CRUSH A Program To Remove Silent Audio and Insert Time Codes

NOTE: All of the files referenced here are in the GitHub repository : https://github.com/dkandle/CrushCSharp

This repository contains a test file, example output file, and the plugin for Audacity.

I have developed this tool which records radio transmissions at my airport, removes the dead time and inserts a time code into the audio track. I do this because there are often long periods of time where there would be nothing but dead time in the recording. I also have an Audacity plugin which displays the time codes so that the actual time the clip was recorded is shown. I am not interested in selling these tools, just making them available so that they get more use.

The project these tools were developed for involved collecting data to determine airport usage and identify safety issues at my local airport.

Based on the software for that project I've produced a simple Windows program which will take an audio file as input and output a condensed audio file which has the dead time removed and the time codes inserted.

NOTE: ***In this version the time inserted will be the time that the file was processed***. It has no way to know the time that the original recording was made. In a "real" version of this tool, you would be able to enter a date-time of the original recording.
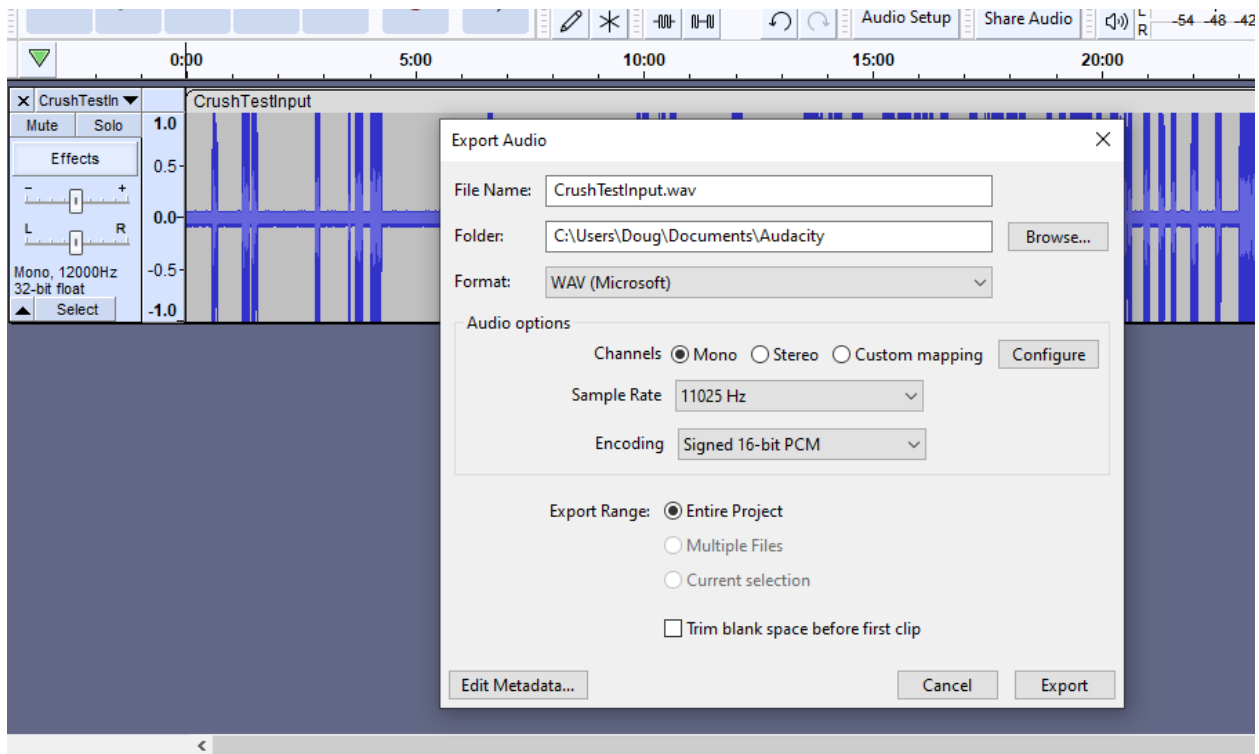
My expertise is in numeric signal processing and not in deploying Windows applications.

