Chapter 7. Meeting 7, History: Gottfried Michael Koenig

7.1. Announcements

- Test direct rendering of CSD files with Csound if ELr is not working
- Make sure you have PD-extended installed and Martingale on your system

7.2. Quiz

- 10 Minutes

7.3. Gottfried Michael Koenig

- Gottfried Michael Koenig (1926-)
- 1954-1964: Worked with Stockhausen and others at West German Radio in Cologne
- Composed for tape and acoustic instruments
- 1963-1964: Studied programming, began developing software for CAAC
- 1964-1986: Director of the Institute of Sonology in the Netherlands
- Employed CAAC at three different levels
  - Symbolic: output from computer used to transcribe notation
  - Control: create sequences of control voltage mapped to synthesis parameters
  - Direct: employed direct creation of waveforms to create non-standard synthesis techniques

7.4. Reading: Koenig: The Use of Computer Programs in Creating Music

- Koenig, G. M. 1971. "The Use of Computer Programs in Creating Music." In *Music and Technology (Proceedings of the Stockholm Meeting organized by UNESCO).* Paris: La Revue Musicale. 93-115. Internet: http://www.koenigproject.nl/Computer_in_Creating_Music.pdf.
- Koenig states that the use of the computer does not herald a new musical epoch: instead, what does he see the computer as offering?
- Koenig describes a variable function generator: what is this?

- Koenig sees work in the electronic music studio as suggesting some of the practices of algorithmic composition: how so?
- Koenig introduces the term composition theory: what might this mean?
- What role did Koenig imagine for the computer in the work of composers and music students?
- Koenig describes a technique of "sound production": what is this?

7.5. Koenig: CAAC for Acoustic Instruments

- Two early software systems
- 1964: Project 1 (PR1)
- 1969: Project 2 (PR2)
- Favored discrete value generation and selection

7.6. PR1: Concepts

- 1964: Project 1 (PR1): Programmed in Fortran for the IBM 7090
- A closed system, providing output based on user parameters
- A user specified six tempo values, twenty-eight entry delays (rhythmic values), a random generator seed value, and the length of the composition
- Materials were algorithmically selected
    - Series: random permutations, selection without replacement
    - Alea: random selection
- Koenig saw series generation as an abstraction of twelve-tone techniques: "the need for variation is satisfied without there having to be the pretense that somewhere deep inside the work the twenty-fifth permutation is still being systematically derived from an original series" (1970a, p. 34).
- At a larger level, 12-tone rows are created and deployed and three-note aggregate completing trichords are created.
- A seven-section formal structure controls the large-scale form, defining a position in a range from regular/periodic to irregular/aperiodic.
- Output is provided for six parameters: (1) timbre (instrument or instrument group), (2) rhythm, (3) pitch, (4) sequence, (5) octave register, and (6) dynamic.

- Sequence is spare parameter, applied to chord formation or timbre component within a timbre group

- All parameters are independent

7.7. PR2: Concepts

- 1969: Project 2 (PR2): Algol, then Fortran for the PDP-15

- A closed system, but more general and user-configurable

- Eight parameters are generated: (1) instrument, (2) harmony, (3) register, (4) entry delay, (5) duration, (6) rest, (7) dynamics, and (8) mode of performance.

- Expanded tools for algorithmic selection

  - Series

  - Alea

  - Ratio: weighted random selection

  - Group: repetition of values

  - Sequence: ordered selection

  - Tendency: random selection within dynamic boundaries

7.8. PR2: The List-Table-Ensemble Principle

- Selection procedures can be used on user-specified numeric or symbolic values (lists, stockpiles, or tables), or new, algorithmically generated expansions of user-specified numeric or symbolic values (ensembles).

