

MuMe and Variation: Classification, Ontology, and Autonomy

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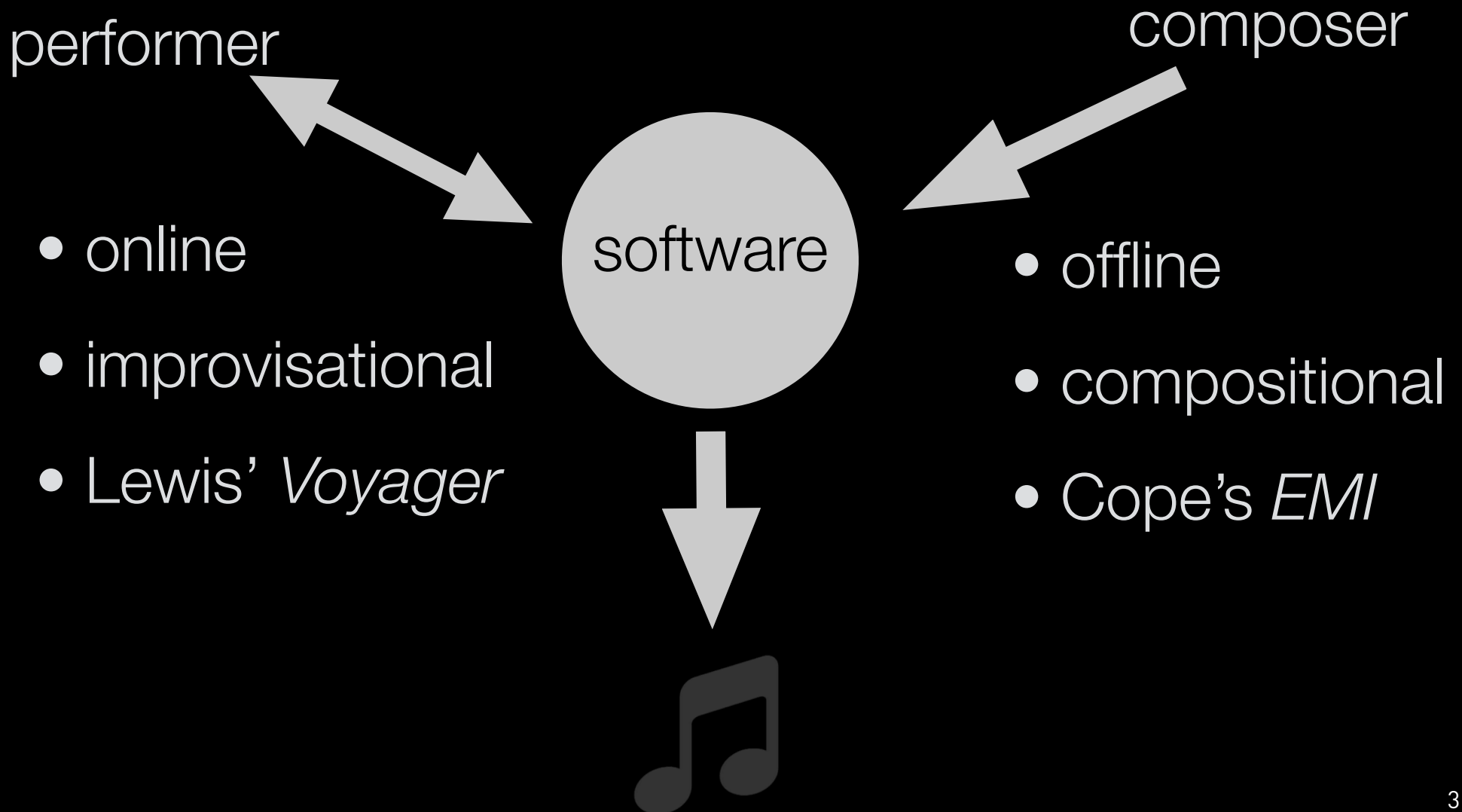
MUME14 @ NIME

NIME <=> MuMe

- 1980s
 - development of software beyond 1:1 relationship



NIME <=> MuMe



NIME <=> MuMe

- interactive systems
 - reactive ?
 - require input from performer for musical interest and complexity
 - high-level decisions remain with performer or are preset
- generative systems
 - selection/rejection from multiple generations
 - composer can piece together larger work from smaller generations

NIME <=> MuMe

- so where are we now?
 - NIME
 - instrumental builder + performer + composer
 - human interaction
 - MuMe
 - software
 - (autonomous?) creativity

Classification (?)

