Federation Bells Sample Player

(version 2)

User Guide

June 2013

Author: T. McDermott

Current build: 2.1.1

What this software is for

What it does and doesn't do

This software can play MIDI files intended for the Federation Bells at Birrarung Marr, Melbourne Australia. It uses a library of samples to emulate how the bells will sound on site. It can also emulate an audio 'perspective' from a particular location in and around the bells installation. This is intended to help composers more accurately assess the character and dynamic balance of their work, without having to play the bells on site.

As well as playing back MIDI files, you can also route live MIDI input into the software, and play the samples from a keyboard or other MIDI source, including a sequencer via an inter-application MIDI bus. You also have the ability to manually trigger individual bell samples from within the software itself.

All these ways of playing or triggering the bells can be rendered into a sound file, to make a recording of the virtual performance of the bells.

The software is *not* a MIDI file editor. It can only play back existing MIDI files. It cannot modify MIDI files in any way. It can play files at different speeds (from half-speed up to double-speed), but these settings are not saved with the source MIDI file. The best way to use this software is towards the end of the compositional process, where you can audition a near-complete piece, or section of a piece without having to go on-site. This would be particularly useful in deciding the dynamics of a piece, as the MIDI-velocity response of the software is the same as the actual bells.

System requirements

Two versions available for either Macintosh or Windows platforms

Macintosh version

Intel-style Macintosh only, will not work on "Power-PC" models (G3/G4/G5).

OS X 10.5 or higher

At least 500 meg RAM

Does NOT work on iPads!

Windows version

Pentium 4 or Celeron processor or higher

XP, Vista, Windows 7 or higher

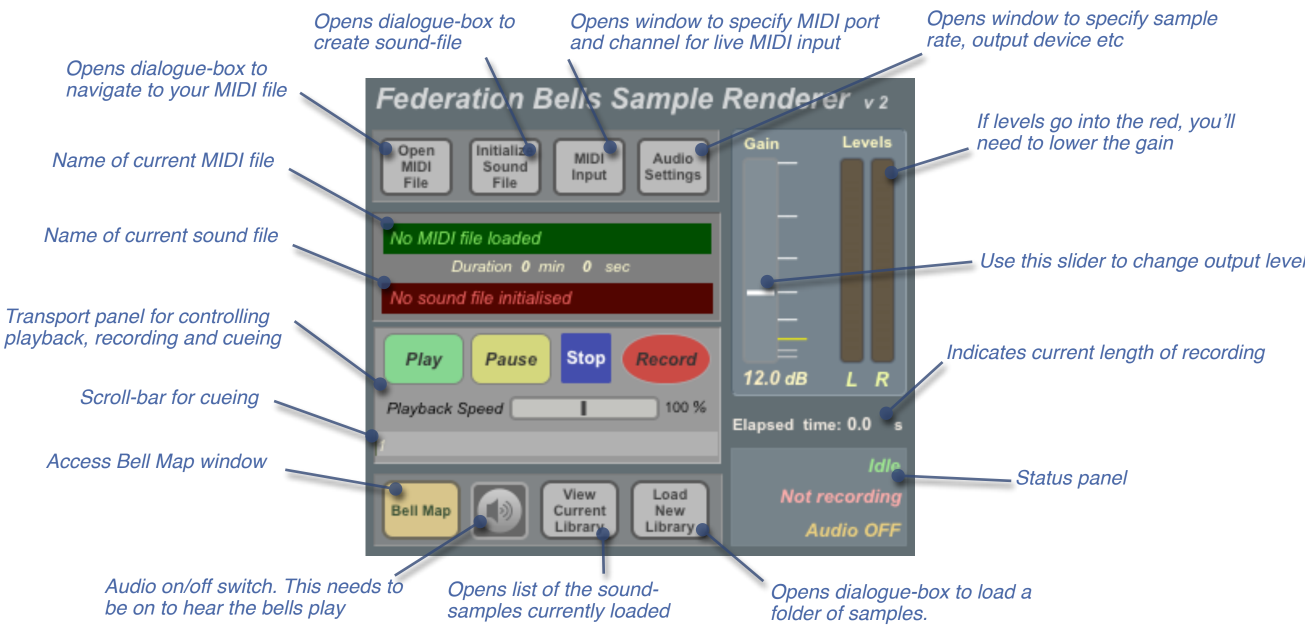
At least 500 meg RAM

Quick start guide

The main window

Access all functions from this window

This is the window that appears when you launch the software. Instead of pull-down menus, this software uses buttons to open windows or alter settings.



