Simple multi-tracking

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Scenario: The person doing the editing is co-located with the performer(s), and may be the same person.

1 Outline

In outline, these are the steps required:

- Choose and set up your tools and equipment.

- Create the "click track"

- Prepare the performance parts

- Record the performance tracks, while listening to the "click track" and performance tracks already recorded and aligned, on head-phones

- Align the start of each track

- Make any corrections or adjustments to each track

- Adjust the balance

- Apply reverb

- Export the audio file

2 Choice of tools

2.1 Editing software

I use *Audacity* – which is free and available on most platforms – both to record and edit performances.

There are other tools, sometimes called "waveform editors", you might prefer to use, or already be familiar with. The main requirements are be able to record and work on several tracks independently, and to play back a mix of the tracks back.

I use the following features of *Audacity*:

- Generate a "click track"

- Generate a track of bar numbers

- "Punch and roll" recording

- Noise Reduction

- Amplify

- Audio Cut and paste

- Audio Delete

- Snip a track into two independent clips, move one of the clips backwards or forward in time, using the Time Shift tool, and join them back up again

- Fade in

- Fade out

- Change Pitch

- Change Tempo

- Change Speed

- Generate silence

Other waveform editors will probably have something equivalent to each of these.

The rest of this document is written on the assumption that *Audacity* is being used.

2.2   Recording room

An important part of the setup is the room in which you make the recordings.

You are probably not aiming for "broadcast standard" here. But it will avoid certain problems if this is as acoustically "dead" as possible, and if it is free from extraneous noise, either continuous (fans or other equipment), or intermittent e.g. passing traffic.

You can determine how "lively" a room is by clapping your hands and listening to how long it takes for the reverberations to die away. Reverberations should be negligible.

To some extent low-level continuous noise can be suppressed when editing using a "Noise Reduction" effect.

Unless it happens in silences in the performance (when the noise can be suppressed when editing by use of a "Generate Silence" effect, occasional noise is impossible to remove.

A not-uncommon source of extraneous noise is the performer's own headphones: a loud click-track may appear in the performance waveform as small peaks in time with the click-track. If this is a problem, it may be worth obtaining a different pair of headphones.

Another common problem with recording spaces is "boxiness", the recording sounds like it was recorded in a concrete bunker: certain low pitches "ring" or are emphasised. This is due to hard sound-reflective parallel walls at about the same distance apart as the wavelength of lower pitches in music, which is to say eight to twelve feet. Most domestic rooms have such dimensions. The cure is usually to introduce something absorbent that will absorb a good proportion of the sound as it makes its round trip from source to wall to microphone. A bit of "clutter" will help a great deal. Or an expanse of open window or heavy curtain.

2.3   Microphone, etc.

Recording a performance clearly requires a microphone of some kind!

Using the PC's internal microphone: Many PCs have a built-in microphone. Or an external webcam may have a microphone built in.

This will appear among the input options in *Audacity*, or whatever PC software is being used, and maybe used to record straight into an *Audacity* track.

Using your mobile: See Figure 1.

One straightforward approach is to use the microphone in your mobile phone. The quality of the recorded sound will depend on the make of phone.

If a sound recording app is being used, e.g. *Voice Recorder*, it will probably export the recorded audio in the form of an MP3 file.

Alternatively, it is often possible to use the phone's Camera app in video recording mode. This will probably export the recorded video in the form of an MP4 file.

If the recording is done by an app on the phone, depending on the capabilities of the app, it will probably not be possible to make use of the convenience of "Punch and Roll" recording, or the equivalent. In this case, a collection of takes in separate files will have to be transferred to the PC for assembly and editing.

If this is the approach taken, it is probably a good idea to preface each take with a shouted remark giving the bar number. This will save time at the editing stage.

Special-purpose hardware such as the "Zoom Handy Recorders" or the "Sony IC Recorder" can give excellent results for a fairly modest cost.