- proposed taxonomy
 - comparison without regard to
 - perceived musicality
 - complexity
 - (traditional) autonomy
 - Eigenfeldt, A., Bown, O., Pasquier, P., Martin, A.
“Towards a Taxonomy of Musical Metacreation:
Reflections on the First Musical Metacreation
Weekend”, Proceedings of the Artificial Intelligence
and Interactive Digital Entertainment (AIIDE’13)
Conference, Boston, 2013

Online vs. Offline

- online
 - improvisational
 - how system reacts to live performer
 - complexity, intelligence, agency, autonomy
- offline
 - no input
 - what extend system produces its own structure and details
 - can it move forward on its own?

Taxonomy of Musical Metacreation

- classification system
 - relationship to designer's control over final musical result
 - how much creative decision-making is left to system?
 - how much influence is required from human to make system perform musically?

Taxonomy of Musical Metacreation

1. Independence

- the use of any process on a musical gesture that is beyond the control of the composer

2. Compositionality

- the use of any process to determine the relationships between pre-defined gestures

3. Generativity

- the generation of musical gestures

4. Proactivity

- system/agents that are able to initiate their own musical gestures

5. Adaptability

- agents behave in different ways over time due to their own internal evolution

6. Versatility

- agents determine their own content without predefined stylistic limits

7. Volition

- agents exhibit volition, deciding when, what, and how to compose/perform

1. Independence

- **the use of any process on a musical gesture that is beyond the control of the composer**
 - delegating some creative responsibility to system
- Examples
 - complex signal processing
 - random playback speed
 - alter volume/onset data in sequencer

2. Compositionality

- **the use of any process to determine the relationships between pre-defined musical gestures**
 - relationship between two fixed gestures/processes
- Examples
 - initiating multiple layers of pre-generated material
 - triggering pre-recorded material
 - initiating complex signal processing
 - separate from the original (i.e. complex delays)
 - initiating events through score-following
 - live-coding
 - sequences initiated



#1 Independence
Press the Keys,
for Bass Clarinet and Live Electronics -
João Pedro Coimbra

3. Generativity

- **the generation of musical gestures**
 - any reactive system that requires input to function
- Examples
 - triggering processes containing pitch/rhythm generation algorithms
 - triggering generative gestures in response to performer's action
 - live systems that use live input
 - feedback systems
 - live-coding
 - sequences initiated that include random/stochastic selection from constrained set



Recorded Live at CCRMA, Stanford Univ. Nov. 27, 2012

#3 Generativity

Viomax

G rard Assayag et al.



#3 Generativity

CIMetrical

Andrew Brown, Toby Gifford

4. Proactivity

- **system/agents that are able to initiate their own musical gestures**
 - agent doesn't wait for trigger
 - agents not reactive
 - do not require input to function
- Examples
 - interactive systems with independent response to performer
 - Lewis' *Voyager*
 - multi-agent systems



#4 Proactivity

Interactive Trio
George Lewis



#4 Proactivity

An Unnatural Selection

Arne Eigenfeldt

5. Adaptability

a) agents behave in different ways over time due to their own internal evolution

- no triggered preset behaviours
- agents determine when and how to alter their behaviour proactively

b) agents interact and influence one another

- social agents
- Examples
 - generative system that generates its own musical structure



#5 Adaptability
Zamyatin
Ollie Bown



#5 Adaptability

The Indifference Engine

Arne Eigenfeldt

6. Versatility

- **agents determine their own content without predefined stylistic limits**
 - generate different compositions each time
 - no formal templates
 - potential for transformation of creative space

#6 Versatility
perhaps by 2017-19?