Load a library of bell samples

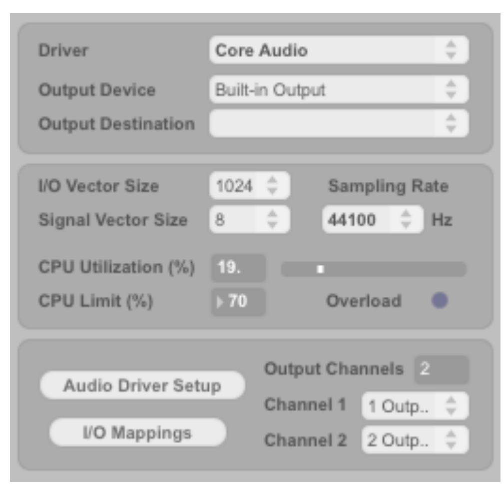
You need to use the specifically provided sample libraries

After launching the application, the first thing you need to do is load a library of samples. A library is simply a folder with the appropriate sample files in them. There are a number of different libraries you can choose from, which should be provided with the software. At the time of writing there are three libraries, one high-quality PCM, sample rate of 48000. One medium quality PCM, 44100 Hz; and one lower quality 32000 Hz mp3 (128-k bit rate). ***Please note the mp3 library will only work on the Mac version of the software.***

Press the **Open Bell Library** button and navigate to where your library folder is, then press open. Once you have chosen a library, the software will remember the folder location and load it automatically next time you launch it. If you want to change libraries, just open a different one whenever you want.

Each library must have 195 files in it, with five files for each of the 39 bells. Each of these five files corresponds to the five dynamic levels each bell can play at. The files must be named in ascending alpha-numeric order, so don't change the file names, otherwise you may get the wrong samples playing.

The sample player will respond to the velocities of the note events in the same way the actual bells do, so you should get a pretty good idea of how a piece with a particular dynamic range will sound.



Configure audio settings

Silence may be golden but we want bronze

Press the **Audio Settings** button to access the Audio Settings window. Select the required settings from the pop-up menus. These are:

- Audio driver
- Output device
- Output destination

You also may need to configure your audio driver, either through the operating system or by pressing the **Audio Driver Setup** button at the bottom of the window.

The most important settings are:

- Sample rate. No need to go above the sample rate of the source files, certainly not above 48000, unless it's for reasons of compatibility with other software in your workflow. If you choose a different sample rate and record a sound file, it will have that sample rate.
- Output channels should be set to 2 (the software renders a stereo file).

If you hear stuttering or crackling in the audio, or see the ***Overload*** indicator light up, increase either the I/O vector size, the signal vector size, or both. The signal vector size can never be greater than the I/O vector size. There are no absolute values recommended for these settings, as it depends on the speed and power of your computer. Try a signal vector size of 512, and an I/O size of 1024 as a starting point. Depending on the audio driver you are using, these options may be expressed in terms of 'latency' (in milliseconds). If this is the case, then try around 20 ms latency. You may also want to put the audio on a higher priority thread, if this option is available. If there is still stuttering, try increasing the latency. In any case, the bigger the number, the less load you will put on the computer. You may also need to increase the CPU Limit, but it probably shouldn't go above 75%. With any computer made within the past 5 years or so, and an optimal vector size, the CPU usage probably wont go above 25% anyway.

Manual triggering

The simplest way to play

Open the Bell Map, using the **Bell Map** button. This is a plan-view of the actual bells installation, with each bell represented by a dark circle. If you can't see any dark circles it means no sample library has been loaded yet (go to first step). You can trigger the samples from the Bell Map, by holding down the 'B' key and clicking on a bell with the mouse. In the top right corner of the Bell Map is a dynamic setting. This defaults to *mf* (mezzo forte, or moderately loud). You can scroll to one of five dynamic settings to hear how different strike forces affect the way the bells sound.