The next challenge is to get the file (MP3 or MP4) onto your PC. There is a choice of ways to do this:

- Email the file as an attachment

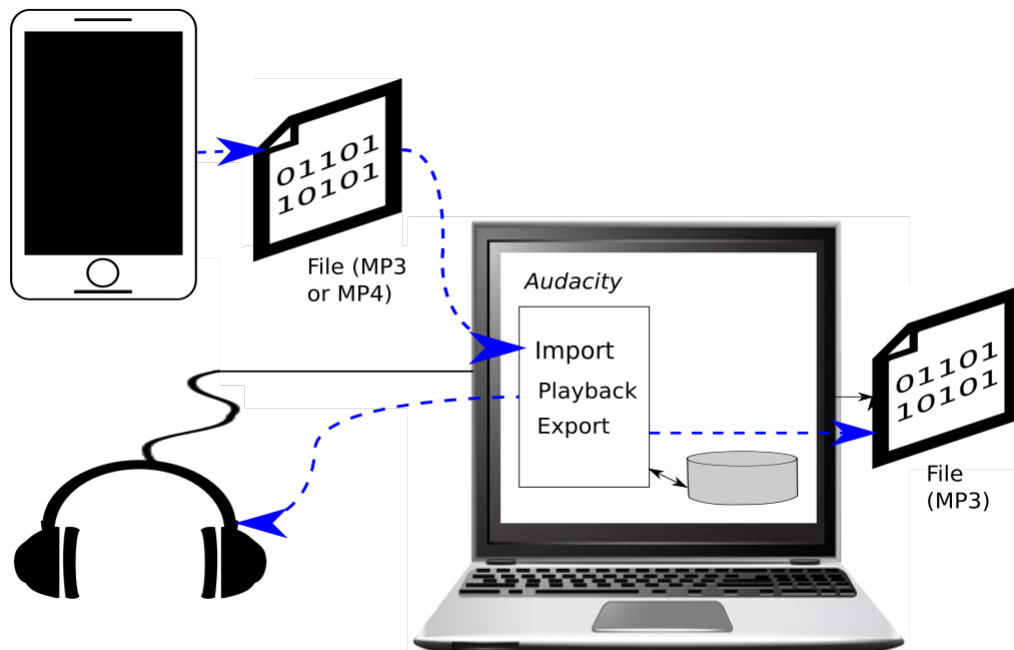- Transfer the file using a USB cable, or BlueTooth.

Figure 1: Mobile phone and PC(for click-track) and editing

If you are using a recorder, such as the "Zoom Handy Recorder", it may come with a PC application that can be used to copy the MP3 from the recorder to your PC.

Import the file into your choice of editing software, e.g. *Audacity*.

If you have used the Camera app and exported an MP4 file, note that *Audacity* will be able to import just the audio element of the MP4.

Audacity, or whatever PC software is being used, will import the MP3 or MP4 file directly and create a new Track.

If you recorded an MP4 with video, you may want to edit the video, using a tool such as *kdenlive* to put a video "performance" together.

A slightly "dark arts" suggestion: you may prefer to record a "mimed" video performance while listening to the final edited audio performance, and apply the MP3 exported by *Audacity*, or whatever PC software is being used, to the MP4 file of this performance.

Using an external microphone: See Figure 2.

There is probably a "mic" socket on your PC. You will be able to use this, provided the output level of your microphone is high enough to avoid noise - clearly audible as "background hiss" in the silences of the performance. A software "noise reduction" effect in your editing software may not be able to eliminate this completely.