7. Volition

- **agents exhibit volition, deciding when, what, and how to compose/perform**
 - freestanding creative system
 - decides when it wants to create
 - why it would do so...
 - deriving its own conceptual spaces (Gärdenfors)
 - autonomous critical evaluation (Galanter)

7. Volition

- Requirements
 - long-term learning
 - sophisticated feedback mechanisms
 - peers and community
 - form aesthetic judgements
 - derive its own motivations

#7 Volition
perhaps by 2024?

Discussion

- no account for complexity
 - complex system that needs to be nudged
 - #4 proactivity
 - random melody generator changing how melodies are produced using randomly generated form
 - #5 adaptability
- without ability to generate own form
 - computer-assisted composition

Proactivity

- Defining element
 - making musical decisions “on its own”
- extremely difficult to define
- listener
 - serendipity vs. emergence?
 - profound change in system not resulting in musical change?
- no methods to determine if something does something “on its own”
 - our deepest analytical and philosophical challenge

Thinking and Listening

- conceptual minefield?
- input not required
 - thus, no need to listen
- good listening system that cannot rise above echoing input
 - limited to #4 Proactivity
- indifferent system to input that determines proactively when to make musical decisions
 - rise to #5 Adaptability

Usefulness

- how (musically) useful is considered
 - generated material
 - interaction
 - Dean (2003) / Newell et al. (1963)
- not accounted for here
- separate issue

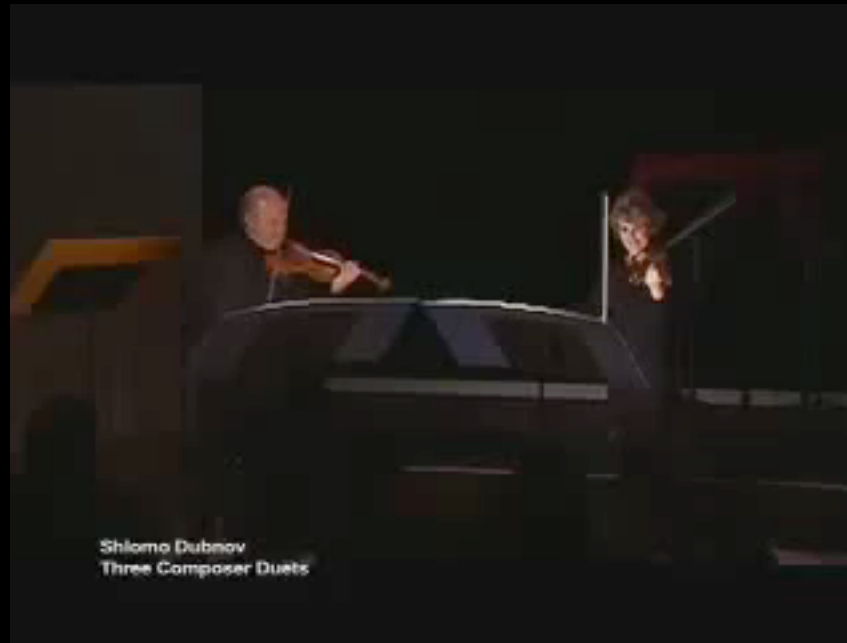
Large-scale Structure

- difficult for artist to delegate to system
- a difficult aspect of music
- systems *can* generate short forms
- “what to do next?”
 - current, past, and potential future musical contexts
- computational aesthetics

Conclusion

- complex and useful systems exist at lower levels
- comparing systems independent of their “musical maturity”
- each level as a principle?
 - which level does a system aspire to?
 - does it master that principle?
 - allow us to critically examine how systems may fall short

Questions / Discussion



what level?

