Musical Computational Creativity

Ángel Faraldo

image (c) Mario Klingemann

Computational Creativity (CC)

According to the Association for Computational Creativity,

Computational creativity is the art, science, philosophy and engineering of computational systems which, by taking on **particular responsibilities**, exhibit behaviours that unbiased observers would deem to be creative.

Computational Creativity (CC)

The ACC states that the goal of computational creativity is to **model, simulate or replicate creativity** using a computer, to achieve one of several ends:

- to construct a program or computer capable of human-level creativity
- to better understand human creativity and to formulate an algorithmic perspective on creative behavior in humans
- to design programs that can enhance human creativity without necessarily being creative themselves

Application of Musical Computational Creativity

- Score generation
- Symbolic music processing
- Sound synthesis
- Generative systems
- Sonification (mapping)
- Interactive (or *reactive*) systems
- NIMEs (New Interfaces for Musical Expression)

Depth of Musical Computational Creativity

- Structure formal relationships
- Generate musical material (Single or multiple)
- Solve combinatorial tasks (generative music)
- Present compositional possibilities
- Algorithm as composer
- Algorithm as instrument
- Algorithm as assistant/teacher (expert system)
- Mapping (i.e. sonification)

Algorithmic Composition Techniques

...markov models, generative grammars, transition networks, self-similarity, genetic algorithms, cellular automata, neural networks, artificial intelligence...

A Few Highlights in MCC

David Cope Experiments in Musical Intelligence

Karlheinz Essl (Lexicon Sonate)

Pachet's *Continuator* (2002)

Iamus: Hello World! (2011) (melomics)

Pop song composed by AI (Flow Machines)

How artificial intelligence wrote Beatles-esque pop song

Opposites in Algorithmic Composition

- Genuine composition vs. style imitation
  - Imitation vs. true creation? // research vs. art?
- Rules (knowledge) vs. derivation (analysis)
- Algorithmic vs. computer-assisted composition
- Single vs. multiple vs. all parameters
- Single vs. groups vs. whole body of work

Some random quotes about computers making music

Ordinary music is like engineering, where everything is built according to a plan, and it's the same every time you play it. Generative music is more like gardening; you plant a seed, and it grows different every time you plant.

Brian Eno, October 2010, *Wired Magazine*

Freed from tedious calculation, the composer is able to devote himself to the general problems that the new musical form poses and to explore the nooks and crannies of this form while modifying the values of the input data. With the aid of electronic computers the composer becomes a sort of pilot: he presses the buttons, introduces coordinates, and supervises the controls of a cosmic vessel sailing in the space of sound, across sonic constellations and galaxies that he could formerly glimpse only as a distant dream.

Iannis Xenakis, 1965

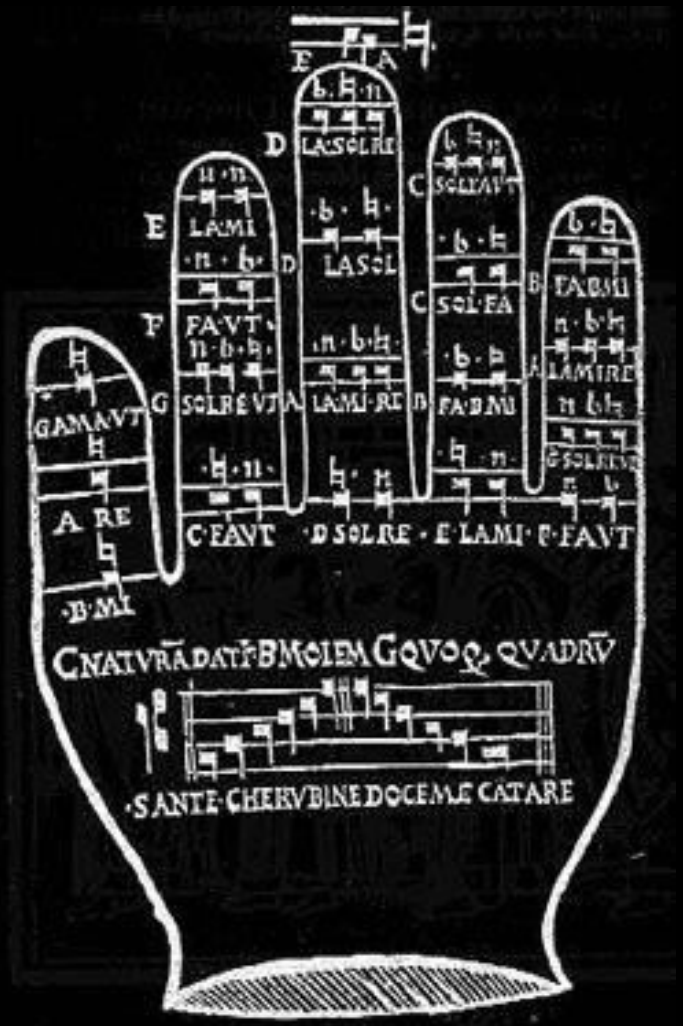
[…Computers] must not cross into the area of human creativity. It would threaten the existence of human control in such areas as art, literature and music.