The program will (should) run on a Windows computer. I've run it on both Windows 10 and 11.
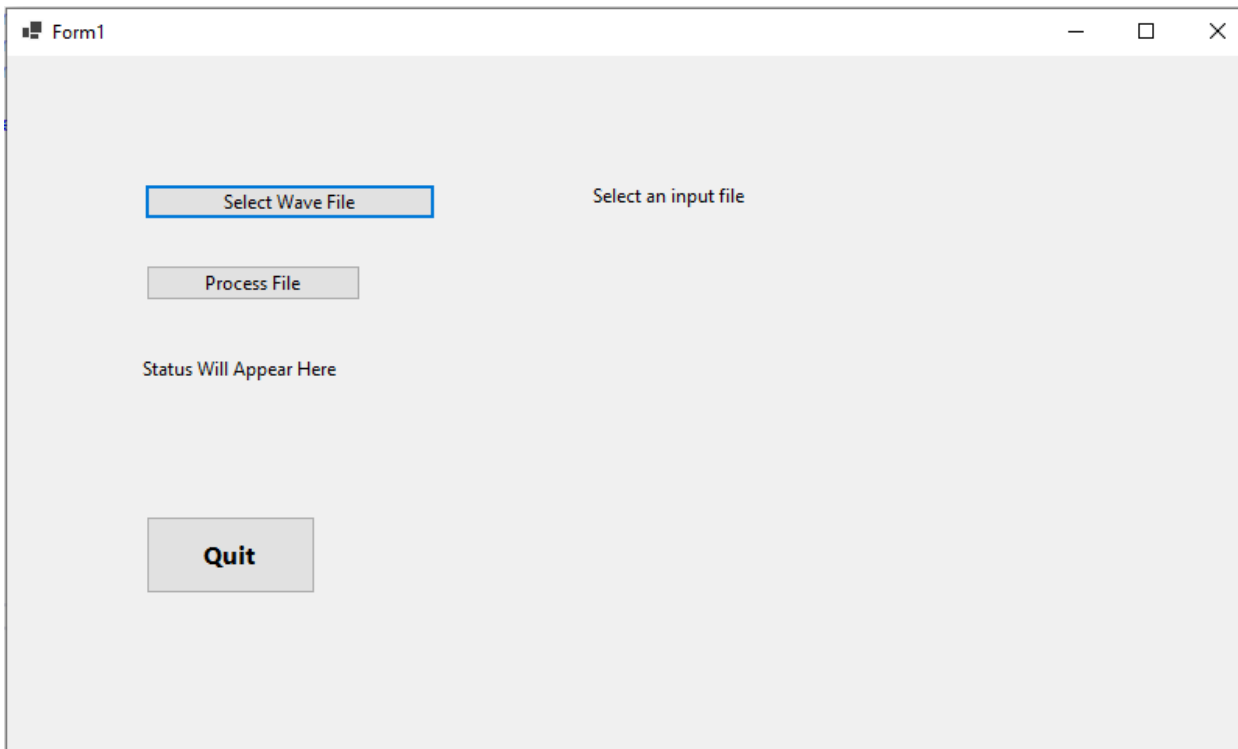
Running the Program

You'll need a wave file to try this program out on. You can use the one in the repository SampleData folder, or your own. It must be a single channel, 16bit samples. I have done most of the testing with a sample rate of 12KHz but it should work with any sample rate. If your file doesn't meet these requirements, I would suggest you open your audio file with Audacity, and then export it in a compatible format.

If you need to convert your input using Audacity then this is the dialog you'll see when you export. To get to here, File->Export Audio.

Export Audio ✕

File Name: CrushTestInput.wav

Folder: C:\Users\Doug\Documents\Audacity　　Browse...

