Algorithmic composition: An overview of the field, inspired by a criticism of its methods

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WHAT TO EXPECT?

Basis
Pearce, Meredith, Wiggins (2002): “Motivations and methodologies for automation of the computational process”

In addition
Overview of the field of algorithmic composition
Appreciation for good science and appropriate methods
1. Introduction
   1.1 What is algorithmic composition?
   1.2 The Problem: Pearce/Meredith/Wiggins' criticism

2. How did we get there?
   2.1 A history of algorithmic composition
   2.2 Different problems and approaches

3. Towards a solution
   3.1 Motivation
   3.2 Pearce/Meredith/Wiggins' 4 motivations

4. Conclusion
1. Introduction

1.1 What is algorithmic composition?
WHAT IS ALGORITHMIC COMPOSITION?

“...the partial or total automation of the process of music composition by using computers.”

– Fernández/Vico, 2013

“...the technique of using algorithms to create music.”

1. Introduction

1.2 The Problem: Pearce/Meredith/Wiggins' criticism
THE PROBLEM

Widespread failure to...

“...specify the precise practical and theoretical aims of research”

“...adopt an appropriate methodology for achieving the stated aims”

“...adopt a means of evaluation appropriate for judging the degree to which the aims have been satisfied”

– Pearce/Meredith/Higgins, 2002
an implicit assumption that simply describing a computer program that composes music counts as a useful contribution to research

– Pearce/Meredith/Higgins, 2002
A CASE STUDY

David Cope's EMI
Experiments in Musical Intelligence
Imitates the style of a given corpus

Exemplary results: www.youtube.com/user/davidhcope/

Wiggins' review
Published work on EMI is vague & unscientific
Review begins with a discussion of pseudoscience

Introduction The problem: Pearce/Meredith/Wiggins' criticism
WHY IS THIS BAD?

Requirements for progress

Well-defined problems

Possible solutions to these problems

The ability to meaningfully compare solutions

Solid methodology

Introduction The problem: Pearce/Meredith/Wiggins' criticism
2. How did we get there?

2.1 A history of algorithmic composition
First conceptualisation

Ada Lovelace, on the Analytical Engine:

“Supposing, for instance, that the fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible of such expressions and adaptations, the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent.”

– Ada Lovelace, 1843

How did we get there? A history of algorithmic composition
HISTORY: FIRSTS

Proof of concept


4 movements for string quartet

First composition by a computer program

Implementing and testing several principles
  e.g. different sets of rules, probabilities/randomness

How did we get there? A history of algorithmic composition
**HISTORY: FIRSTS**

Iannis Xenakis

Composer (1922 – 2001)

Pioneer in computer music

Used the output of algorithms & mathematical models in his compositions

Image: www.iannis-xenakis.org

How did we get there? A history of algorithmic composition
GUIDO D'AREZZO

11th century
Deterministic mapping of vowel sounds to pitches

W. A. MOZART (ATTRIBUTED)

18th century
“Musikalisches Würfelspiel” / “Dice Music”
Randomised combination of pre-composed parts
2. How did we get there?

2.2 Different problems and approaches
How did we get there? Different problems and approaches
How did we get there? Different problems and approaches

**SOURCES OF VARIETY**

**Input:**
- Musical scores
- Recordings
- Extra-musical data
- Rules
- Probabilities
- ...

**Algorithm**

**Output:**
- Musical scores?
- Synthesised sound?
Sources of Variety

Each choice defines a different problem!

Input:
- Musical scores
- Recordings
- Extra-musical data
- Rules
- Probabilities
...

Technological approach:
See upcoming slide!

Characteristics:
- Determinism?
- Degree of human intervention?

Output:
- Musical scores?
- Synthesised sound?

What is a “good” or “correct” output?

How did we get there? Different problems and approaches
TECHNICAL APPROACHES

How did we get there? Different problems and approaches

Figure: Fernández/Vico, 2013
TECHNICAL APPROACHES

Immense variety of approaches

Further complication:
Similar approaches are used to achieve different ends

Choice of any one approach needs justification!

How did we get there? Different problems and approaches
WHAT IS A GOOD/CORRECT OUTPUT?

What is good music?
- Question for music theorists and philosophers
- Not particular to algorithmic composition
- Subjective impression of listener/larger audience
- Are there computable measures for algorithms?

What is the aim/expectation?
- "style imitation" vs "genuine composition" (Nierhaus 2009)
- Imitation of a style/corpus vs automation of compositional tasks (Fernández/Vico 2013)

How did we get there? Different problems and approaches
3. Towards a solution

3.1 Motivation
HOW CAN WE DO BETTER?

Switch hats
Composer: “What is my artistic vision?”
   “What sounds good to me?”
Scientist: “How can I make that relevant to the scientific discourse?”
   “How can I measure that?”

Reminder (Pearce/Meredith/Wiggins)
Specify aims!
Adopt appropriate methodology!
Adopt appropriate means of evaluation!

Towards a solution Motivation
3. Towards a solution

3.2 Pearce/Meredith/Wiggins' 4 motivations
4 DIFFERENT MOTIVATIONS

Categorisation by motivation

1. “Algorithmic composition” in a stricter sense
2. Design of compositional tools
3. Computational modelling of musical styles
4. Computational modelling of music cognition

Due to Pearce/Meredith/Wiggins

Failure to distinguish between these tasks leads to bad methodology & bad research!

Towards a solution Pearce/Meredith/Wiggins's 4 motivations
4 DIFFERENT MOTIVATIONS

1. “Algorithmic composition”

Objective is artistic

Algorithm is tool in the compositional process

Reflects composer's needs & vision

When published, the theoretical/practical relevance must be demonstrated!

Towards a solution Pearce/Meredith/Wiggins's 4 motivations
2. Design of compositional tools

Software engineering standards should be upheld!

Perform and document analysis, design, implementation, and testing stages!
4 DIFFERENT MOTIVATIONS

3. Computational modelling of musical styles

Allows for hypotheses about the properties of different styles

Tests for over- and undergeneration can be made significant
→ How well does the algorithm emulate the style?

Towards a solution Pearce/Meredith/Wiggins's 4 motivations
4. Computational modelling of music cognition

Goal: Test hypotheses about the cognitive processes that are required for musical composition

The relations and differences between algorithmic and cognitive processes must be made clear!

Towards a solution Pearce/Meredith/Wiggins's 4 motivations
4. Conclusion
Algorithmic composition...
...is a complex and fascinating topic
...can comprise different tasks
...has seen a plethora of approaches

Pearce/Meredith/Wiggins
The field suffers from a lack of appropriate methods
Categorisation by 4 motivations might help

The mere description of an algorithm that composes music is not a valuable contribution to research!

Conclusion
Print


Web
http://blogs.bodleian.ox.ac.uk/adalovelace/about-ada-lovelace/

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

https://commons.wikimedia.org/

http://www.iannis-xenakis.org/

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