Gary Kasparov in 1997, after being defeated as Chess World Champion by the supercomputer Deep Blue

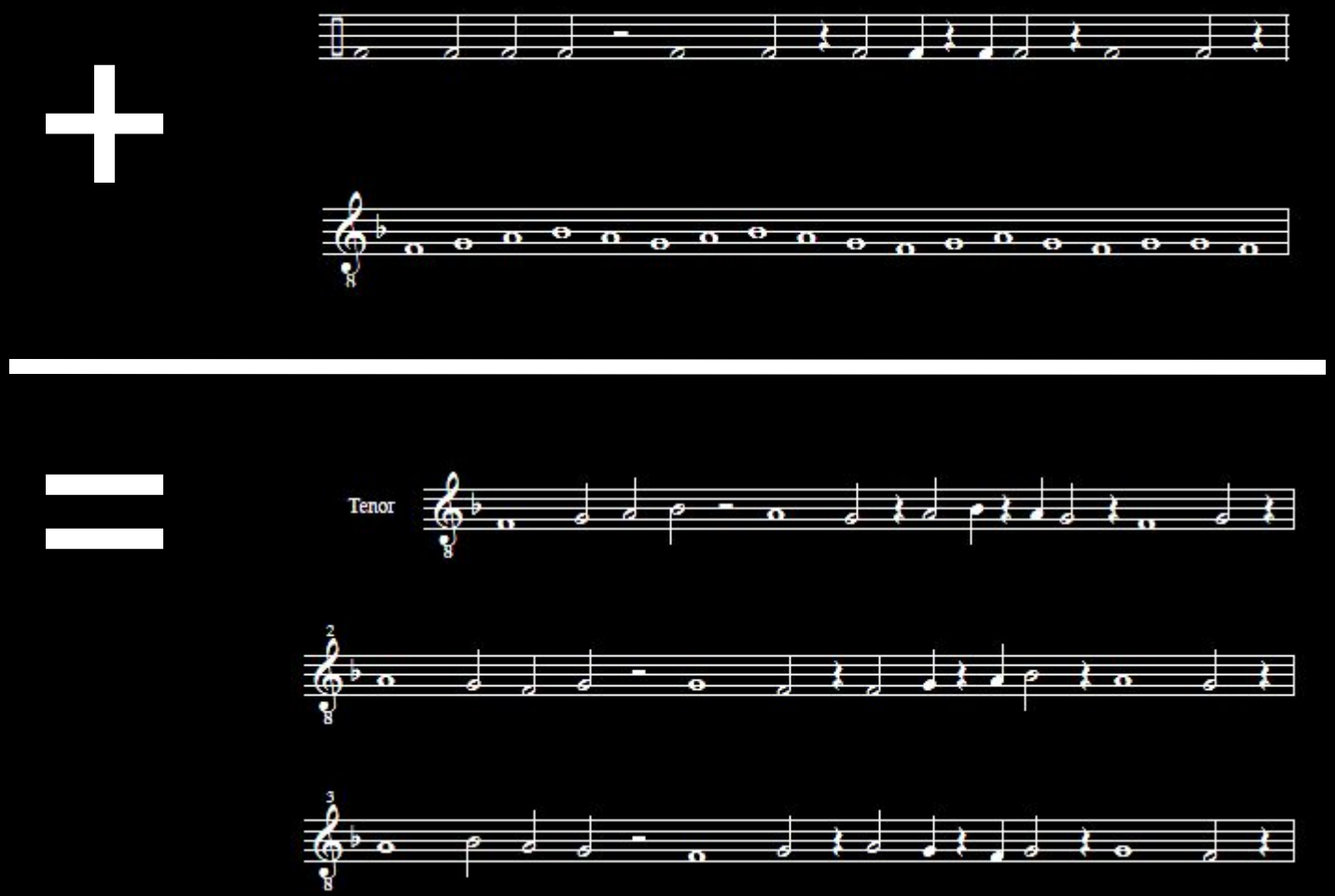
The final step in the evolution of the arts is the scientific method of art production, whereby works of art are manufactured and distributed according to definite specifications.