Format: WAV (Microsoft) ▾

Audio options

Channels　⦿ Mono　◯ Stereo　◯ Custom mapping　　Configure

Sample Rate　11025 Hz ▾

Encoding　Signed 16-bit PCM ▾

Export Range:　⦿ Entire Project

　　　　　　　◯ Multiple Files

　　　　　　　◯ Current selection

　　　　　　☐ Trim blank space before first clip

Edit Metadata...　　　　　　　　Cancel　　Export

When you run the program, you will see this window come up:

Click on the button "Select Wave File" and navigate to your input file. The default folder is Documents\Audacity (which is the default folder where Audacity will put exported audio).
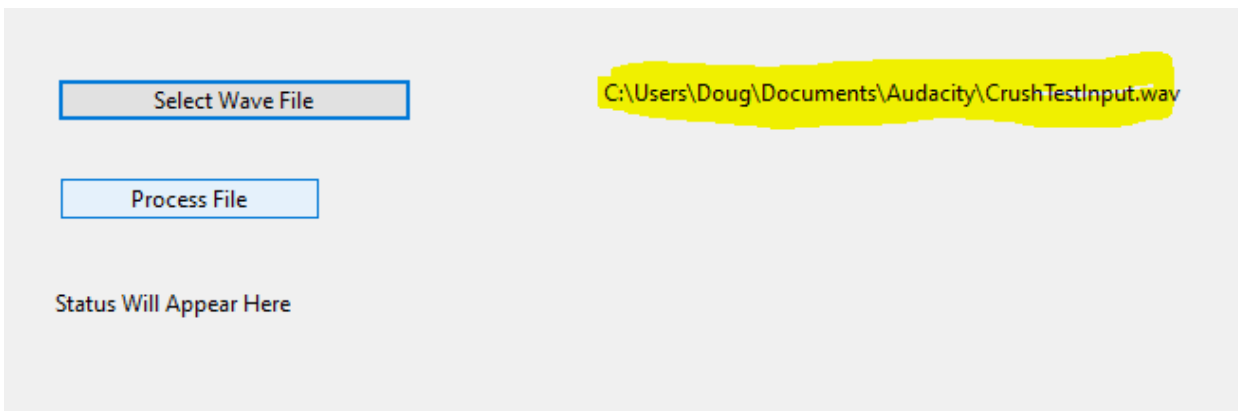
The selected file name will appear to the right of the button.

Click on the "Process File" button. This will initiate the process. The output will be in the same directory as the selected input wave file and the file name will have "Crushed" appended to the name. E.g. if your input file was **sound.wav**, the output will be **soundCrush.wav**.

Audacity
Before you can display the time codes in Audacity, you'll need to install the plugin.

Download the plugin from the repository SampleData folder. You should get the file LabelTimecodes.ny. Put that file somewhere you can find it later.

To install the plugin select Tools->Nyquist Plugin Installer
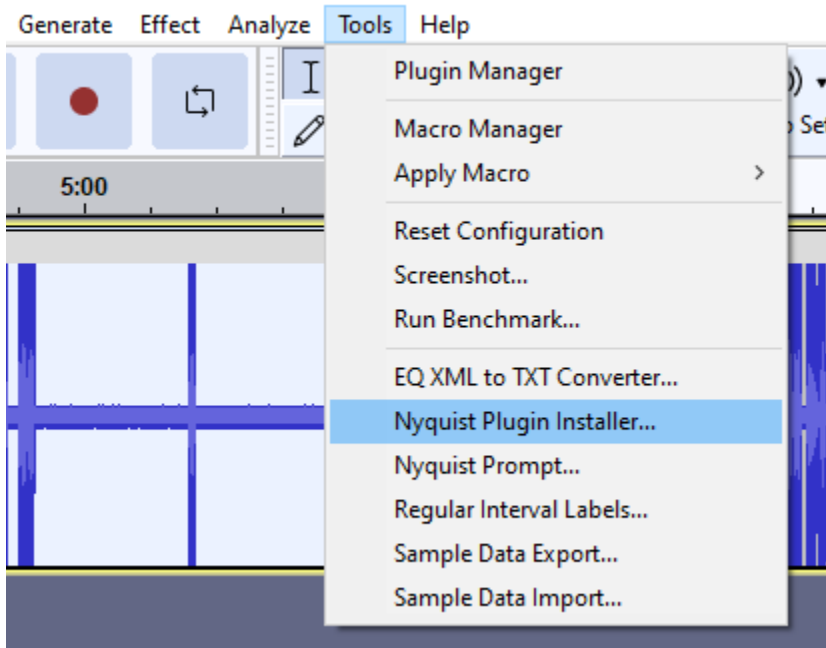
Navigate to the location of LabelTimecodes.ny and click on Apply.

