# Music Player Based on Gesture Recognition

## Project Description

Our project aims to develop a music player application based on gesture recognition, which captures the user's gesture movements by invoking the device's camera and performs gesture recognition processing in real time. The system performs corresponding playback control operations according to the recognized gestures, providing users with a novel and convenient music playback experience.

First of all, it can achieve the basic functions of ordinary music players. The interface has a series of buttons, through which you can play, switch music, adjust the volume of music and save songs and other operations. In addition, the left side of the screen will display your music list and favorites list.

In addition, our project adds gesture recognition elements on top of ordinary music players. After running, the program will call the camera of your device, the image captured will be displayed on the screen, the program will capture your gesture and process it, and perform different feedback operations according to different gestures.

Our project gives special treatment to the following gestures:

1. The "V" shape represents the switch status, that is, continue to play or pause;

2. Left wave means switch to previous song;

3. The right wave means to switch to the next song;

4. Thumbs up means volume increase;

5. Making a fist means reducing the volume;

6. Comparison represents collection or cancellation of collection;

7. A "Rock" shape represents the termination of the program.

On the left side of the screen, a list of text prompts will explain what actions represent what features.

Our code mainly consists of the following three modules:

User interface: The program uses PyQt5 to draw the interface, and uses QSS to beautify the interface;

Music playback module: This program uses Pygame library to control music playback, and uses mutagen library and PIL library to complete the extraction and processing of music cover;

Gesture recognition module: This program mainly uses mediapipe for gesture recognition, and uses opencv-python library to process video streams and obtain real-time camera data.

## Implemented Requirements

The project focuses on two groups of users. One is the younger user base who are looking for a sense of technology and convenience, especially those music lovers who like to try new things. They may not be interested in the traditional music player interface, and expect to realize the control of the music player through simple gestures, so as to enjoy more convenience and fun in daily use. The second is users who want to be able to control music more easily in certain situations. In many everyday situations (such as sports, driving, dining, etc.), users may not be able to easily operate the traditional physical buttons or touch screens, and gesture recognition based music players can perfectly solve this problem. Users only need to control the player through simple gestures, and no longer need to worry about operating inconvenience or mistouch.

In terms of user requirements, the first thing to be simple and easy to use, users want to be able to complete the music control through simple and intuitive gestures, without the need for complex operating steps. Gesture recognition needs to be able to quickly and accurately respond to user actions to ensure smooth user experience and avoid inconvenience caused by misoperation. The basic functions must be complete, covering common music playback control functions, such as playing, pausing, cutting songs, adjusting volume, etc., to meet the needs of users in different scenarios.

According to the needs of users, we have implemented the following core functions: play control, song cutting operation, volume adjustment, collection, program termination.

This project embodies user interaction and user friendliness in the following aspects:

1. The gesture design is simple and intuitive, in line with users' daily habits and intuition. Users can control the player with simple actions.

2. When the user performs gesture operation, the system gives feedback in real time, such as switching the playback status and adjusting the volume. This instant feedback enhances the user experience and satisfaction.

3. The interface is simple and clear, easy for users to understand and operate. In addition, it provides detailed operation instructions and prompts to help users quickly get started.

## 3. Advantages and Disadvantages

### 3.1.Advantages

Our projects have the following advantages:

1. Compared with traditional player, this project realizes contactless control of player through gesture recognition. Users do not need to touch any physical keys or touch screens, just through simple gestures to complete a variety of operations, greatly improving the convenience of use.

2. Intuitive and easy to understand operation. We designed intuitive and easy to understand operation meanings for different gestures, such as "V" shape to switch playback status, left and right wave to switch songs, etc. These designs are in line with the user's intuition and habits, so that users can quickly grasp and enjoy the fun of music playback.

3. The system can capture and recognize the user's gestures in real time and give corresponding feedback immediately. This instant feedback mechanism allows users to accurately understand the results of operations and make adjustments as needed, thus improving the overall experience of music playback.

### 3.2.Disadvantages

But at the same time, our project also has some shortcomings:

1. In the case of low lighting or low light, the image quality captured by the camera will decrease, resulting in insensitive gesture recognition or incorrect recognition.

2. Due to the high sensitivity of gesture recognition, users may accidentally make some actions and trigger unnecessary operations. For example, the function to switch songs may be accidentally triggered when the user waves his hand. This may interrupt the user's music experience or cause some unnecessary trouble.

3. At present, our gesture recognition system only supports the preset meaning of gesture operation. However, different users may have different personalized needs and want to achieve specific functions through different gestures. Due to the limitations of the system, it is difficult to meet these individual requirements.

## 4.Improve To Our Program

In view of the above shortcomings, we put forward the following improvement measures:

1. For the problem that light affects recognition accuracy, image enhancement algorithms can be introduced to preprocess captured images to improve image quality and contrast. At the same time, the gesture recognition algorithm can be optimized to maintain high recognition accuracy under different light conditions.

2. For the problem of misoperation risk, a certain gesture recognition threshold can be set, requiring that the user's gesture must reach a certain similarity and accuracy before it can be recognized. At the same time, a confirmation mechanism can be added to require users to confirm twice when performing key operations (such as switching songs, adjusting the volume, etc.) to reduce the possibility of misoperations.

3. For the personalized needs of users. Develop user-defined gesture function, allowing users to set specific gesture actions to perform specific operations according to their preferences and habits. In this way, users can customize a personalized music playing experience according to their needs.