Computer Duets

Shlomo Dubnov

Agents and Multi-agent Systems

- agent
 - large field in computer science
- intelligent agents
 - some element of AI
 - learning / reasoning
- autonomous agents
 - modifying the way in which they achieve their objectives
- distributed agents
 - on distinct computers

Agents and Multi-agent Systems

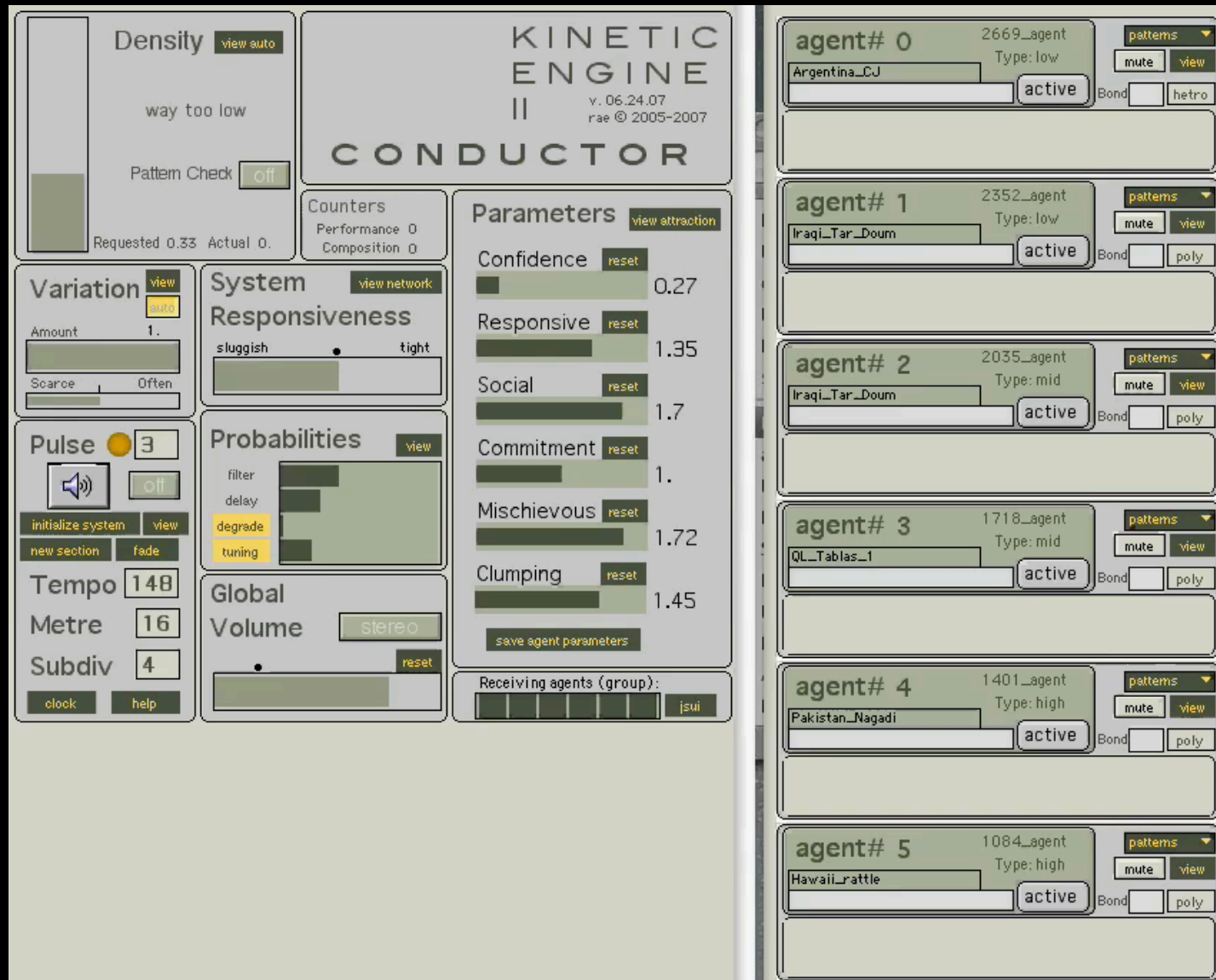
- musical agent
 - independent entity
 - reacts to input in a complex manner
 - operates on its own
 - doesn't need to be directed/controlled
 - *more than an algorithm!*



Interactive Trio George Lewis

Agents and Multi-agent Systems

- multi-agent
 - autonomous
 - no direct user interaction
 - social
 - interact with one another
 - reactive
 - interact with their environment
 - proactive
 - make decisions how and when they should operate



Kinetic Engine
Arne Eigenfeldt