Alternatively you could use a microphone plugged into a power preamplifier. This combination will give an output level high enough to make sure any noise is at a tolerable level.
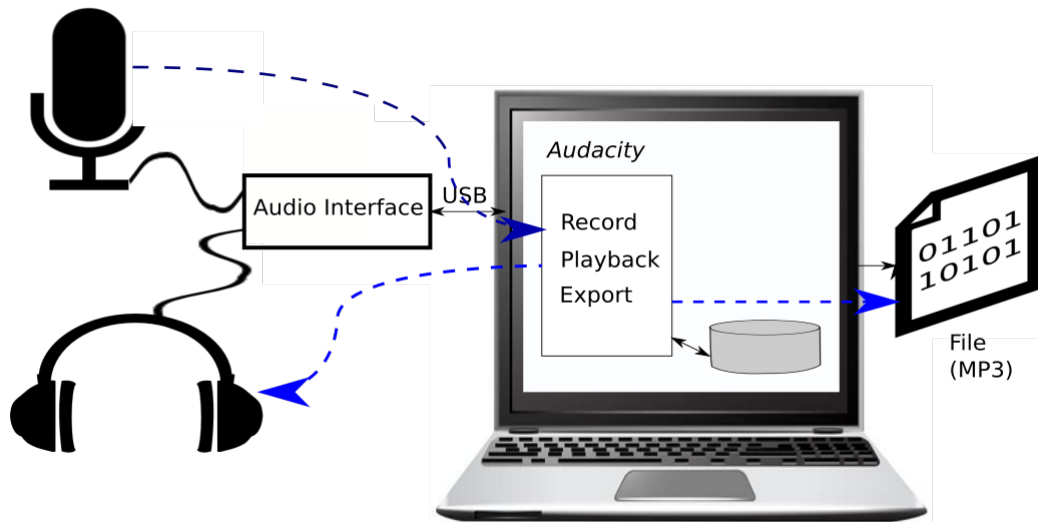
Figure 2: External microphone, audio interface and PC

Some common types of microphone – the higher quality ones – need a power to be supplied to them to work. This is typically supplied (as DC) by the preamplifier box over the microphone cable.

The "preamplifier box" may also include an audio interface to your PC, via a USB input; the PC's "mic" socket is not used.

This box may also provide a "phones" socket to plug headphone into. In this case the PC's "phones" socket is not used, either.

I use an *MXL 990* microphone, and a *Behringer UMC204HD* audio interface plugged into a USB socket on my PC.

The single microphone I use is presented by the microphone cable as all in the left-hand channel of the stereo. This calls for an additional step in the editing:

- Split the stereo channel produced into two mono tracks. The right-hand channel will be silent.

- Select the entire left-hand track and copy it into the silent right-hand track

- Select both tracks and choose the "Make Stereo Track" option from the track drop-down menu.

If you use a normal microphone, *Audacity* will record a track directly from the microphone; no intermediate MP3 or MP4 file will be needed.

3   Creating the "click track"

This will comprise

- a track containing audible and visible marks for the musical beats.

- a track showing the bar numbers.

Depending on which recording/editing tool is being used, these two timing tracks may be combined.

When creating these two tracks, will need to know the number of bars, the duration of the performance, and the tempo of the piece. Clearly, if you know two of these, the third can be calculated.

If there are to be variations in tempo, or pauses, these will have to be incorporated in the timing tracks, perhaps by creating the timing tracks *straight* and then adjusting them.

Audacity lets you delete and add sections to the click track, but only lets you delete from a label track.

3.1   The click track

This is a track containing audible and visible marks for the musical beats. The first beat of each bar, and perhaps other important beats, may be distinguished by a different sound and mark.

The audible clicks will be played back on headphones to the performer, and will serve the function of a "conductor" allowing different performances to be synchronised.

If there are to be variations in tempo, or pauses, it may be possible to snip the click track into two "clips" and shift the second one later in time, as needed.

A reasonable delay after a pause is half the value of the paused note.

After a pause, tt is sometimes helpful to add a few extra double-speed beats to make it easier for performers to resume together.

The visible marks in the click track can be very useful when making adjustments to the timing of individual tracks.

3.2   The bar-number track

I have found it invaluable when doing "punch and roll" recording and when editing a performance, to be able to see "at a glance" which bar-number corresponds to which downbeat click and which feature in the waveform display.

Audacity has a tool called "Generate Regular Interval Labels" which can be used to create a track of bar numbers. To use this, one has to calculate the time-interval between each generated label. For a simple piece with only one tempo and meter, this is straightforwardly the total duration of the audio divided by the number of bars.

Note that, if you remove from, or add to the click track, you will have to manually adjust the bar-number track.

4   Preparing the performance parts

A few things will make it easier during the recording

- Bars "for nothing". See sub-section 5.4.

- Cues. See sub-section 5.5.

And now is the time to look through the part, try out any challenging-looking passages, and understand the layout of the part: repeats, jumps, etc. so that momentary losses of confidence are avoided.

