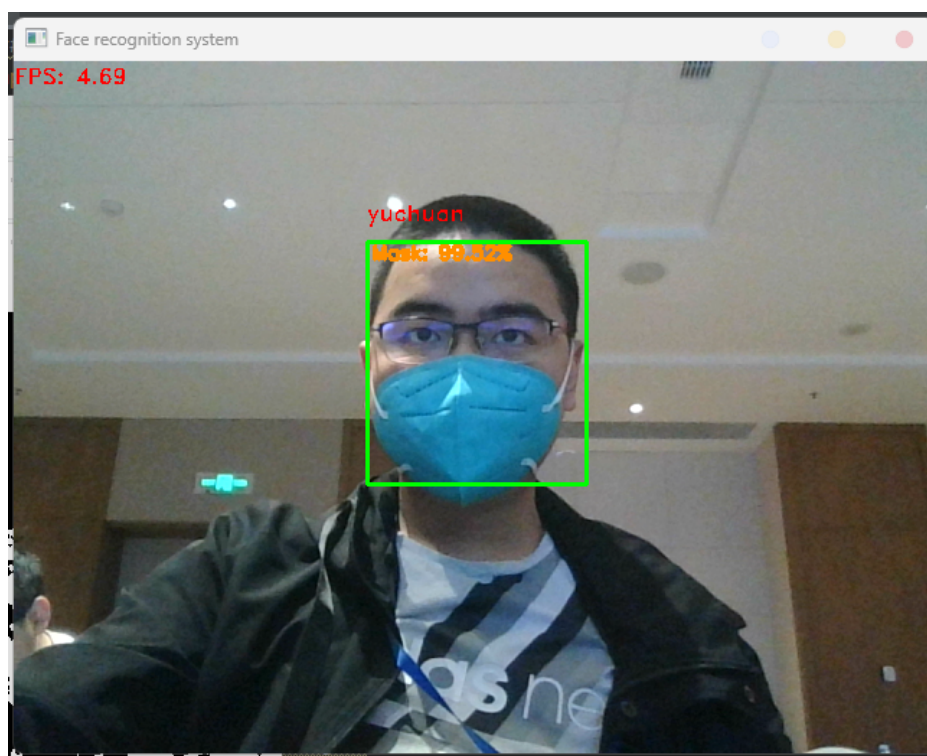
图 6: face with happiness
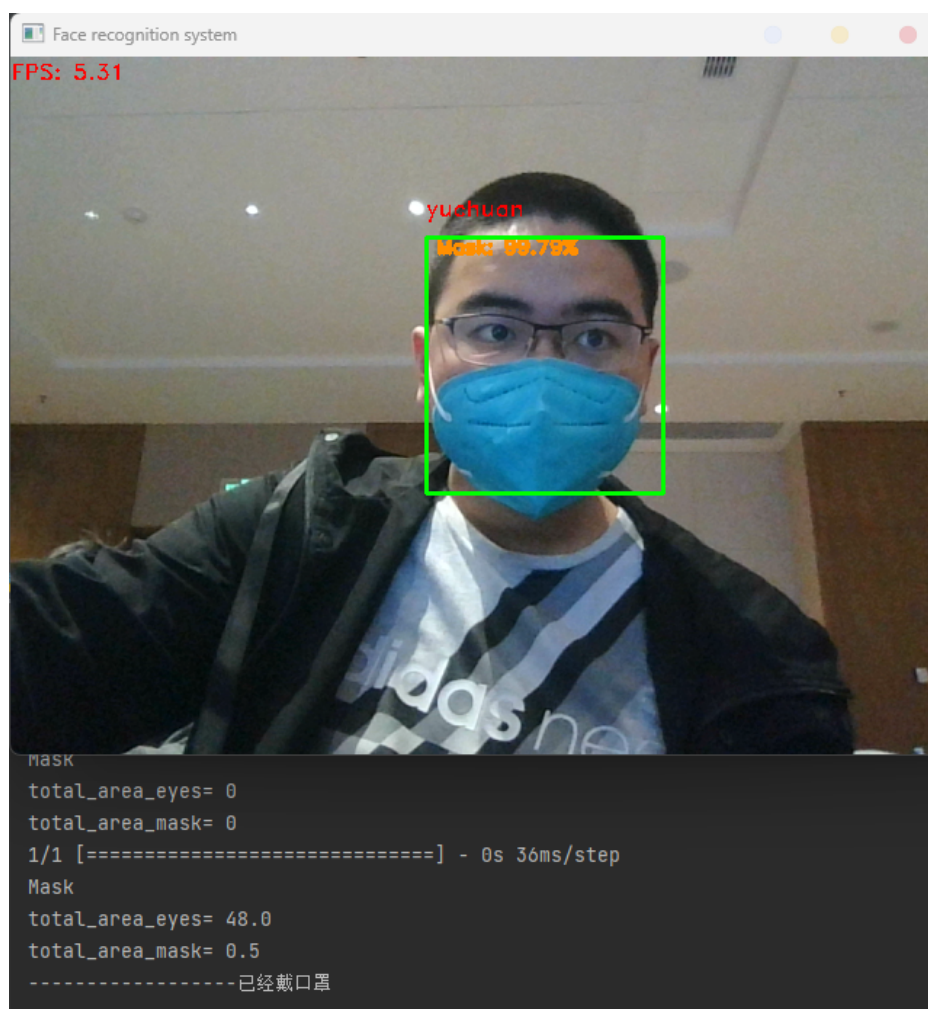

