AI MUSIC Literature Review

https://en.wikipedia.org/wiki/Musikalisches_Würfelspiel

Mozart made a dice game for algorithmic generation of music. While the pieces that come out of it are basic and similar to each other, it can generate billions of unique pieces.

Types:

source:
https://www.researchgate.net/profile/Geraint_Wiggins/publication/209436205_AI_methods_for_algorithmic_composition_A_survey_a_critical_view_and_future_prospects/links/5464887b0cf2c0c6aec570ce/AI-methods-for-algorithmic-composition-A-survey-a-critical-view-and-future-prospects.pdf

Mathematical Models:

Mostly statistical approaches to music.

Examples include:

- stochastic processes (makarov chains) (reviewed by jones 1981)
- chaotic non-linear systems (Pressing 1988)
- iterated functions (Gogins 1991)
- multiple viewpoint machine learning based on entropy/unpredictability (Conklin and Witten 1995)

Disadvantages:

- Someone needs to find probability parameters first
- It is difficult to capture more abstract levels of music as deviations from the norm are not accounted for

Knowledge based systems:

Involve an “expert” teaching a programmer how to make a formal system for a task. Supervised AI is an example of this.

It is useful when an expert is present, and when the problem has well defined domains.

Disadvantages:

- Knowledge Elicitation is difficult and time-consuming
- They do what they program them to do, so it depends on the ability of the "expert"
- They become too complicated if we try to add all the "exceptions to the rule"

Grammars:

Extracting 'grammars' for music similar to grammar in language, and using simple rules to build chord progressions and musical pieces.

Experiments in Musical Intelligence (EMI) is a project focused on understanding musical style of various composers. It takes two works as input and extracts "signatures" using pattern matching.

Disadvantages:

- They are hierarchical structures, but music is not (improvisation). Ambiguity is necessary
- Most grammar implementations do not make strong claims about semantics of pieces.
- Quality is questionable, but quantity of output is high

Evolutionary Methods:

Genetic algorithms have proved successful

Disadvantages:

- subjectivity
- Efficiency (fitness bottleneck)

Learning Systems

Basically unsupervised learning systems such as
- Artificial Neural Networks
- Machine learning models

Disadvantages:

- fail to pick up higher-level features of music such as phrasing or tonal functions

- representation of time cannot be dealt with effectively even with recurrent networks
- they solve toy problems, as opposed to knowledge based approaches

Discussion

“Do we want to simulate human creativity as well or the result of it?”

Using mathematical models like AI on music poses an interesting problem. AI are normally trained based on “accuracy” and “error” from a given answer. However, how can we be sure that errors in the context of simulated music composition are actually errors and not deliberate choices on the part of the AI? It is the subtle deviations from the norm that gives music its character.

Performance plays a big role in the character of musical pieces. Computerized renditions of famous music pieces always feel strange because of their ‘perfection’. The subtle intonations and deviations are part of what makes music interesting.

Commercial Music Generation

https://www.jukedeck.com

https://www.ampermusic.com

https://magenta.tensorflow.org
This seems to be the definitive tool for open source music generation (google)

https://www.aiva.ai
(also a ted talk by this guy https://www.ted.com/talks/pierre_barreau_how_ai_could_compose_a_personalized_soundtrack_to_your_life?language=en)

http://computoser.com

http://popgun.ai/x/hello.html

http://melodrive.com

https://www.algotunes.com/generate-music/

https://deepj.ai

Github Projects

(Haven’t tested any of these)

https://github.com/salu133445/musegan

https://github.com/calclavia/DeepJ

https://github.com/hexahedria/biaxial-rnn-music-composition

https://github.com/yoavz/music_rnn

https://github.com/mil-tokyo/NeuralMelody