- Lists: raw stockpiles of data (assigned index values for access)

- Tables: user-organized collection of indexes pointing to data in Lists

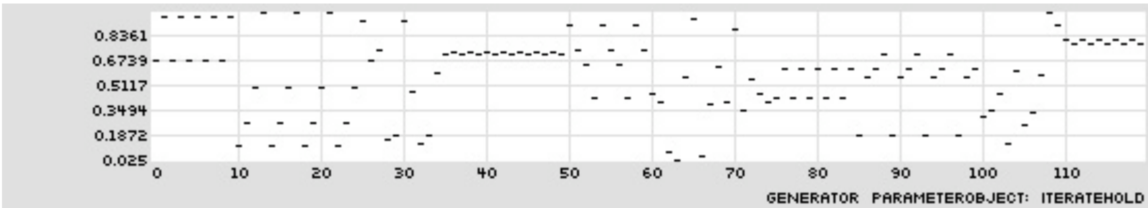
- Ensembles: selection methods are used to create intermediary groups of data that are then drawn from to produce parameter values

- A techniques of meta-selection that constrains values within distinct representations (distributions and orderings)

- IterateHold: a rough analogy to the list-table-ensemble principle: select a number values from a PO, employ these for a number of times, and then regenerate a new selection

  ```
  :: tpmap 120 ih,(ru,0,1),(bg,oc,(2,4,13)),(bg,oc,(10,15))
  ```

```
iterateHold, (randomUniform, (constant, 0), (constant, 1)), (basketGen,
orderedCyclic, (2,4,13)), (basketGen, orderedCyclic, (10,15)), orderedCyclic
TPmap display complete.
```



7.9. Listening: Koenig

- Three Asko Pieces
- Koenig: *Three Asko Pieces* (1982)

7.10. PR2 Selection Principles: Ratio

- Weighted randomness can be achieved by configuration of BasketGen values
- More control can obtained by configuring a zero-order Markov chain, to be discussed later

7.11. Controlling Pitch in athenaCL

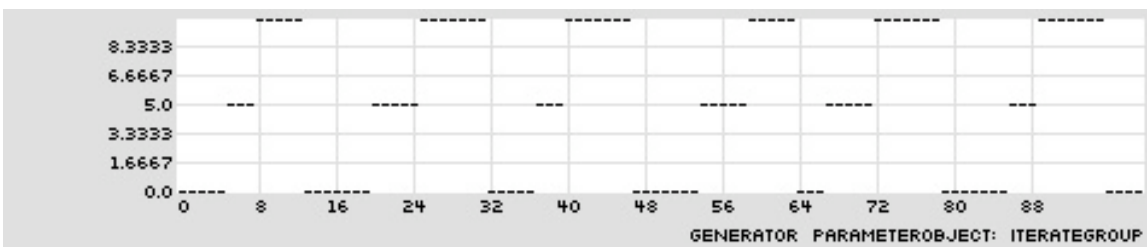
- Paths provide ordered collections of pitch groups (Multisets) with proportional durations

- A Texture is assigned a Path based on the last-created Path, an assigned Path, or an automatically created Path (if none exist)
- The default Path is a single pitch, C4
- A Texture can transform the Path with ParameterObjects assigned to the field (transposition) and octave (register shift) parameters
- Different TextureModules can deploy Paths in very diverse ways

7.12. PR2 Selection Principles: Group

- IterateGroup: Two POs, one generating values, the other selecting how many times those values are repeated before a new selection is made

```
:: tpmap 100 ig,(bg,oc,(0,5,10)),(bg,rc,(3,5,7))
iterateGroup, (basketGen, orderedCyclic, (0,5,10)), (basketGen, randomChoice,
(3,5,7))
TPmap display complete.
```



- Create a collection of values, select a value, and then repeat a selected number of times
- Command sequence:
  - emo m
  - tin a 6
  - tie r cs,(rb,.2,.2,.02,.25)
  - tie f ig,(bg,rc,(2,4,7,9,11)),(bg,rp,(2,3,5,8,13))
  - tie o ig,(bg,oc,(-2,-1,0,1)),(ru,20,30)
  - ticp a b c d
  - eln; elh