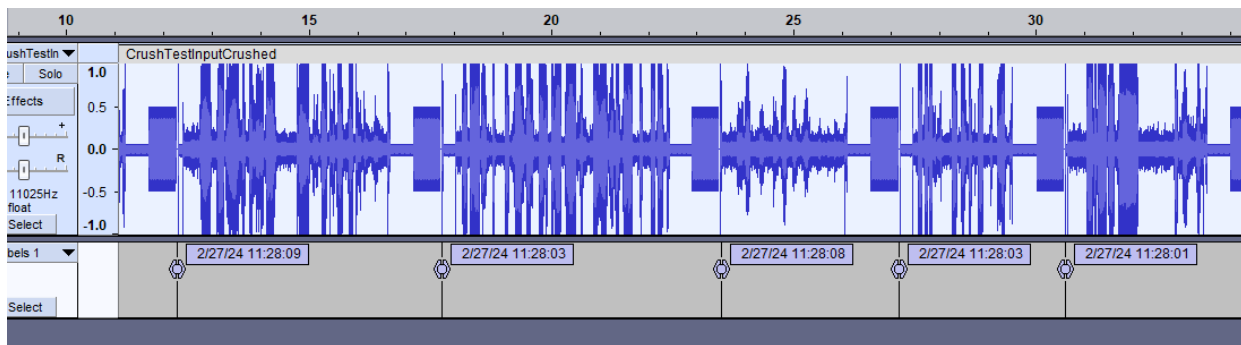You will have to exit Audacity and open it again for the plugin to be made available.

Viewing Crushed File with Time Codes

If you view both the input and output audio files you'll see that all the blank time has been removed. In my example it crushed a 12 minute recording down to about 1:30.
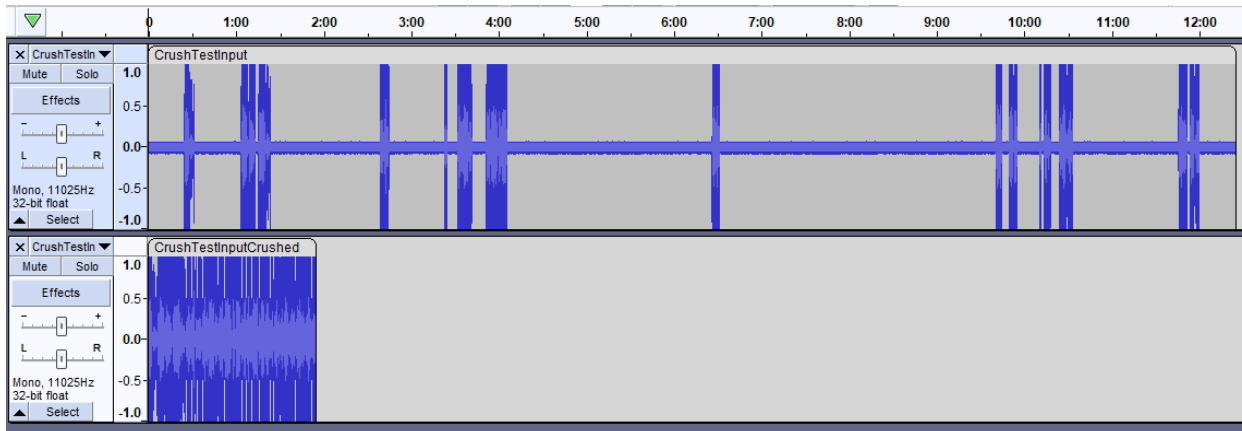
Open Audacity and then open the output file. You must select a region of the audio to label the time codes. You can either use the selection tool, or select all.