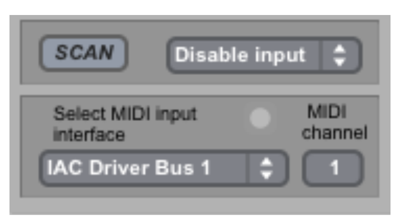
The blue triangle represents listener position, or 'virtual microphone'. You can drag it around with the mouse to hear how the balance between bells is affected by where the listener is situated. The virtual mic always points to the centre.

To play a MIDI file

A great way to audition your newly-composed piece for the bells

The first thing you will need are some MIDI files to play. They can be either type-0 (single track) or type-1 (multitrack). IMPORTANT: *While the software will play type-1 MIDI files, if a file has tempo changes (i.e. a MIDI file with a 'tempo track') it will need to be type-0.* Almost all sequencers these days have the option of exporting sequences in a variety of formats, including the generic type-0. The sample player responds to MIDI notes 24-63 inclusive (C0 to D#3), so your exported sequence needs to be in that range. It responds to velocities 1-127 (velocity-0, or 'note-off' is ignored). These velocities are quantised into the five dynamic levels by the software.

Press the **Open MIDI File** button and select your MIDI file. Its name should appear in the green name field in the main window. Press ***Play***. You can adjust playback speed, or ***Stop*** or ***Pause*** (and then ***Resume***) at any time. Part of the playback capability is being able to scroll through a MIDI file to cue its playback from a position other than the very beginning. Use the green scroll bar under the transport controls. You can do this in either Stop (silent cueing) or Pause (unmuted cueing) modes. This may be useful if you want to render only part of a MIDI file as an audio recording.



Recording

'Convert' a MIDI file into audio

Press the **Initialise Sound File** button. You need to first create and name a sound file before you can record into it. Open a MIDI file if you haven't already done so. Play the MIDI file, and adjust the recording gain (main window) so the levels don't go into the red. You can also drag the virtual mic around the Bell Map to get the audio 'perspective', or balance that you want. When you're ready to record, press **Stop**, and then press the ***Record*** button, to play back from the start.

If you want to record part of a piece at some point in from the start, first press ***Pause***, and scroll to the point you want using the scroll bar, then press ***Record***, then ***Resume***.

You can press **Stop** at anytime to stop recording. Note that a message appears saying ***Recording Fadeout***. This is to record the final decay of the bells after the piece is finished. Do not try to open the sound file (in a sound-file editor or playback program) until after the message says ***Finished Recording***.

Real-time MIDI input

This software can become an extension of your favourite sequencer

You can play the bells using real-time MIDI input. This could be from a piece of hardware like a drum-machine or keyboard, or from another application on your computer, such as a software sequencer.

If you want to play from an external device, you'll need to have the proper MIDI setup, with interface (with proper driver) hooked up and the device transmitting MIDI. If you want to play from an application in your computer, you need to set up an inter-application MIDI bus, and then choose this bus in the the same way you choose any other MIDI input port (see below).

After setting up your hardware/software MIDI communication, press the **MIDI Input** button to open the MIDI Input window. Select **Enable input** from the popup menu (this always defaults to **Input disabled**), and then select your MIDI input interface. If the interface you want is not showing up in the pop-up menu, press the ***SCAN*** button to rescan the MIDI bus.

Select the channel you want to receive on. If MIDI note-on messages are being received on that channel, a green light will flash. Remember the software only responds to MIDI notes 24-63 inclusive (C0 to D#3), so you need to send note-on events in that pitch-range. You may need to transpose pitches down to this range if you are using limited-octave keyboard.

If audio is turned on (speaker icon in main window) you should hear the bell samples responding to your playing. You can also play along to MIDI-file playback, just as you would in normal sequencing workflows, where you might play a single line and then overdub another line later. You can record the audio output of what is being played in the same manner that you record MIDI file playback, by initialising a sound file and pressing the ***Record*** button. To stop recording, press **Stop**.