Joseph Schillinger (1943) *The mathematical basis of the arts*

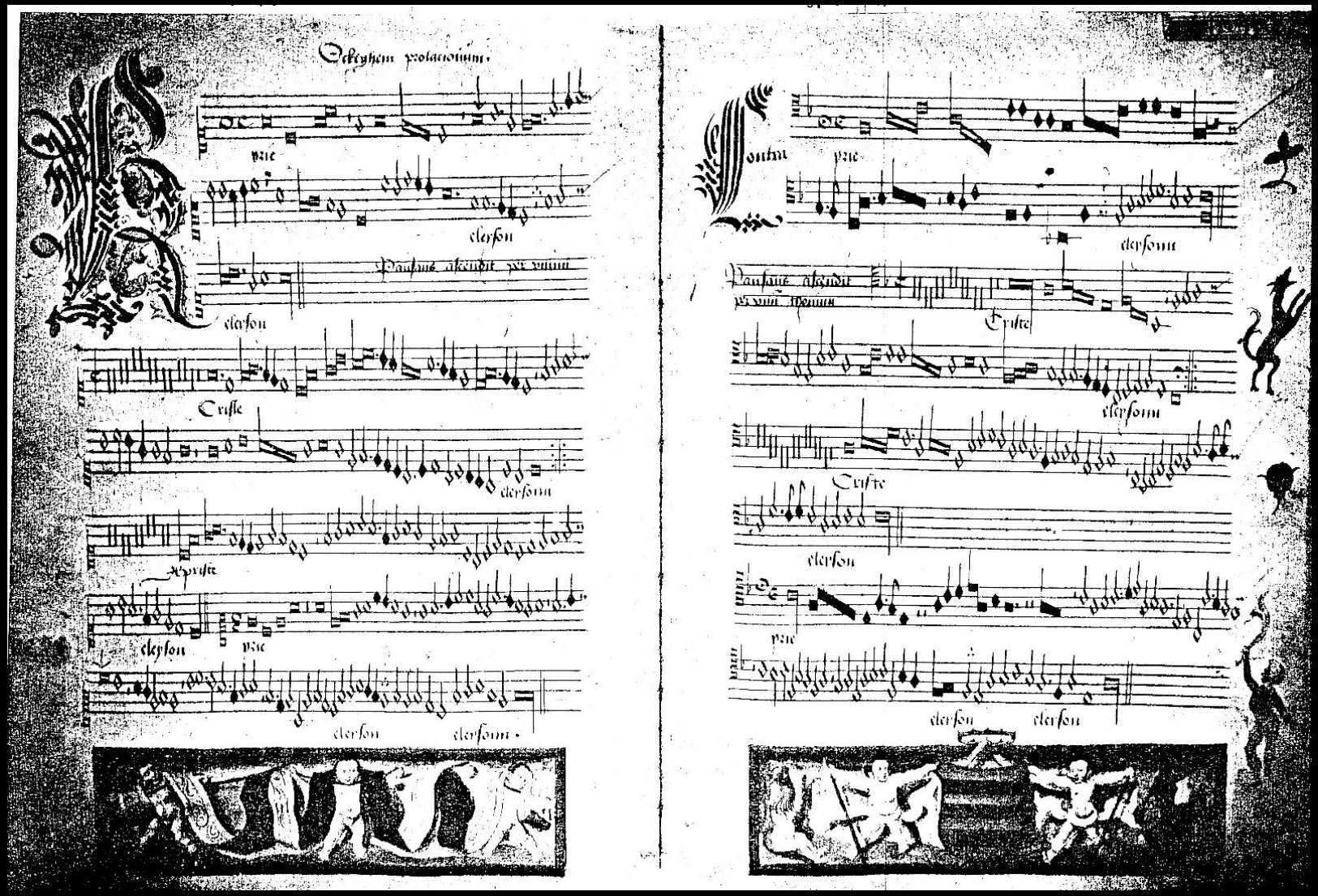
Algorithmic thinking before the computer



