

CANTATIO

Computer Assisted Musical Interpretation and Expression (patent pending)



There are very few (if any) information technology tools dedicated to human musical interpretation. At the opposite, most existing softwares (especially sequencers) rely on the perfectly rigid computer clock to produce music (hence the advent of the “bpm” domination). Achieving fine expression from a musical instrument is well known as requiring years and years of musical studies and practice. On the other hand, the recent availability of virtual instrument of stunning quality (either sample or model based) makes even more important the question of the musical interface between the human and the computer. Good news are that the computer tool allow to embed a significant part of the technical skills needed to play music at a high level. The main objective of Cantatio is definitely musical expression. Everything here has been tuned and tested from the music point of view. Various tools are provided to satisfy both the beginner and the advanced musician.

Some possible uses of Cantatio

- **Listen to top quality interpretation of songs while seeing currently played notes highlighted in realtime on the score.**
- **Enjoy playing songs by tapping tempo and velocity as you feel. Record your performance and output it as a midifile.**
- **Use the advanced Cantatio playmodes to produce beautiful interpretations of difficult or complex songs, even without being an expert instrumentist. Get levels of expressiveness and interpretation impossible to achieve by music programming. The advanced Cantatio engine intelligently analyses your gesture to produce musical realtime midi output. Lot of parameters are proposed to adapt to various situations.**
- **Practice and learn traditionnal piano playing: select classical modes and play right or left hand. The software will play the other hand, waiting for you if necessary.**
- **Practice and learn music composition: look which notes are currently heard on the orchestral score, or see how are evolving the six voices of a BACH Fugue**
- **Play in expert mode if you don't need any computer assisted playmodes, but benefit from instant access to hundredth of scores/songs**
- **Use the pianoroll editor to get full control on the Cantatio engine: decide exactly which notes you want to play and how, which notes should be played by the computer and how, add acent, trills...**
- **Import midifiles and play them using the Cantatio engine with all its features**
- **Import scores as PNG images and associate them with midifiles, save them as songs for further access from the library**

Cantatio main features

(I) GENERAL

- Works from any midi controllers, outputs to any midi sound generation system
- Most actions from a single click
- Context dependant buttons and commands allow to keep simple user interface
- Optional complete control from master keyboard
- 9 different playmodes to adapt to user musical skills
- Variable song/score format
 - ✓ complete proprietary format embedding score/midi relationships allows realtime drawing of each note on score while song is played. More than 120 scores available. Numerous other scores planned.
 - ✓ intermediate format for songs created by the user. User can add page information for further automatic page turn when playing.
- Recording and managing performances
 - ✓ notes drawing on scores embedded in your performance
 - ✓ saving performances in performance dedicated format
 - ✓ export your performance to midifile for later use in various music softwares
- New song from midifile import
 - ✓ convert a midifile to internal song format
- Import PNG score image
 - ✓ import up to 24 pages scores as png images
 - ✓ associate a midifile and the corresponding score image
 - ✓ add paging information
 - ✓ save both score and midifile as a song in the library

The screenshot displays the Cantatio software interface. On the left, a musical score for "Sonata No. 8 'Pathétique' 2nd Movement" by L. van Beethoven is shown. The score is in 3/4 time and marked "ADAGIO CANTABILE". The right side of the interface features a tutorial window titled "TUTORIAL 02 - THE SONG PLAYER". The tutorial text explains three playmodes: Meccanico, Expressivo, and mp3. It also describes the Bar Display feature. The bottom of the interface shows a control panel with various buttons and a tempo display set to 120.

TUTORIAL 02 - THE SONG PLAYER

Meccanico, espressivo and mp3 playmodes are intended to listen to the selected score.

Meccanico

This mode allows to listen to the score with the exact note timing and duration that has been written by the composer.
Having selected «meccanico» by clicking it in the playmode pane (the lowest pane of the Cantatio screen), click the «play» button in the sequencer pane. Select a different tempo from the tempo box.

Click play again to stop playing.