The Bell Map

A sophisticated panning and balance control

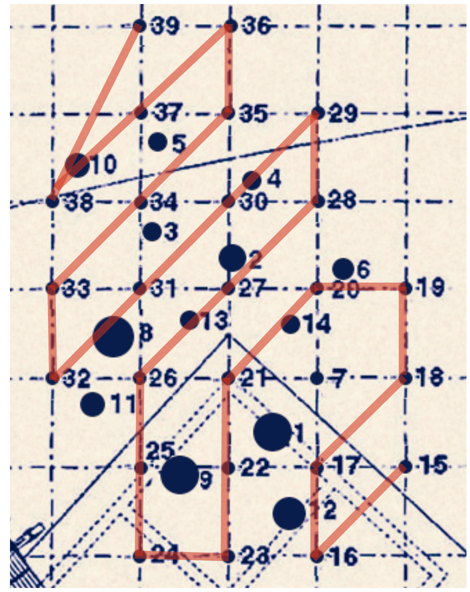
Given the physical scale of the bells, no single rendering of a sequence of notes is going to truly represent how they sound. The balance between individual bells with each other depends very much on where a listener happens to be positioned when hearing your piece. The Bell Map attempts to address this unusual characteristic of the bells by emulating a possible listening experience, using a 'virtual' listener (the 'virtual mic') which can be placed anywhere in or around the installation. This should give you a much better idea of how the bells will actually sound at various listener positions.

The Bell Map consists of a plan-view representation of the bells as they exist on-site at Birrarung Marr. It gives you an idea of how the bells are arranged. As you can see most are arranged in a grid of 3x3 meter squares, with the lower-pitched ones situated in between. The pitches of the higher bells are arranged so they form a more-or-less diagonal zig-zag path over this grid. This arrangement results in the highest octave being up one end of the grid, the north-west end, the middle octave being down at the south-east end, and the lowest-pitched bells scattered throughout.

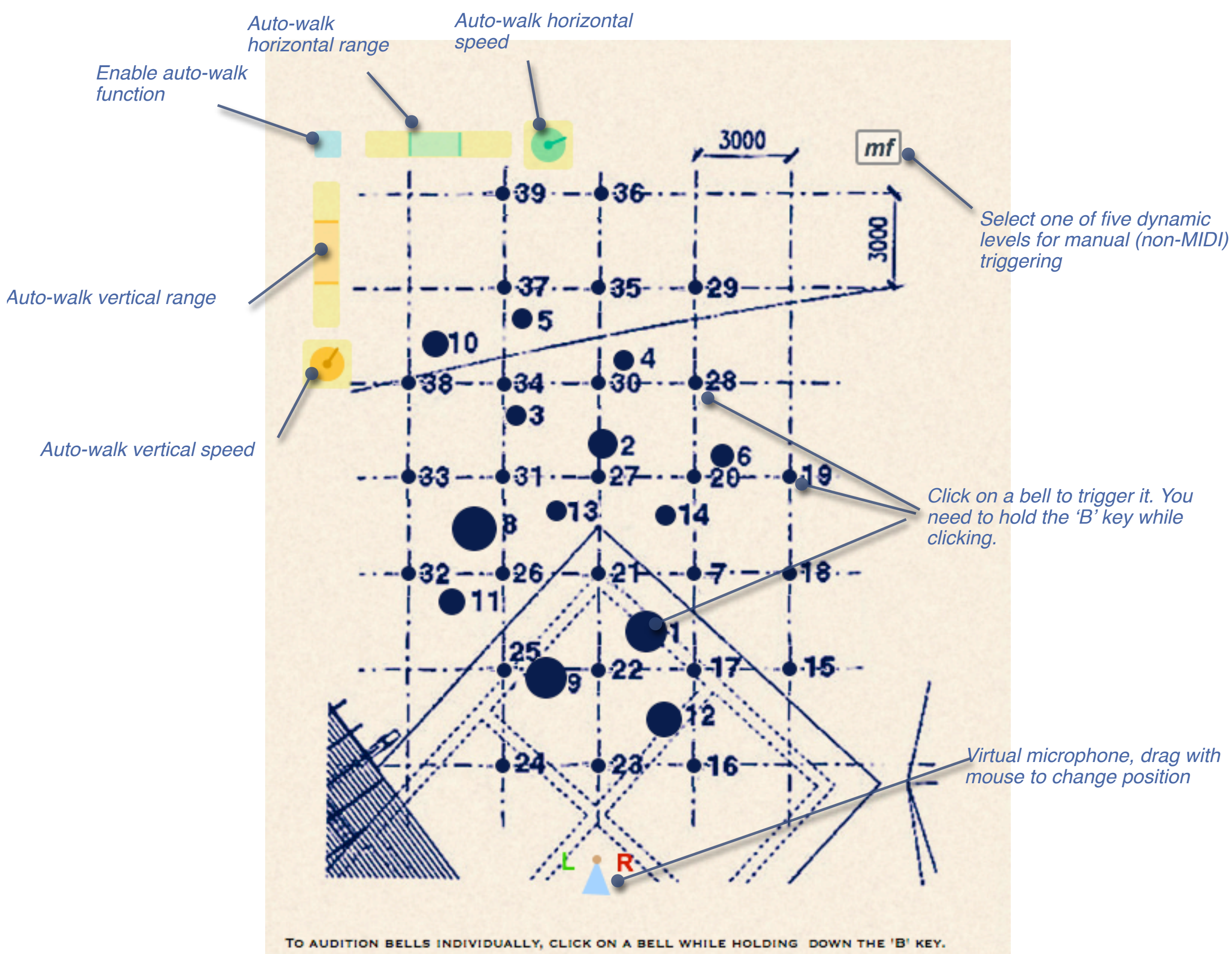
As well as a visual representation, (with the observer overhead) the Bell Map also creates a sonic representation, with the listener situated on the ground (actually at a height of 1.7 meters, or head-height), their position and orientation determined by the position of the blue triangle on the map, called the ‘virtual microphone’. You can move this triangle to different parts of the map to explore different sonic perspectives. The height of the bells also varies amongst the bells, and this is also taken into account when rendering the audio.

