Assignment 2: Digital Signal Processing (15P)

Goals

You are familiar with capturing and processing digital signals in real time. You can implement interaction techniques based on real time audio signals.

1 Karaoke Game 6P

Recommended Packages: *numpy, pyaudio, pyglet*
Create a program called *karaoke.py* which captures audio from your computer's microphone and detects the sound's major frequency in real time. Use this frequency as input for a small audio-based game. For example, it could be a karaoke game in which players have to sing a certain (random, pre-defined, or MIDI) melody, or a game to train playing, singing, or whistling musical notes or intervals.

Score

(**3P**) frequency detection works correctly and robustly
(**2P**) the game is playable, does not crash, and is (kind of) fun to play
(**1P**) low latency between input and detection

2 Whistle Input 8P

Recommended Packages: *numpy, pyaudio, pyglet, pynput*
Create a program called *whistle-input.py* which detects whisteled frequency chirps and reacts to them in real time. Frequency chirps are signals that change their frequency over time, for example *"ooouuuiii"* for an upwards chirp and *"iiiuuuooo"* for a downwards chirp.

Use detected whisteled frequency chirps (up and down) to navigate in a list. First, implement a simple 2D application using pyglet that displays a stack of rectangles of which one is visually selected. When an upwards whistle is detected, the selection should move upwards (and downwards for downwards whistles).

Now generalize your new interaction technique to other applications. Use the pynput library[1] to trigger key presses (upwards and downwards arrow) to navigate in arbitrary GUI menus by whistling.

Score

(**3P**) upwards and downwards whistling are detected correctly and robustly
(**2P**) detection is robust against background noise
(**1P**) low latency between input and detection
(**1P**) the pyglet test program works
(**1P**) triggered key events work

Bonus Point: well-structured and readable code; virtual environment is used

[1] `https://pypi.org/project/pynput/`