Click «frew» (full rewind) to go back to the song beginning. You can also select another bar as starting point. Turn the dial using your mouse and you will see a red rectangle surrounding the currently selected bar. Alternatively, use the «bar -» and «bar +» buttons. Or just click a bar directly on the score.

Expressivo

Expressivo playing is based on a previously recorded performance of the selected score. When you save a performance, the song is given the .cap extension (Cantatio Performance). All songs embedding performance data are displayed in green on the library page.

Select expressivo playmode by the corresponding button. Then click «perf. play» button in the sequencer pane to hear the song.

As performance data embeds tempo variations, tempo cannot be tuned in expressivo mode.

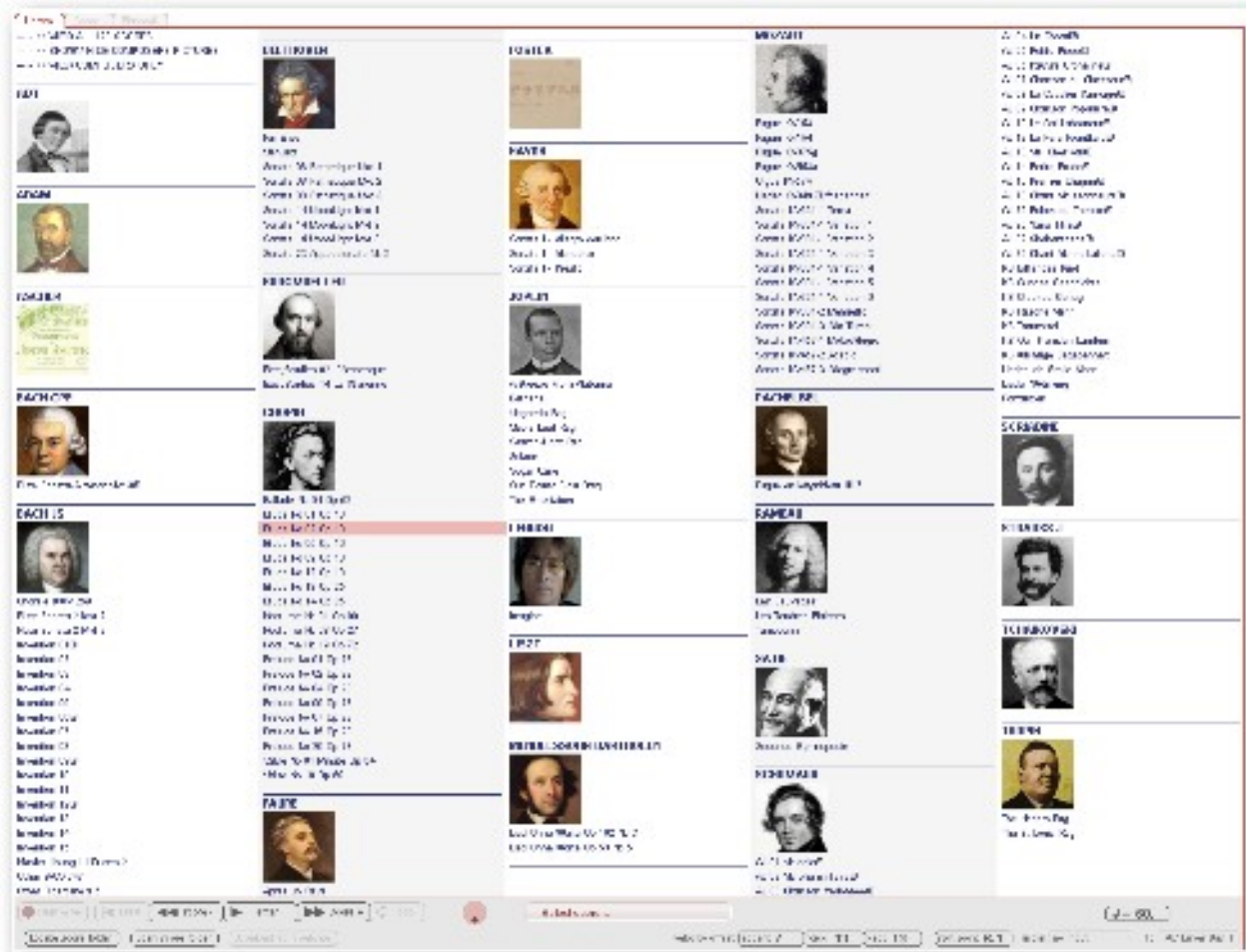
mp3

Some mp3 files have been recorded from existing performances. They are displayed in blue on the library page. Click the mp3 button, and then click perf. play. You hear now the original performance in full quality.

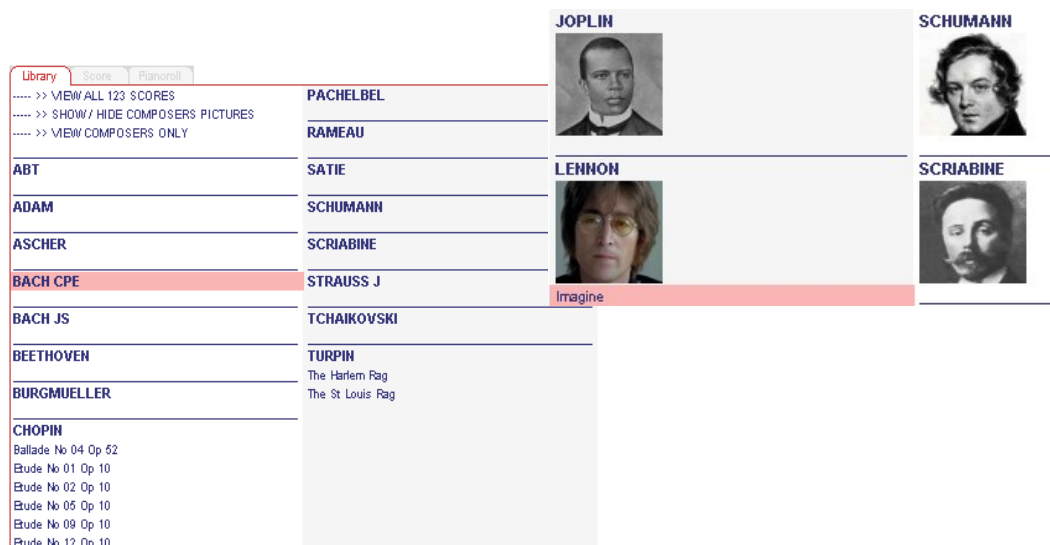
Bar Display

The bar display shows the current bar and position in the bar. Upon some actions like loading or saving a song, it is also used to show the progression of that action.

(2) LIBRARY Page



- One click instant access to all songs in your library.
- Customizable view (show/hide songs, pictures)
- Multiple libraries access by “Locate Score Folder” command
- Up to 300 scores/songs per page
- Score browsing and selection from your master keyboard



(3) SCORE Page

The image shows a screenshot of a music score player interface. The main area displays two pages of a piano score for 'Rondo Alla Turca' by W. A. Mozart. The score is presented in a split-screen view, with two systems of staves on each page. The first system on page 1 includes the title 'Rondo Alla Turca', the subtitle 'Turkish March', the tempo marking 'ALLEGRO', and the composer's name 'W. A. MOZART'. The score is written in 3/4 time and features a variety of rhythmic patterns and dynamics. The interface includes a toolbar at the bottom with various playback controls and a status bar at the very bottom.