Algorithmic thinking before the computer



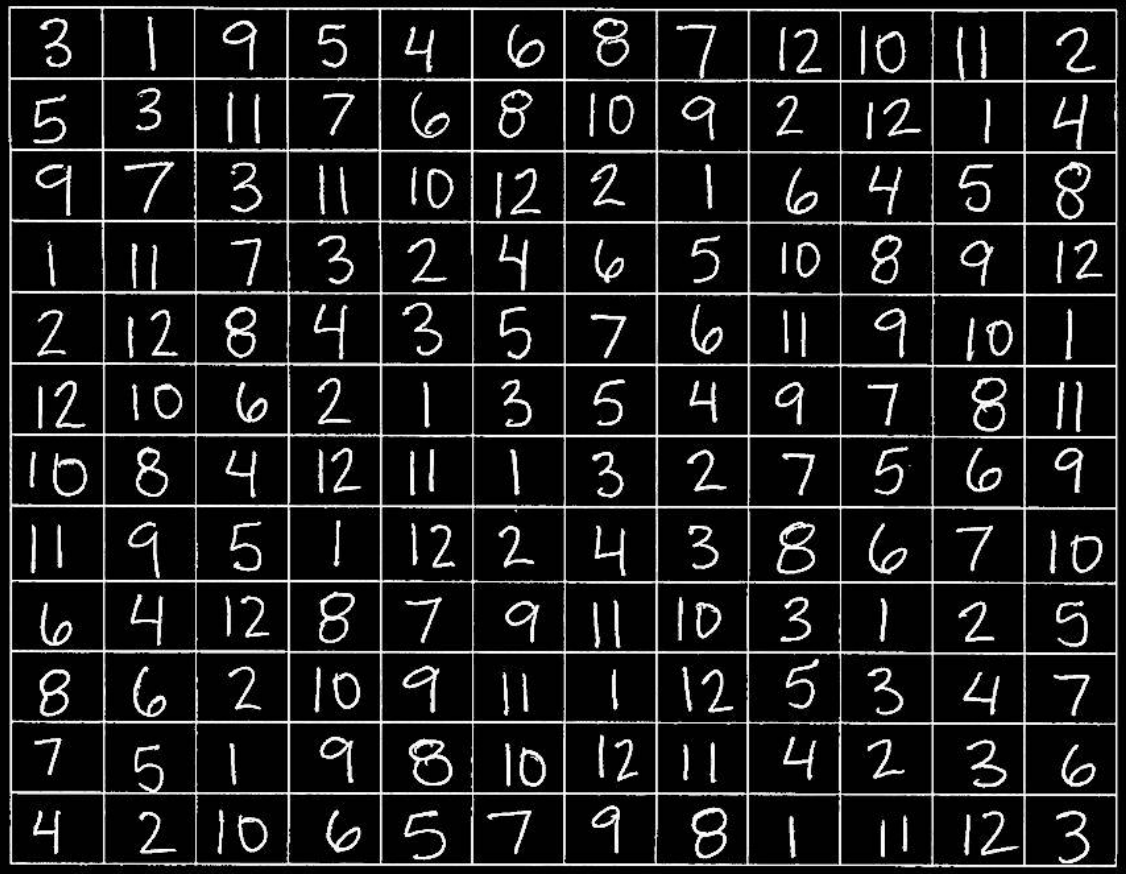
Algorithmic thinking before the computer