The virtual mic is a model of an ‘ideal’ mid-side stereo mic, with a sub-cardioid polar response pattern for the mid channel. The side channel is figure-of-8. This seems to give a reasonable representation, without resorting to modelling the actual human ear. All relative levels and panning of the bells are determined by how this virtual stereo microphone ‘hears’ the bells at any point in time, according to where it is situated in the Bell Map.

No matter where you drag the mic, it will always point to the centre, bell 27. You can even drag it off the window (it will disappear) so you can hear how the bells sound from a distance. To get it back on-screen just keep holding the mouse button down in the map until it is attracted back.



Zig-zag pattern articulated by the bells’ scale from 15 to 39



Another feature of the bell map is the auto-walk function. Rather than dragging the virtual mic around, you can get it to 'walk' around the map automatically. Click on the blue toggle in the upper left corner to turn it on. Adjust the horizontal and vertical range of travel using the range sliders. You can shift-click, and command click as well as drag to alter the range of travel. You can also vary the speed of travel with the dials. This function is good for slowly changing the sonic perspective over the duration of a whole piece (a few minutes), in the same way a casual listener might walk amongst the bells. The paths taken by the virtual mic are characteristically smooth, circular, elliptical or figure-of-eight quality (Lissajous figures). They are not able to be saved. If you want to have a specific path travelled during a piece, you can simply drag the virtual mic around manually.

Other Stuff

The Bell Library window

This window is simply for checking that the correct samples have been loaded in the correct order. It consists of a number of columns:

- sample number (1-195)
- name of the buffer (not really relevant)
- name of file loaded
- duration of each individual sample (sound-file) in milliseconds. (1000 ms is 1 second).
- number of channels in source file (should always be 1, as the software is designed for mono samples)
- sample rate (should either be 48000, 44100, or 32000 depending on which library you load)

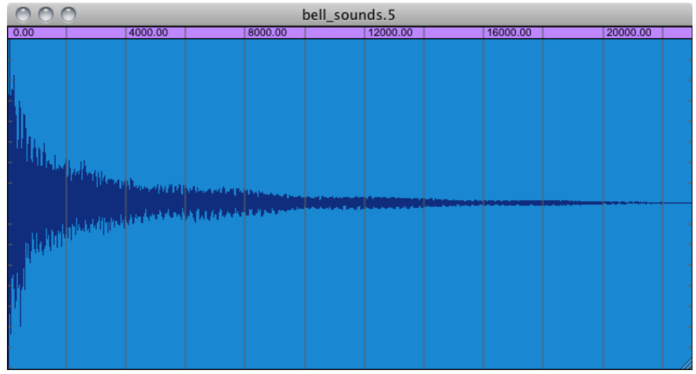
It also indicates how much total memory the samples use, in the bottom left corner.