- Top quality scores (special thanks to [Mutopia](#))
- Up to 24 pages per score
- Currently played or heard notes can be realtime highlighted
- Select how your listening or playing experience among 9 playmodes:
 - ✓ meccanico: exact score played by computer
 - ✓ espressivo: interpreted score stored with the song, played by computer
 - ✓ mp3: high quality audio mp3 listening
 - ✓ tap mode: play regular beat (eg quarter or half notes) by tapping a note. Software analyses your speed and velocity to play the song.
 - ✓ Cantatio, CantatioR, CantatioL: play any keys on the keyboard, and the computer will place the right pitches: see details hereunder. Noteoff control either by computer or by player.
 - ✓ classicalR, classicalL: play exact notes with one hand, computer plays the other hand (excellent to practice)
 - ✓ expert : for advanced pianists, software acts as midithrough
- Support for both piano and orchestral scores
- Adequate handling of repetitions, anacrouse...

(4) PIANOROLL Page

The screenshot displays the Pianoroll software interface. The main area is a piano roll with a grid showing measures from 30 to 44. The right-hand part (treble clef) is represented by pink notes, and the left-hand part (bass clef) is represented by blue notes. A context menu is open over a note, showing options: 'Right hand', 'synced to Right hand', 'Left hand', and 'synced to Left hand'. Below the piano roll is a control panel with fields for 'played by', 'channel', 'pitch', 'trill', 'velocity', 'accent', 'position', and 'length'. The 'played by' dropdown is currently set to 'Right hand'. The control panel also includes 'OK', 'create', and 'delete' buttons. At the bottom, there is a playback control bar with buttons for 'stop', 'rewind', 'play', 'fast forward', and 'loop', along with a time display showing '30 . 1 . 23040' and a zoom level of '120'.

- Usual pianoroll type editor with new editable parameters
- For each note, the “played by” menu determines how the note is processed:
 - ✓ right hand: you will play that note (using current velocity and noteoff control parameters), either by pressing the exact key on your keyboard (classical modes) or by pressing a random key (Cantatio modes).
 - ✓ synced on right hand: the computer will play the note at the correct timing and velocity taking into account your current right hand gesture: for example you can choose to play one note over two, and to sync the remaining notes.
 - ✓ left hand: same as right hand
 - ✓ synced on left hand: same as synced on right hand.
- accent: notes marked with an “accent” will have an added velocity offset added to the current midi received velocity.
- trill: allows to introduce trill capability even when using one of the Cantatio modes, where you can play random pitch on your keyboard. You play the trill as long as you keep pressing the same two keys. Trill is finished when using a third key.

(5) The Cantatio engine

As soon as you are playing existing musical data stored in a memory, the computer knows where you are in the song, and thus which are the next notes to play. Taking that fact into account, it can be understood that the computer can automatically produce the right pitches to come, extracted from the stored musical data. It is no longer necessary that the player plays the exact expected pitch on the keyboard.



The musicologist Pierre Schaeffer announced such evolution of musical instruments long before the computer had enough power to exploit efficiently the idea. He explains that the story of musical instruments exhibits an increased amount of semantic and cultural content embedded in the instrument, during their evolution. He previewed that a step to come could be to embed some temporal “melodic” information in instruments. (See [Pierre Schaeffer](#), *Traité des Objets Musicaux*, 1977).

Various previous softwares already explored the approach. We believe that Cantatio proposes an unprecedented range of features based on that concept. We have been working extensively by studying a lot of musical situation and interpretation of classical masterpieces, in order to analyse what is exactly needed to give an interpretation the greatest possible variability and control. When using the Cantatio engine, many computations are working in the background to achieve the musical effect you are expecting. Just as an example, Cantatio is able to analyse several simultaneous key press/release actions, and to translate them in proper voicing information, triggering separately note on and note off messages for each voices in polyphonic complex situations. Or you can ask the system to play the note off automatically, which can be a great help for playing some organ pieces. Or the engine is ready to accept inputs from non keyboard actuators, like motion sensors.

Let us conclude by a few words about the evolution of musical instruments. Cantatio proposes various modes ranging from the simplest one (just press play and listen to the song) to the traditional keyboard approach. In our sense, none of them is better or worst than the others for performing music. Glenn Gould himself declared once that putting a music media in a player IS a musical act.



Find [here](#) mp3 recordings produced with the Cantatio system.