5   Record the performance tracks

5.1   Level

The recording level should be as high as possible without exceeding the maximum that the recording channel can handle. The recording app will probably have recording level indicator of some sort, that will give a visual warning if levels exceed this maximum. Because sound output levels are a bit unpredictable in performance, it is best to err on the side of caution and to back off a bit from recording at full volume.

When the recording and editing of a track is complete, *Audacity*'s "Amplify" effect can be used to correct the level so that the maximum level in the recording is actually at full modulation, which is to say just at maximum that the recording channel can handle. The balance against other parts can be correct later.

5.2   Unwanted background noise

Similarly, When the recording and editing of a track is complete, *Audacity*'s "Noise Reduction" effect can be used to mitigate any background noise intruding into what are intended to be silences. This effect needs a recording of a stretch of the background sound to be suppressed. So it is good to make sure that the performance is preceded or followed by several seconds of "wild" background sound

5.3   Intonation

The performance tracks will be recorded while listening to the click track at a good level on headphones. It's important to make sure that the headphones don't "leak" the sound of the clicks to the microphone.

While recording, it is better to correct one's intonation by listening, at a fairly high level, to the other tracks.

Clearly, this is not possible when recording the first part. So it is a good idea to record the lowest part first and to ensure that the pitches in this are correct, e.g. by reference to a table of Equal Temperament frequencies. (There is one at *https://pages.mtu.edu/ suits/notefreqs.html*.)

5.4 Bars "for nothing"

To ensure that all the performances begin "at the same time" when mixed, it is often the practice to record a couple of bars of clicks, "rim shot" from the percussionist, or shouted "one, two, three" *handclap*, during the silence before the actual performance begins. Whichever is used, it should be clearly visible in the waveform of the performance to make synchronisation possible. It is wise to remind the performer about this by noting it in the performance parts, either as an additional couple of bars of rests marked "clicks" or whatever, or a suitable text remark.

In the case of parts that start with rests, i.e. that don't play anything on the first note, it's a good idea to record a handclap or similar sound either on the first down beat, or on the downbeat of the second of the "bars for nothing". This will be visible in the waveform of the record and be useful when correcting the recorded timing of the start of that track, as discussed in sub-section 6.

5.5 Retakes

It's unlikely that a recorded performance will be perfect from start to finish, and, when the performer inadvertently does something that can readily be improved upon, it will be convenient to stop the performance straight away, identify a point before the blunder, and re-start the recording at that point.

Audacity, for example, provides the "Punch and Role" facility, which plays back a stretch preceding the restart point, and, switches automatically to record mode at the restart point. The newly-recorded material is seamlessly attached to the old recording.

When using "Punch and Role" recording, I have found it works well to resume performing well before the restart point – this run-up not being recorded.

If the restart point is immediately ppreceded by a run of bars rest, however, it can be somewhat difficult to resume the performance with confidence. In such a case it can be useful if the performance part includes a traditional "cue", showing in small-headed notes what a prominent already-recorded track is doing.

6 Aligning the start of each track

This is the task of time-shifting recorded tracks so that they are synchronised, i.e. events in different tracks that are supposed to happen at the same time will sound at the same time during the mix-down.

The clicks of the click track will be visible in the waveform editor, and tracks can be aligned by eye.

Tracks that contain a performance that begins at the start of the piece will simply be dragged left or right using the time-shift tool, and aligned by eye.

Tracks that contain a performance that doesn't start at the beginning of the piece will be easier to synchronise if the recording starts with a hand-clap either on the first down beat, or on the downbeat of the second of the "bars for nothing", can be pulled into alignment using the hand-clap.

If such a track doesn't start with a helpful hand-clap, it may be possible to synchronise on some later event that leaves a clear visible mark in the track in question and in another track.

7   Make corrections/adjustments to each track

7.1   Timing corrections

A performer may inadvertently play a note a little early or late. Some musical passages are more effective if the contributing parts are in more exact synchronisation than can readily be achieved when playing solo.

Figure 3: Detail of *Audacity* display showing Add "waveforms" to dictionary of click track with a stereo performance track

In a normal performance, with performers present together, it is natural for performers to take cues from the physical movements of others. This, of course, will be missing from a multi-tracked performance, and the performer(s) may find it harder to achieve a "tight" ensemble.