195 Items   Search...

#	Buffer Name	File Name	Duration (ms)	Ch.	Sample Rate (Hz)
1	bell_sounds.1	bell-48000-01-01.wav	20693.98	1	48000
2	bell_sounds.2	bell-48000-01-02.wav	20000.67	1	48000
3	bell_sounds.3	bell-48000-01-03.wav	17970.73	1	48000
4	bell_sounds.4	bell-48000-01-04.wav	18519.15	1	48000
5	bell_sounds.5	bell-48000-01-05.wav	22999.40	1	48000
6	bell_sounds.6	bell-48000-02-01.wav	5660.44	1	48000
7	bell_sounds.7	bell-48000-02-02.wav	5723.98	1	48000
8	bell_sounds.8	bell-48000-02-03.wav	5746.96	1	48000
9	bell_sounds.9	bell-48000-02-04.wav	4432.56	1	48000
10	bell_sounds.10	bell-48000-02-05.wav	18105.56	1	48000
11	bell_sounds.11	bell-48000-03-01.wav	5998.96	1	48000
12	bell_sounds.12	bell-48000-03-02.wav	5932.56	1	48000
13	bell_sounds.13	bell-48000-03-03.wav	5876.19	1	48000
14	bell_sounds.14	bell-48000-03-04.wav	4456.79	1	48000
15	bell_sounds.15	bell-48000-03-05.wav	15000.50	1	48000
16	bell_sounds.16	bell-48000-04-01.wav	5967.12	1	48000
17	bell_sounds.17	bell-48000-04-02.wav	5967.15	1	48000
18	bell_sounds.18	bell-48000-04-03.wav	5861.81	1	48000
19	bell_sounds.19	bell-48000-04-04.wav	4484.17	1	48000
20	bell_sounds.20	bell-48000-04-05.wav	18649.08	1	48000
21	bell_sounds.21	bell-48000-05-01.wav	5940.88	1	48000
22	bell_sounds.22	bell-48000-05-02.wav	5973.67	1	48000
23	bell_sounds.23	bell-48000-05-03.wav	5834.46	1	48000

Memory Usage: 327.20 MB

If you double click on an entry in this window it brings up a display of the sample's waveform. You cannot play the sample from this window, but it does give you a visual display of the contents of the sample buffer. The timeline at the top is in milliseconds. The example below a little more than twenty seconds long.



The way the samples are structured is that each bell has five samples, corresponding to the five possible dynamic levels the bells can play at. Each dynamic level corresponds to a specific strike-force that the hammers in the bells' mechanisms have been calibrated to. This means that every possible 'sound', or class of sounds, that the bells are able to make have been documented in the bell-sample library.

The five levels are (in Italian musical parlance):

p, mp, mf, f, ff (*soft, moderately soft, moderately loud, loud, very loud*)

The internal data-structure which stores the samples in memory is arranged so that the samples are ordered in ascending order of bell-number, and then ascending order of dynamic level. So, bell 1, *p*, is the first sample; bell 1, *mp,* is the second; bell 2, *p* is sample 6; and so on. The way the software 'knows' which sample should go where is simply in the way the sound-files in the library are named: the samples are loaded in alphabetical order. This is why the naming of the samples is so important. The libraries come with the correct naming scheme for all items, so there should be absolutely no reason why you should ever change the names of the source files.

Velocity switching

The 127 velocity values transmitted in MIDI is quantised to only five separate bell-mechanism responses. The table below indicates how the MIDI velocities are quantised.

musical symbol	***p***	***mp***	***mf***	***f***	***ff***
description	soft	moderately soft	moderately loud ('normal')	loud	very loud
MIDI velocity range	1-25	26-50	51-75	76-100	101-127

Help

You can also access embedded help from the Help item in the Documentation menu.

End of document.