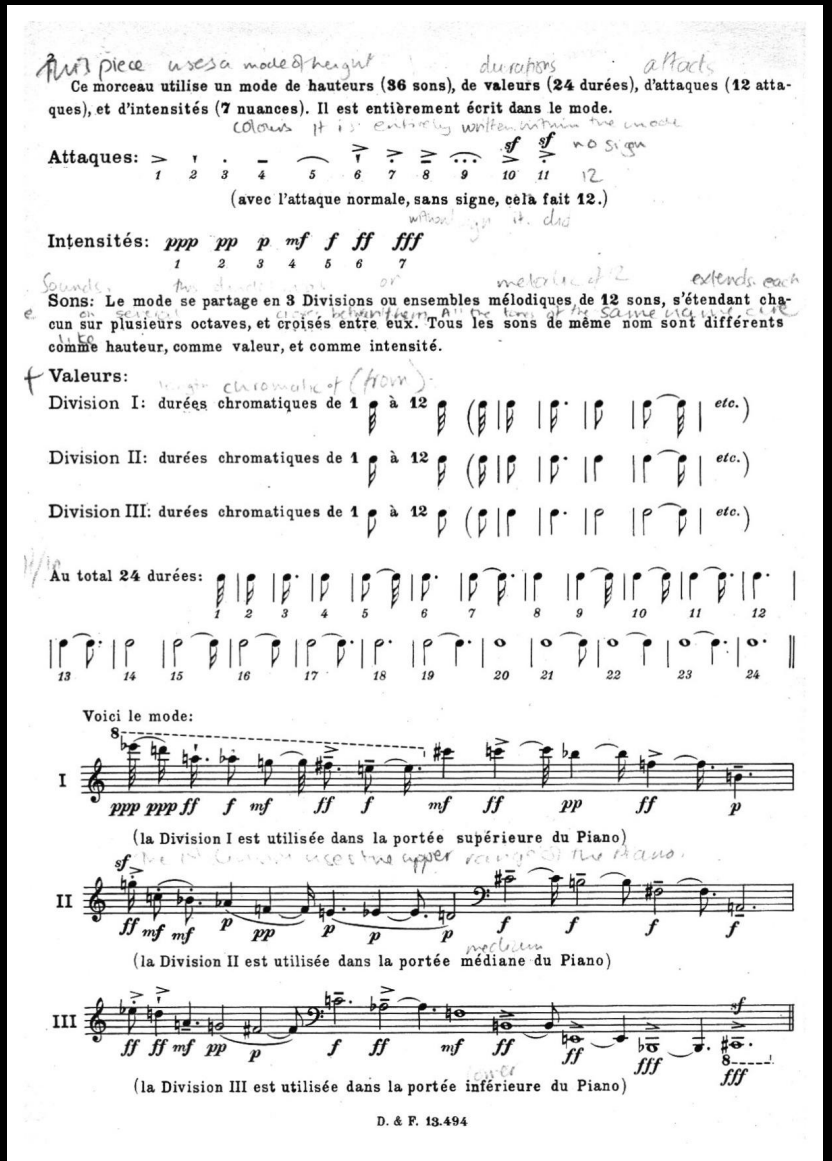
Algorithmic thinking before the computer

Algorithmic thinking before the computer

Algorithmic thinking before the computer



Algorithmic thinking before the computer



Ce morceau utilise un mode de hauteurs (36 sons), de valeurs (24 durées), d'attaques (12 attaques), et d'intensités (7 nuances). Il est entièrement écrit dans le mode.

Attaques: 1 2 3 4 5 6 7 8 9 10 11 12

(avec l'attaque normale, sans signe, cela fait 12.)

Intensités: *ppp* *pp* *p* *mf* *f* *ff* *fff*
1 2 3 4 5 6 7

Sons: Le mode se partage en 3 Divisions ou ensembles mélodiques de 12 sons, s'étendant chacun sur plusieurs octaves, et croisés entre eux. Tous les sons de même nom sont différents comme hauteur, comme valeur, et comme intensité.

Valeurs:

Division I: durées chromatiques de 1 à 12 etc.

Division II: durées chromatiques de 1 à 12 etc.

Division III: durées chromatiques de 1 à 12 etc.