After you have selected something, then choose Analyze->Label Timecodes. After it is done you should see this:

CrushTestInputCrushed

2/27/24 11:28:09 2/27/24 11:28:03 2/27/24 11:28:08 2/27/24 11:28:03 2/27/24 11:28:01

Notes and Disclaimers

This was a very quick port from an existing program running under Ubuntu so it has had limited testing in this environment. There are zero checks that the input file meets the requirements. If you give it something other than a 16 bit wave file I have no idea what will happen (but probably not what you want).

If there are at least 10 people who find this useful I'll make an effort to fix any issues that you find.

If the Windows version has users and others want a Linux version that can be done as well but it will be command line based (no graphical interface).

Some Internals

As the input wave file is read the program has two states: 1) inside a quite time, or 2) copy input to output (not in quiet time).

To determine if the next sample read is in a quiet time the program must look back in time to see if everything for the last X seconds is below a threshold. When the program goes from quiet time to copy output state it first puts out a brief burst tone at 400Hz, followed by a few +1/-1 samples (this will unique as no recordable sound can have these samples). Followed by a BCD representation for year, month, day, hour, minute and second.

Following the time code the program will again be copying input to output until the input goes silent again.

CrushTestInputCrushed
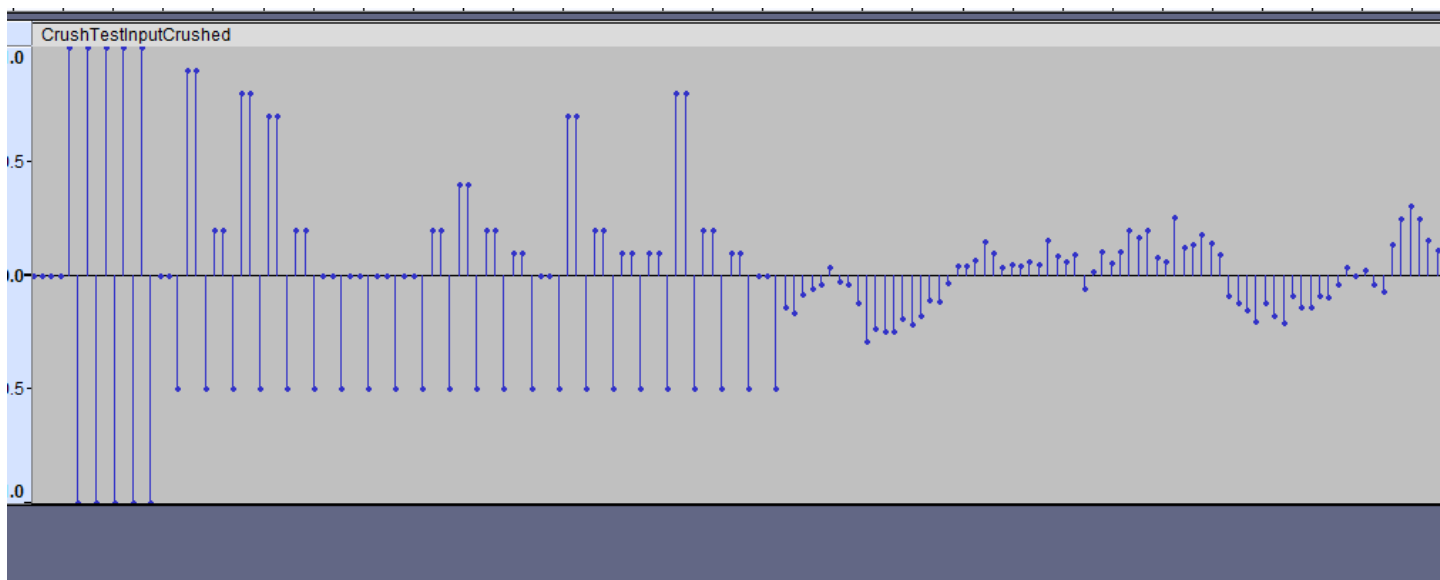
This is an example of the samples inserted for a time code. The Audacity plugin (LableTimecodes.ny) finds this code in the audio stream and creates labels from the values.