Using an editor, such as *Audacity*, it is possible to "nudge" individual notes backward or forward in time, and achieve near-perfect synchrony between performance parts.

This adjustment is usually to bring a note into alignment with the click track and/or other parts. Figure 3 shows the waveform display of a click in the click track together with the waveform display of a single note from a stereo performance track.

Note that the effective musical position of a note is not the exact beginning. Instead it is delayed by a small period, of the order of 50 milliseconds, during which the sound rises to the perceived loudness of the note, as the attack develops.

How a note evolves during this period is very characteristic of the instrument, and (as discussed in "Dark Arts" Section 7.4) the start of each note should be scrupulously preserved if the note must be shortened.

"Swing" and syncopation: In the performance of a passage such as Figure 4, there are potentially two variations in timing from that called for by a strict interpretation of the notation:

- The even numbered quavers of a run may be delayed somewhat typically up to two-thirds of the way through the beat. (Later than that can sound like a conventional "dotted" rhythm.) This has the effect of further weakening the note; this effect may also be enhanced by playing them at a reduced volume. (Not all instruments can easily drop the volume of individual quavers, say, in a reasonably fast passage – which may go some way towards explaining why "swing" is easier to achieve on some instruments than others.)
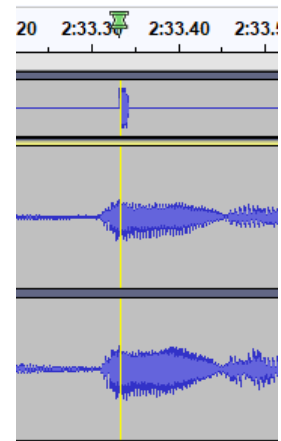
- The notes sounding on the "strong" beat may be pulled early typically by up to one third of the duration of the preceding beat; this effect has the effect of further strengthening the note. This effect may also be enhanced by playing them at a higher volume.


Figure 4:

The term "swing" is often applied indiscriminately to both of these rhythmic variations. But these two time variations can operate independently. And, in some genres of music, the "weakening" of even-numbered quavers, for example, may be negligible, while the "strengthening" of strong beats, by bringing them early, is pervasive, and may well be explicitly written out (as in the given example).

See the performance track in Figure 5. Note how the start of the second note is delayed, and the last note is somewhat louder. Note also that the first and second notes are slurred and the third note somewhat separated and shortened.

Again, the ear, and the editor's sense of style, must be the final judge.

Figure 5: Detail of *Audacity* display showing waveform of performance track
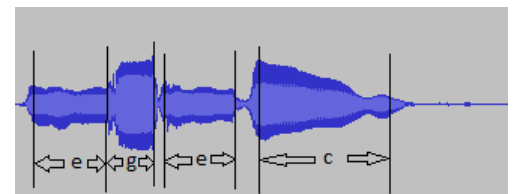
7.2 Pitch corrections

At this point, it may be worth a digression to refresh one's understanding of pitch, intervals, etc..

An *interval* in music corresponds exactly to a *frequency ratio* in acoustics. So, for example, the interval of an *octave* is a *frequency ratio* of $1 : 2$. If we double the frequency of a note it goes up an octave; if we halve the frequency, it goes down an octave.

Similarly, multiplying by three raises the pitch by [approximately] an octave and a fifth – a perfect twelfth. (The "approximately" will be explained shortly.)

To *add* a musical interval, we must *multiply* the frequency by some number. To go up by two identical intervals, we must *multiply* the frequency by some number squared. So, more generally, to go up n identical intervals, we must multiply by the nth power of the ratio for that interval.

However, it a mystery of integer arithmetic that no power of 3 has exactly the same value as any power of 2: no matter how many exact perfect fifths we go up, we will never come to a pitch that is some number of octaves up. Consequently, it would take an infinite number of different frequencies to ensure that fifths were perfectly in tune in all circumstances.

This is not an issue for musical instruments that can "bend" the pitches of notes up or down. Such an instrument can be equipped with a practically small number of basic notes which the player can then "bend" to give a pure interval with the notes that others are playing. This is such an instinctive action that we are likely to be unaware of it, when done properly. Such instruments really can emit an infinite number of different frequencies.