图 7: face with mask and breathing mask

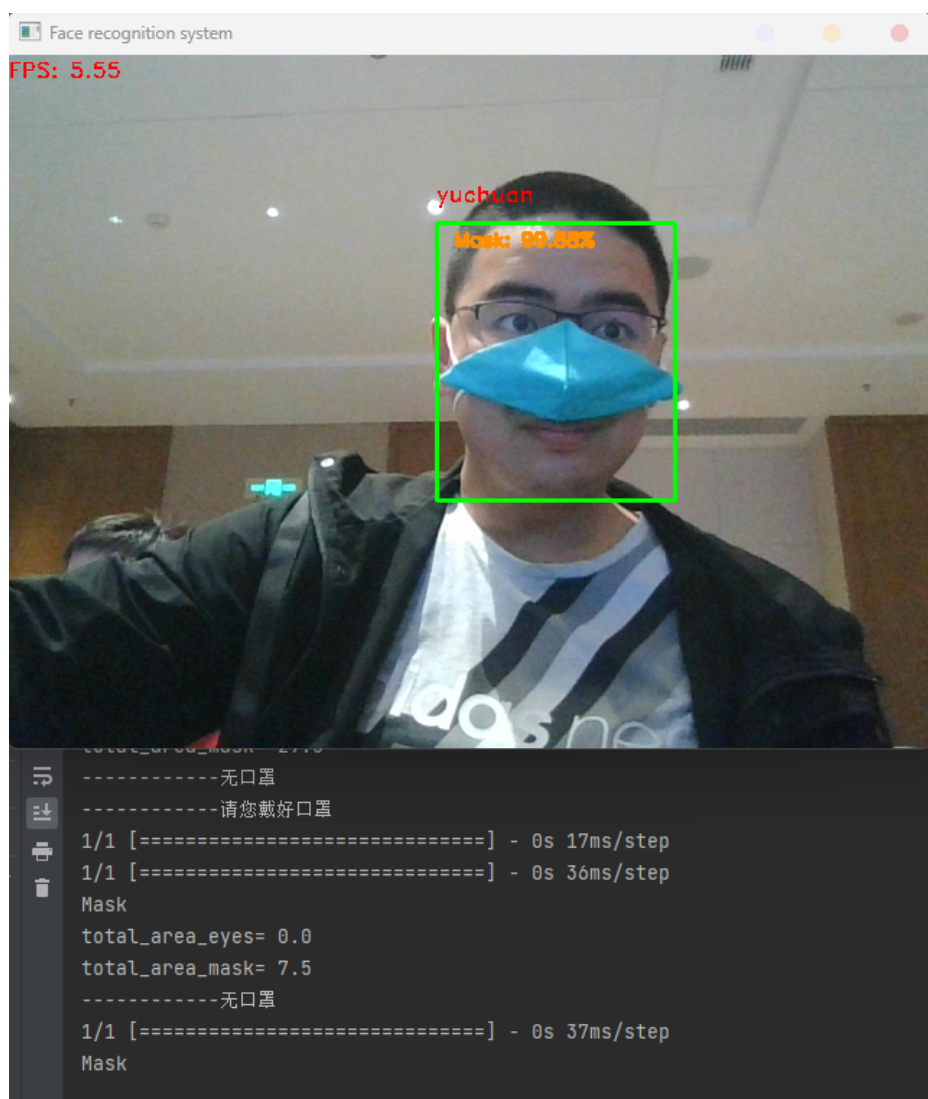图 8: face with mask and breathing mask

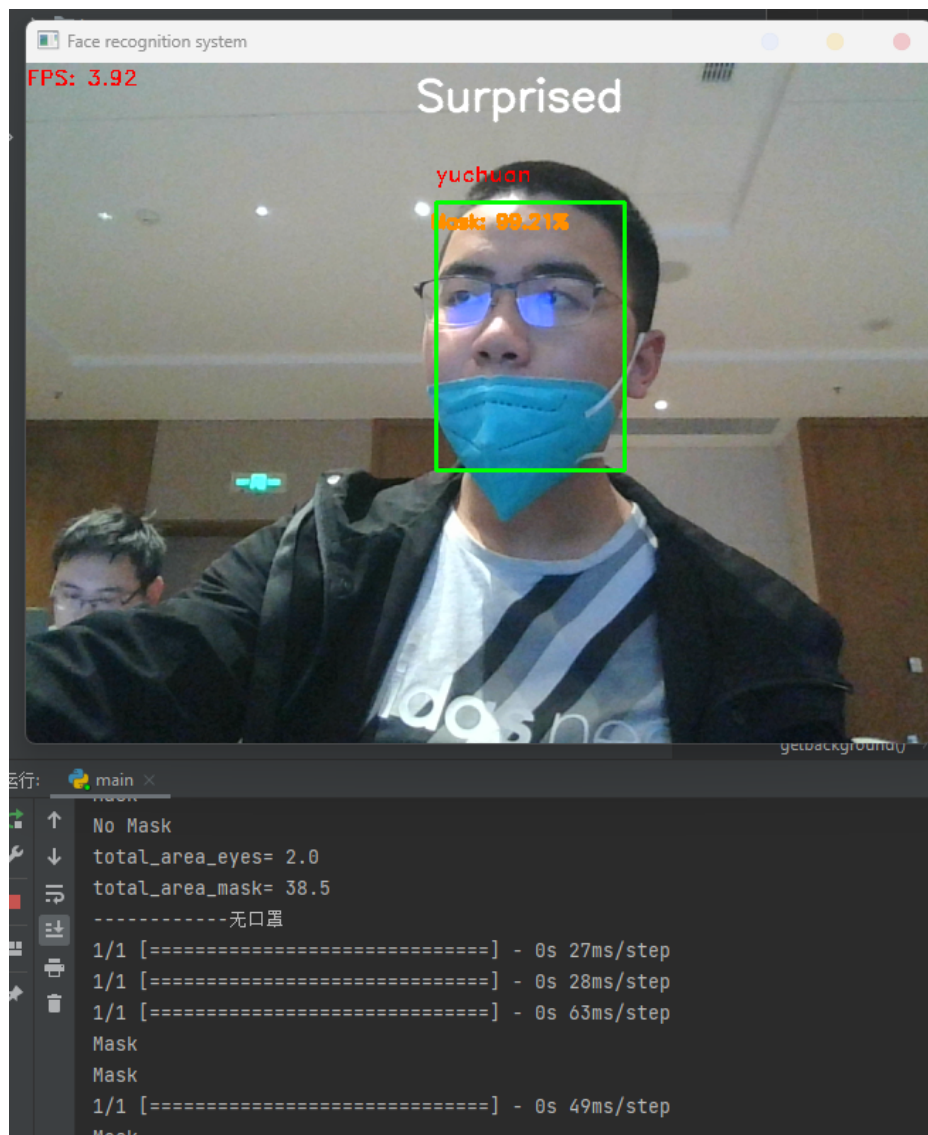图 9: face with mask but without breathing mask

图 10: face with mask but without breathing mask

4 Dependencies

Python 3.x, OpenCV 4.7, Tensorflow, TFlearn, Keras,Pygame,Threading

Open terminal and enter the file path to the desired directory and install the following libraries

```
1 pip install numpy
2 pip install opencv-python
3 pip install tensorflow
4 pip install tflearn
5 pip install keras
6 pip install threading
```

```
7 pip install pygame
```

参考文献

[1] https://github.com/fengyuentau/WSB2022-assignment.