Stellar Resonance for Cello and Piano
5 graphical scores by the Mandelbrot's mapping

This music is composed for cello and piano based on a beautiful mathematical function Mandelbrot's mapping. I developed the original computer program to calculate the nonlinear mapping of the Mandelbrot set to determine the timing, pitch, and duration of the notes. The variation of score depends on the initial value of calculation. As shown by the colored (e.g., red and yellow) lines in the following figure, the output values are calculated recursively and depend on the initial parameters. I mapped these successive values on the score as a graphic score. However, I did not simply put the calculated notes on the score directly. I ran the program many times while changing the parameters of the Mandelbrot set to calculate lots of sets of notes, and selected only agreeable and beautiful notes to this piece carefully. The titles of each movements mean the initial values of Mandelbrot's mapping used to calculation the consecutive notes.

Instruction:

Start from the sign ★ and play next to next according to the arrows; the music does not move left to right and the horizontal axis means the volume. Arrow under the score indicates the range of volume.

Timing of note depends on the distance between two notes and tempo.
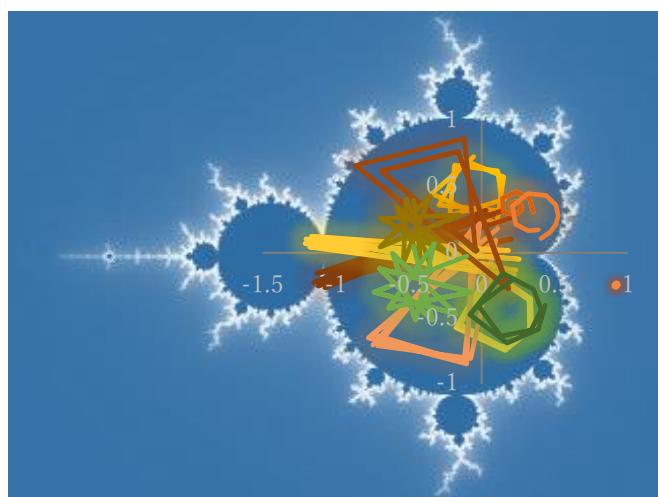
Duration of note depends on the tempo and repeat (about 6 - 9 min).

Repeat times depends on player's choice.

example
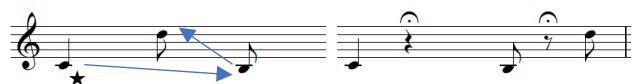
written score ➡ actual performance

Mandelbrot set and mapped values using original program

I. value = -1.2+0.12i and 0.313+0.067i

Piano : Repeat 3 ～ 5 times (until cello finishes, ad lib.)

II.   value = -0.073+0.823i and -0.12+0.87i

* vib. = vibrato : during pushing key, shake the palm up und down.

III. value = -1.047+0.247i and 0.633+0.347

* Before performance, push these keys by arms
with sostenuto pedal slowly to keep dampers up.

IV.　value = 0.19+0.53i

V.   value = -0.553-0.467i, 0.3+0.193i, 0.36-0.233i

Repeat 6 ～ 9 times (ad lib.)

* Bowing : Repeat with following pedal order.

1st, 4th , 7th time : sul pont.

2nd , 5th, 8th time : frosch

3rd , 6th, 9th time : quasi battuto, col legno

* Pedals : Repeat with following pedal order.

1st, 4th , 7th time : senza pedal

2nd , 5th, 8th time : una corda

3rd , 6th, 9th time : sustain pedal