However, instruments such as the piano and the organ have a fixed set of pitches they can produce, under the control of a keyboard with one pitch to each key. Since an infinite number of different frequencies would be required if its fifths were to be perfectly in tune in all circumstances, the keyboard would need to have an impractically large number of keys per octave to be able to be perfectly in tune at all times.

Fortunately, the ear/brain combination can cope with inexact fifths, particularly with less pungent timbres, with moving parts, and where the sound produced by the instrument decays fairly rapidly. So it has long been the practice to tune fifths on instruments such as the piano and its relatives more or less lower than a pure ratio of $2 : 3$, and use a keyboard with twelve pitches per octave.

Making this mistuning (or "temperament") equal for all the fifths on the instrument allows music to be played equally in (or out) of tune at any transposition.

The problem is even more extreme in the case of thirds. A "perfect" third would be a ratio of $4 : 5$, i.e. $1 : 1.25$ (perfectly achievable by most instruments) to sound perfectly in tune. Whereas the major third on an equal temperament piano is $1 : 1.25991$, which is noticeably sharp[1].

And "perfect" sevenths (a ratio of $4 : 7$, i.e. $1 : 1.75$), while easy to produce on many brass instruments as the natural seventh harmonic, are simply avoided in most music, having no equal temperament pitch within reach.

What this means for this discussion is that what sounds "in tune" may not be "correct" according to a table of Equal Temperament frequencies. And correspondingly an interval that is "correct" according to a table of Equal Temperament frequencies may not sound "in tune" in performance. The ear must be the final arbiter.

7.3 Technical Faults

When reviewing a fresh recordings, unwanted noises may be discovered, e.g. clicks and pops, intrusions from outside.

These can often be removed from the recording, or at least made less obtrusive.

Clicks and pops: *Audacity* "EZPatch", an "effect" plug-in, will dispose of unwanted clicks during sustained notes. It is downloadable from the *Audacity* forum at
https://forum.audacityteam.org/.

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[1]Among the many theories about the origin of the major/minor system, it seems plausible that the two thirds (major and minor) we have in music are respectively expressively "brightened" and "darkened" versions of the $4 : 5$ "perfect" third. And perhaps the $4 : 5$ "perfect" third has re-appeared in recent centuries as the familiar "blue" note, lying as it does between the normal major and minor thirds.

7.4 "Dark Arts"

By "dark arts", I mean those editorial changes which are made to the recorded tracks which lead the listener to hear something which was never performed: shortened notes and rewritten passages, tempo changes to passages, and "fake instruments".

"Split notes": During an otherwise-good "take" there may be one or two notes that failed to sound correctly.

It is sometime possible to copy-and-paste a successful performance of such a note in place of the "split" note:

- Find the "split" note

- Select it from the preceding silence to the following silence

- Note the duration of the selection

- Find the proposed replacement

- Select the proposed replace from the silence preceding for the duration of the "split" (noted earlier). In an ideal case, the proposed replacement note will be no longer than the "split" note, and the end of the selection will fall on a silence.

- Copy the selection in the proposed replacement note

- Again select the "split" note from the very end of the preceding silence for the duration measure above.

- Paste the replacement note in place of the "split" note

- Spin back and listen to the repair in context.

It may be that the best available replacement note is too long, in which case the above procedure will leave it with a "cut off" tail end. In this case, there will be an audible click at the end of the note. This can be mitigated by selecting a short period at the end of the note and invoking the "Fade Out" effect. The endings of nearby notes are a useful guide as to what the length of this artificial fade-out should be.

It is not generally possible, however, to repair a note which has had its start cut off. The "attack" of most instruments is very characteristic and cannot be simulated by used of the "Fade In" or other effect.

It may be that the best available replacement note is the wrong pitch. In which case it will probably be possible to use the "Change Pitch" effect bring it to the intended pitch of the "split" note.

It is rarely satisfactory, if the replacement note is too far away from (say more than a third), or is above, the intended pitch of the "split" note.

It may be possible to look up the intended pitch of the "split" note in a table of Equal Temperament frequencies. The result should always be checked "by ear" for the reasons given in section 7.2.