Au total 24 durées: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Voici le mode:

I *ppp ppp ff f mf ff f mf ff pp ff p*

(la Division I est utilisée dans la portée supérieure du Piano)

II *ff mf mf p pp p p p f f f f*

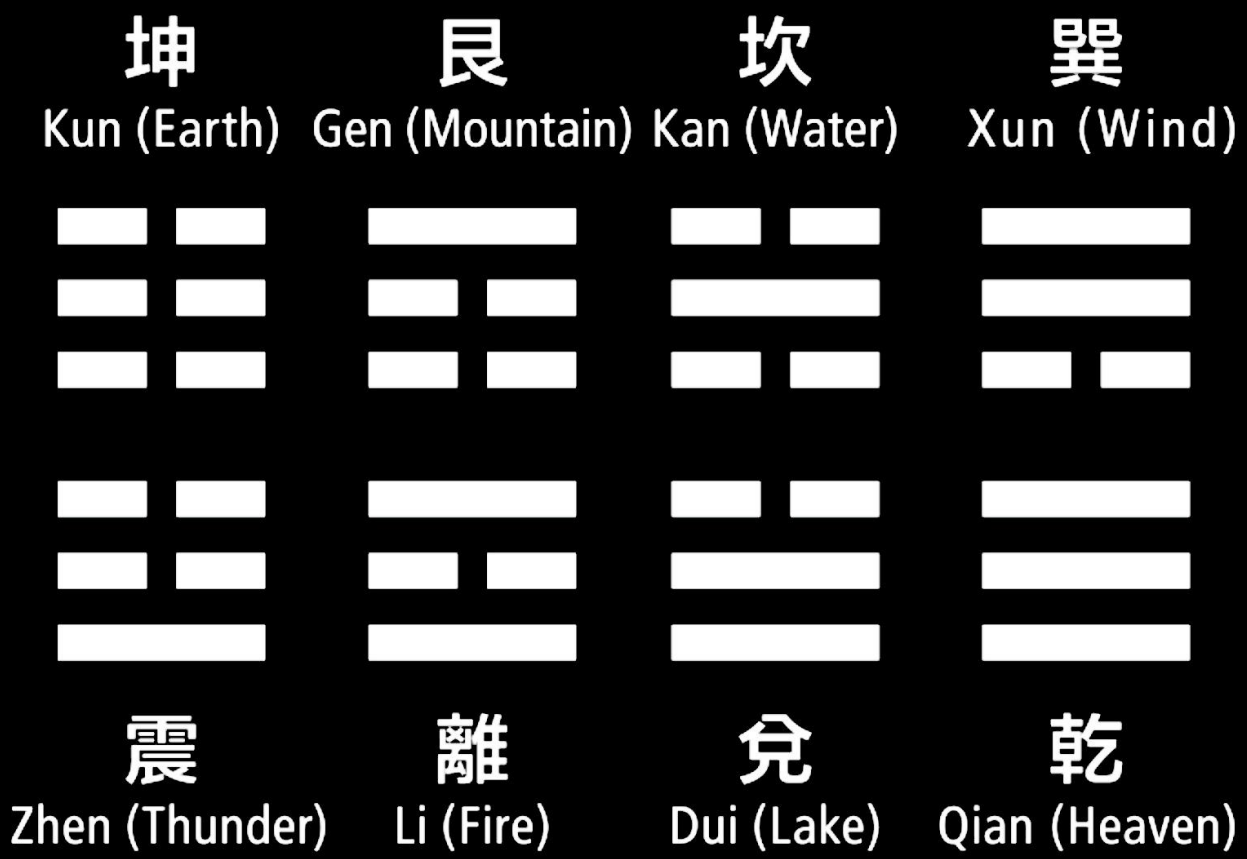
(la Division II est utilisée dans la portée médiane du Piano)

III *ff ff mf pp p f ff mf ff ff fff fff*

(la Division III est utilisée dans la portée inférieure du Piano)

D. & F. 13.494

Algorithmic thinking before the computer



Assignment 1: Read, Question & Answer

What are your thoughts on CC?

Do you feel positive/negative about it?

What are the implications of CC in society, the arts, the market, work?

Does this raise a genuinely contemporary issue or can be traced in other eras?

Where do you see it belonging: reseach, cognition, philosophy, arts?