7.13. PR2 Selection Principles: Tendency Mask

- Random values selected from within dynamic minimum and maximum value range
- Can be implemented with any Generator PO that has min/max parameter
- Boundaries can be controlled by BreakPoint, Wave, or similar ParameterObjects
- A powerful technique for creating long range behavior
- Here, a break-point function and a wave sine generator form the boundaries of a random beta selection to control pitch
- Command sequence:
  - emo m
  - tin a 15
  - tie r cs,(ig,(ru,.01,.25),(ru,4,12))
  - tie a ru,.2,(cg,u,.3,.9,.005)
  - tie f rb,.2,.2,(bpl,t,l,((0,-12),(30,12))),(ws,t,29,0,0,24)
  - eln; elh
- A powerful technique for creating long range behavior
- Here, random octave values are chosen between two wave triangle generators
- Command sequence:
  - emo m
  - pin a d,e,g,a,b
  - tin a 107
  - tie r pt,(c,16),(ig,(bg,rc,(1,2,3,5,7)),(bg,rc,(3,6,9,12))),(c,1)
  - tie o ru,(wt,t,25,0,-2,4),(wt,t,20,0,-3,1)
  - eln; elh

7.14. Reading: Koenig: Aesthetic Integration of Computer-Composed Scores

- Koenig, G. M. 1983. "Aesthetic Integration of Computer-Composed Scores." *Computer Music Journal* 7(4): 27-32.

- Koenig states that "... to react functionally means ... to refrain from imitation of a particular production mode in another medium": what is he suggesting?

- What is Koenig suggesting about the use of histograms, where the composer supplies histograms and the computer program takes care of the data connections?

- What is the process of transcription that Koenig describes? How is this different than conventional transcription?

- What is aesthetic integration? Does Koenig suggest that this step can also be automated?

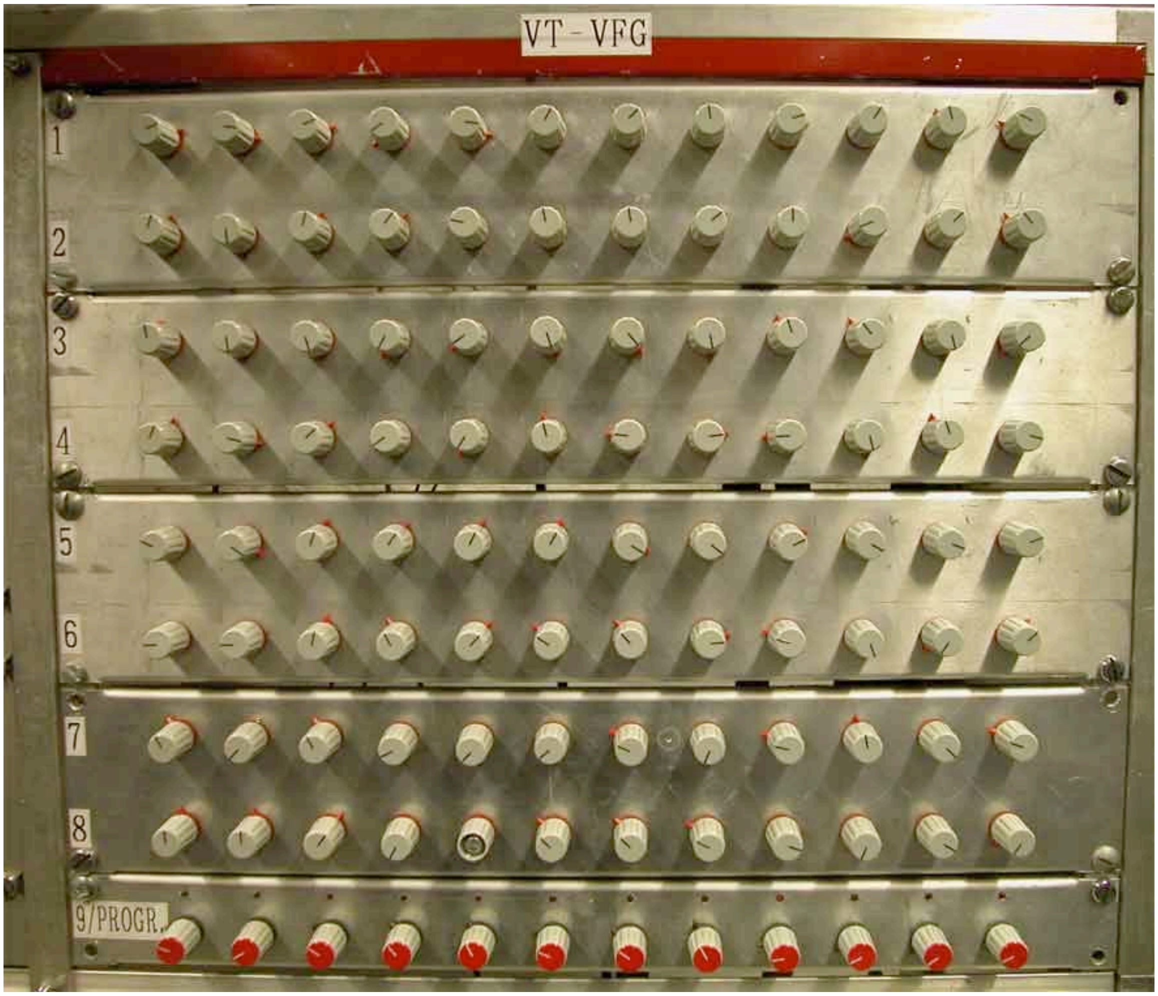
- Koenig talks about composer having a sense of responsibility for the aesthetic result: why is this significant?