Notes that are very late: It is easy when recording a performance to introduce an unintended delay in one note in an otherwise-good take.

It will generally be possible to correct this by reference to the waveform display of the click-track or other already-recorded tracks.

A small time-slice ahead of the offending note is selected and deleted, and a similar-length time-slice inserted afterwards. To insert a time-slice,

- Select a suitable point in a silence following the offending note,

- Click on >Edit >Clip Boundaries >Split

- Click on the "Time Shift Tool"

- Point the mouse at some point to the right of the split point

- Drag the clip to the right to expose a gap of about the same size as the time-slice deleted above.

- Select a short stretch of time that runs over the edges of the gap

- Click on >Edit >Clip Boundaries >Join

Notes that are badly mis-tuned: It is possible to adjust the pitch of a note using the "Pitch Change" effect. The intended pitch of the "split" note may be looked up in a table of Equal Temperament frequencies. The result should always be checked "by ear" for the reasons given in section 7.2.

Fake instruments: If an instrument is not available, it may be possible to make a satisfactory "fake" by pitch-shifting an instrument that *is* available.

It will be found to be rarely satisfactory to shift an instrument up in pitch; a shift downward by as much as an octave may give a musically-useful result.

There are two approaches I have tried:

- Use the "Change Pitch" effect. This does not seem to work as expected if the resultant pitch is lower than about 45 Hz (which is the 'E' an octave below the 'E' below the bass stave.)

- Use the "Change Speed" effect followed by the "Change Tempo" effect. It will take a few simple calculations to determine the correct shift values to use in this case.

Synthesised parts: Accompaniment parts must generally be played in an unobtrusive way. The best way of achieving this is often to perform them with great accuracy of timing and intonation, something can be very hard for a human performer to achieve, as well as being unrewarding and needing prolonged stamina. So, in some situations, it may be better to leave such unobtrusive but very important passages to a synthesised instrument. If the performance parts are prepared using an up-to-date score-writer, such as *Sibelius* the quality of the synthesised instruments may be very high. And it may be convenient, and give a better result, to include a sporadic contribution from this source.

7.4.1   Where to find further "dark arts" incantations

The *Audacity* forum at *https://forum.audacityteam.org/* has lots of inventive suggestions for "improving" recordings, and getting round acoustic problems.

8   Adjust the balance

Balancing the volume of parts to achieve an effective ensemble, should be done after the individual parts have been "panned" to their intended left-to-right position on the "sound stage", but before any reverb has been applied.

The aim is to achieve clarity, in which the important notes are clearly audible, and the ear able to comprehend the musical structure without difficult.

8.1   Applying a dynamic marking

The performance tracks may be performed with an attempt at the written dynamics. However, when heard together, improvement may be possible by adjusting these dynamics.

The "Amplify" effect is useful for doing this.

The differences between dynamic markings ($\mathbf{p}, \mathbf{mp}, \mathbf{mf}$, etc.) correspond roughly to a difference of about 3 decibels.

As always, the ear should be the final arbiter, and it may be best to select a passage, change the volume using the "Amplify" effect, listen, and decide whether further adjustment is needed.

8.2   Overall balance

David Clarke writes "I've sometimes used the multi-band compressor in Adobe Audition to good effect when the dynamic balance between parts is less than perfect. The effect has a "classical master" preset. Without evidence other than my ear, I suspect that studio engineers regularly apply this effect, even to classical music. "

"I've also used the "Kill The Harshness" preset. There is a free multi-band compressor plug-in available for Audacity .... Balance can be adjusted dynamically in Audacity using the envelope tool although it's rather fiddly to use."

9   Apply reverb

Applying reverb should be the last step because the other effects and editing operations because much more difficult if noticeable reverberation is audible.

