Pitchbender for MacOS

Andreja Andric 2019

1. Purpose of the program and how it works

The purpose of the Pitchbender program is threefold:
1. to resample the input at a sample rate that is a given multiple or fraction of the original sample rate,
2. to be configured to follow any number of such fractions one after the other, and to change the sample rate accordingly at precisely the right moments, and
3. to do all the above processing and generate the output in real time and without any noticeable delay

In addition it can save the sound result if Save mode is on. The selection of the input files, the buffer size and other options can be configured in the file pitchbenderconfig.txt.
Pitchbender uses internal buffering to allow the sample flow to slow down and speed up at will. Obviously, it can go faster than real speed only if it had slowed down before, because it would be impossible to go absolutely faster than the real time. However, if it happens that the configuration file is set up so that Pitchbender has to go “before its time”, a solution is provided in a sort of a loop – the sample pointer goes a fixed distance back when it hits the last sample from the soundcard input. This creates a convincing "looping" in high register, but should nevertheless be avoided because it also creates unpleasant clicks in the sound output. The input files should be composed in such a way that this cannot happen – every higher note should always be preceded by its lower counterpart, so after every two subsequent notes the sample counter is exactly where it would be if there were no pitch altering at all.

2. Input files

The input files for Pitchbender have simple structure: it's a list of time-pitch pairs each of which indicate for how long a given relative pitch is to sound. The list is preceded by a "pivot" number that indicates the value in respect of which the other relative pitches are "relative". For example if this number is 1, then relative pitch of 0.5 indicates slowing down to a half and an octave lower pitch, relative pitch of 2 indicates an octave transposition and twice faster playing, and so on. Setting the file this way makes it easy to transpose an entire input file just by varying this pivot number. Lists of time-pitch pairs can be optionally followed by a single negative number, that indicates the number of repeats of the preceding group (between this and the previous repetition mark). Example:

```
440.0

5000 440.0 -1

48 110.000000
48 377.142861
48 502.857165
```

```
48 770.000000
-16
48 110.000000
48 366.666658
48 513.333316
48 770.000000
-16
48 110.000000
48 352.000005
48 528.000021
48 770.000000
-16
```

3. Config file

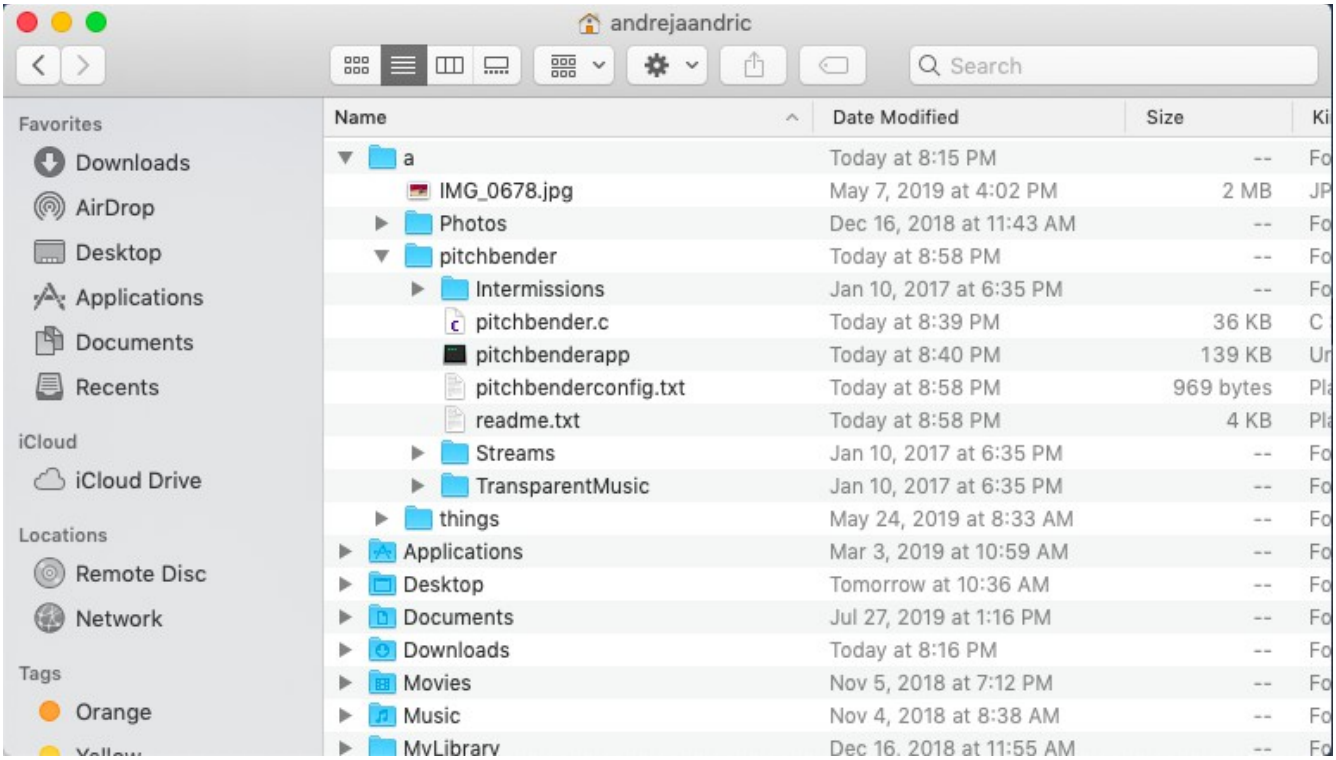
Edit pitchbenderconfig.txt file to specify the input file(s), the buffer length, whether you wish the input file to be looped infinitely, default device numbers for input and output, default key for controlling the flow and the stereo channel handling (left-to-both, right-to-both, normal-stereo).

Example config file:

```
# Pitchbender config file
# Format:
# field: value
# Allowed fields: BufferLen, File, InfiniteLoop, DefaultKeyCode,
DefaultKeyName, Stereo,
# DefaultInput, DefaultOutput

BufferLen: 64
File: 1_Introduction.txt
File: 2_Dance1.txt
File: 3_Intermission.txt
File: 4_Dance2.txt
File: 5_NightWalk.txt
InfiniteLoop: No
DefaultKeyCode: 32
DefaultKeyName: Space
Stereo: normal-stereo
DefaultInput: 0
DefaultOutput: 1
```

The application, and the pitchbenderconfig.txt have to reside in folder <youruser>/a/pitchbender. Various input files need to be in subfolders mirroring the content of the pitchbenderconfig.txt file. See the folder and file structure on the picture below:



Run the program by invoking it from the Terminal window or with a doubleclick.

4. If you need to modify the program

To compile the program you need Xcode from Apple and portaudio library from portaudio.com.

I used Xcode 7.3.1 and portaudio from pa_rc_190600_20161001.tar on
macOS Sierra Version 10.12 and later Xcode 10.3 on macOS Mojave Version 10.14.

After you have installed Xcode, first build portaudio: open the Terminal window, position yourself in the portaudio directory and type:

```
./configure --disable-mac-universal && make
```

As a result, library file libportaudio.a should be created in the directory portaudio/lib/.libs.

After building portaudio, build Pitchbender with the following command in the Terminal window:

```
gcc pitchbender.c ./portaudio/lib/.libs/libportaudio.a -framework
CoreServices -framework CoreFoundation -framework AudioUnit
-framework AudioToolbox -framework CoreAudio
```