7.15. Koenig: CAAC for Voltage Control

- Used PR1 to generate events that were encoded in voltage control data

- Voltage control data processed and translated to various musical parameters at different speeds

- Used "variable function generator" (1966) to set and deploy values from the control rate to the audio rate


VT - VFG
1
2
3
4
5
6
7
8
9/PROGR.

- Produced Funktion pieces with this method: Funktion Grün (1967), Funktion Gelb (1968), Funktion Orange (1968), Funktion Rot (1968), Funktion Blau (1969), Funktion Indigo (1969), Funktion Violett (1969), Funktion Grau (1969)

- Similar methods will be employed by outputting athenaCL generators to PD Arrays

7.16. Listening: Koenig

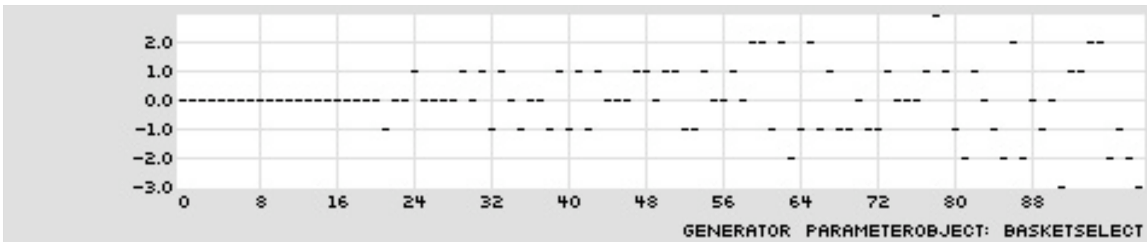
- Employed techniques of Funktion pieces

- Koenig: “Terminus X” (1967)

7.17. Alternative Approaches to Grouping and Masking

- BasketSelect: Select values form a list using another PO providing values within the unit interval

```
:: tpmap 100 bs,(-3,-2,-
1,0,1,2,3),(ru,(bpl,e,l,((0,.5),(100,1))),(bpl,e,l,((0,.5),(100,0))))
basketSelect, (-3,-2,-1,0,1,2,3), (randomUniform, (breakPointLinear, event,
loop, ((0,0.5),(100,1))), (breakPointLinear, event, loop, ((0,0.5),(100,0)))),
TPmap display complete.
```



- IterateWindow: Select from a list of POs, and then draw a selected number of values from that PO

```
:: tpmap 100 iw,((ru,.2,.8),(re,15,0,1),(ws,e,12,0,0,1)),(bg,rp,(14,20,26)),oc
iterateWindow, ((randomUniform, (constant, 0.2), (constant, 0.8)),
(randomExponential, 15.0, (constant, 0), (constant, 1)), (waveSine, event,
(constant, 12), 0, (constant, 0), (constant, 1))), (basketGen, randomPermutate,
(14,20,26)), orderedCyclic
TPmap display complete.
```