Application of Image Identification and Processing in Wearable Devices

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Project Goal

Facioplegia is a kind of disease caused by nerve paralysis. Traditional therapy of facioplegia uses massage, antibiotics or surgeries to cure the infected nerves. Now our goal is using wearable devices to monitor patients and cure facioplegia. As we know, patients of facioplegia often cannot control one side of their faces while the other side moves normally. Our new therapy is stimulating the rigid side by electric current to make both sides act symmetrically. This involves face landmark identification and circuits integration. We want to produce a pair of wearable glasses as light as possible with the function of detecting facial muscle movements and releasing electric currents.

Last year we have made a device that can be applied in hospitals. This year we try to modify the last generation wearable devices and make a smaller, lighter second generation that can be widely used in multiple circumstances.

Project Achievement

In last few weeks, our team has completed the design of integrated circuits and debugging of face landmark identification program.
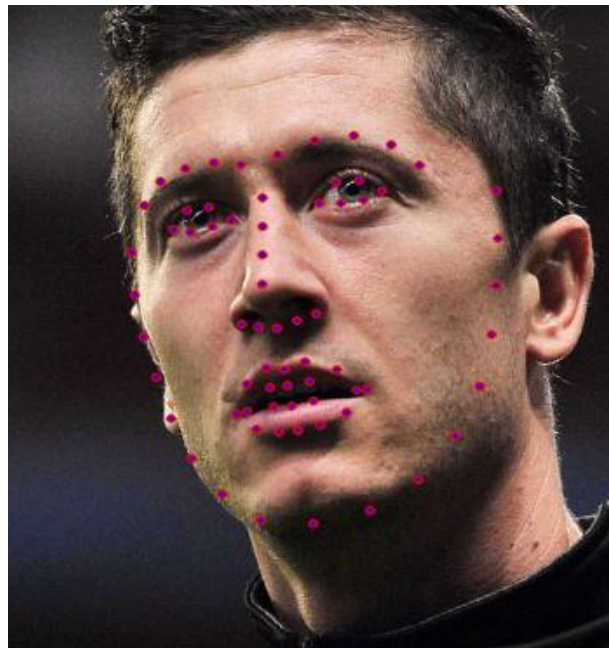

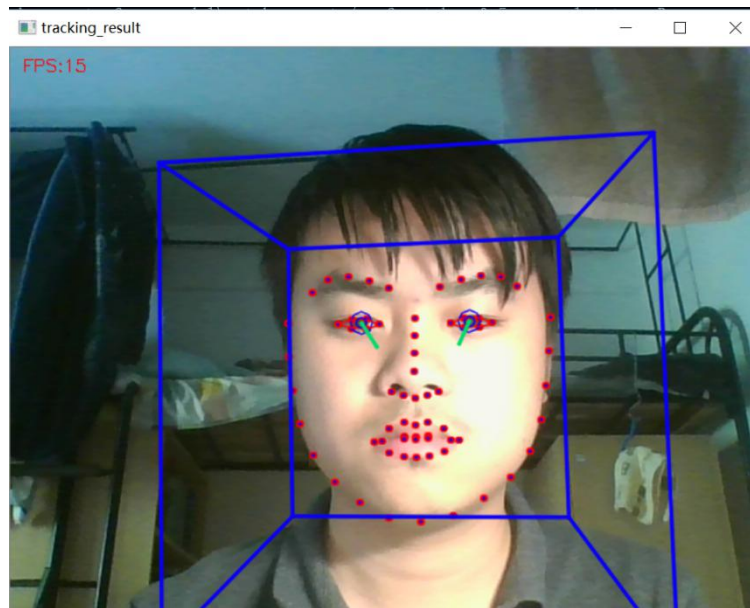Figure 1 Image Face Landmark Detection

Figure 2 Video Face Landmark Detection

I am in charge of debugging the program. The main thought of our program is locating eyes, nose and mouth after detecting people's face. By analyzing the eyes the computer can know which direction people are looking at.

To run this program on a device small enough to attach to wearable devices, I also constructed a platform of Opencv for Raspberry Pi.

As you can see in Figure 1 and Figure 2, our program can precisely detect the outline of people's face and roughly locate the eyes now, nose and mouth. We also find a method to identify which direction people are gazing at.

Project Scenario

Though we have made great progress in wearable devices so far, there are still many difficulties we have to tackle if the product is to be widely used in curing facioplegia.

First, the circuit is not small enough to be placed on an ordinary pair of glasses.

Second, our program cannot accurately locate the eyes and gaze direction without detecting the face. In real application, camera on the glasses will not be able to film the whole face, so we need to upgrade our program to fit real condition.

During the summer vacation, we plan to solve problems above and add a blink detection module to finish this project of curing facioplegia. We also hope to apply our research on other fields, such as using the glasses we designed to operate Drones.