I have found the defaults offered by the "Reverb" effect to be rather extravagant for chamber music purposes, I think the best approach may be to experiment with reduced values for "Room Size" and "Reverberance", for example.
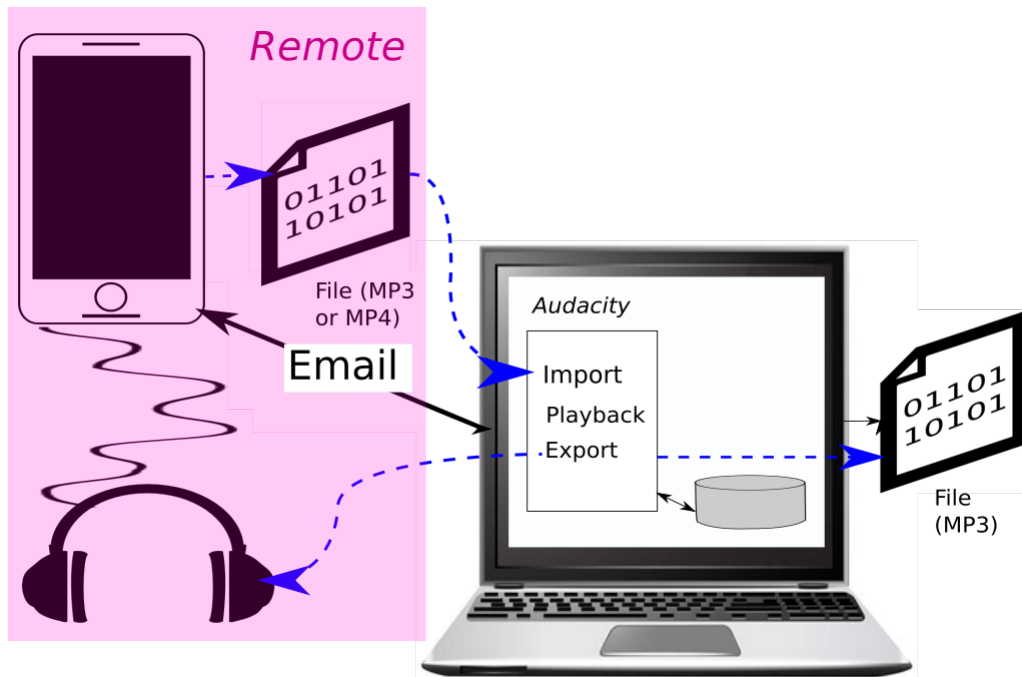
Figure 6: Remote contributor

The aim of adding artificial reverb, a practice so universal in professional recording that it is not counted here as a "dark art", is to blend the ensemble into a whole and provide a certain "gloss" to the sound.

10   Export the audio file

I have generally exported the final result as an MP3 file. Although this is – in theory – slightly poorer in quality, the file size is usefully reduced in comparison to "lossless" file formats.

It is also widely understood and supported.

You may wish to fill in the meta-data fields that will be attached to the MP3 file.

A   Remote contribution

Scenario: The Editor is collecting performances from any number of physically-remote contributors, to whom the Editor is connected by e-mail.

See Figure 6.

If the quality given by a mobile phone's microphone is tolerable, it is possible to record a performance while at the same time listening a guidance track of some kind, sent out by an editor.

On such a phone, it is generally possible to play an MP3 file to headphones, plugged into the phone's 3.5mm plug, while at the same time making a recording using the phone's built-in microphone.

The guidance track could be another performance, a click track, or a mix of the two. The guidance track is not to be present in the recorded performance.

So, during recording, the guidance track must be made audible to the performer using a reasonably isolating pair or headphones, or similar.

As noted above, if the recording is done by an app on the phone, depending on the capabilities of the app, it will probably not be possible to make use of the convenience of "Punch and Roll" recording. In this case, a collection of takes in separate files will have to be transferred to the PC for assembly and editing.

The steps to take are:

- The Editor prepares the "guidance track" perhaps as a mix of the click track and some other performances.

- The Editor emails it to the Performer.

- The Performer

    - installs and runs a suitable recording app.
    - listens to the guidance track, while at the same time
    - records their performance (perhaps as several "takes")
    - emails the recorded track(s) to the Editor

- The Editor tops-and-tails and adjusts the recorded performance track (as described in the earlier sections of this document).

Not illustrated is the case where the remote contributor uses another PC, with an internal or external microphone, in place of a remote mobile phone.

Another setup might be a hybrid of these. For example, recording on the other PC, but listening to a guidance track played by the mobile phone using headphones.

Several other possibilities exist.