MediaScape: Towards a Video, Music, and Sound Metacreation

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ABSTRACT

We present a new media work, *MediaScape*, which is an initial foray into a fully interdisciplinary metacreativity. This paper defines metacreation, and we present examples of metacreative art within the fields of music, sound art, the history of generative narrative, and discuss the potential of the "open-documentary" as an immediate goal of metacreative video. Lastly, we describe *MediaScape* in detail, and present some future directions.

KEYWORDS

Generative video; generative music; sound art; metacreation.

1 | INTRODUCTION

Generative Art has a long tradition, one that may be "as old as art itself", according to Galanter (2003). While the potential of codifying artistic decisions may be alluring to many artists, the challenges are numerous: for example, can the notion of creativity be extended to machines, or can they (should they?) only remain as tools for the creative artist? The nascent field of computational creativity, also known as metacreation, explores these questions, and is populated by psychologists, art theorists, cognitive scientists, artificial intelligence researchers, machine learning specialists, and, perhaps most importantly, artists. As such, it is not merely an academic pursuit:

it is, and has been, a fertile creative domain for artists exploring new avenues of production. This paper will explore three such directions – music, sound, video – and provide some examples, many of which are drawn from the authors' work, as proof of its existence. Lastly, we will describe a current project that aims to blend the three formerly disparate media into a single, cohesive artistic medium.

2 I METACREATION

Metacreation is the idea of endowing machines with creative behavior (Whitelaw, 2004). Metacreation is a contemporary approach to generative art, using tools and techniques from artificial intelligence, artificial life, and machine learning (themselves inspired by cognitive and life sciences) to develop software that is creative on its own. In other words, software is a metacreation if it exhibits behaviors that would be considered creative if performed by humans.

Artists use tools to produce their artwork. Traditionally, the creator of the tool and the artist have remained distinct; with digital tools, a growing number of tech-savvy artists design and develop the software tools with which they produce their works. By developing tools with ad hoc functionalities, these artist/engineers aim to gain more control over their creative processes. What if these artist/scientists could develop tools that do not need a user to create the finished artworks? The notion that the creation of the computer-tool can take precedence over its utilization is at the root of generative arts.

From a research standpoint, the question regarding metacreation is no longer "can a computer exhibit creative behavior?": that question has been answered, in the positive, many times over. AARON's (Cohen, 1995) paintings have exhibited at the Tate Gallery in London, and EMI's compositions (Cope, 1991) have created music that could not be discerned from human-composed music by the most educated experts (see Section 3 for more examples of metacreations). The question can now be reframed as "how can artists and scientists collaborate to define, structure, and explore the boundaries of this relatively recent multidisciplinary field?"

Two types of approaches are possible for modelling creative behaviour in metacreation research. One can model systems that produce creative behavior in which the system is a "black box", and only its behavior (i.e. its output) matters. This results in processes that explore creativity as it could be, rather than model creativity as it is. Moreover, although relatively successful, these systems do not mimic humans in the way they operate. It is clear, for example, that a human improviser does not maintain transition probability tables when playing, as is the case with the *Continuator* and its Markov Model (Pachet, 2003), and human composers do not evolve populations of musical gestures and simulate their natural evolution, as *GenDash* does (Waschka, 2007).

One can also try to model systems that will be creative using the processes that humans are thought to use. This approach has been relatively unexplored, mostly because these processes are largely unknown. One would have to address more deeply the question of what human creativity is, and produce models that are believable, not only in terms of their output, but in terms of their internal processes. Our group has been exploring some early attempts in this regard (Maxwell et al., 2012), by starting to bridge the gap between the literature in cognitive science, musical perception and cognition, and generative systems.

3 I EXAMPLES OF METACREATIVE ART

Metacreative art is the artifact produced by systems, arising from the implementation of specific models of creativity and creative process. These machine-generated artefacts have been used to observe the validity of the model under investigation, and, often, been positioned within cultural contexts such as performance and exhibition venues. The following examples of metacreative art demonstrate the diversity of approaches that researchers have employed in modelling creative behavior in the domains of music, sound art, and moving image.

3.1 METACREATIVE MUSIC

Music has had a long history of applying generative methods to composition, due in large part to the explicit rules involved in its production. A standard early reference is the *Musikalsches Würfelspiel* of 1792, often attributed to Mozart, in which pre-composed musical sections were assembled by the user based upon rolls of the dice (Ihmels and Riedel, 2007). However, the "Canonic" compositions of the late 15th century are even earlier examples of procedural composition (Randel, 2003).

Exploring generative methods with computers began with some of the first applications of computers in the arts. Hiller's *Illiac Suite* of 1956 utilized Markov chains for the generation of melodic sequences (Hiller and Isaacson, 1979). In the next forty years, a wide variety of approaches were investigated – Papadopoulos and Wiggins (1999) provide a good overview of early uses of computers within algorithmic composition. However, as the authors suggest, "most of these systems deal with algorithmic composition as a problem solving task rather than a creative and meaningful process". Since that time, this separation has continued: with a few exceptions (Cope, 1991; Waschka 2007), contemporary algorithmic systems that employ AI methods remain experimental, rather than generating complete and successful musical compositions.

An approach followed by Eigenfeldt in *Kinetic Engine* (Eigenfeldt, 2008) was to model the interaction of human improvisers within a drum ensemble through the use of virtual agents. Player agents assume roles and personalities within the ensemble, and communicate with one another to create complex rhythmic interactions. The software was used to control the robotic percussion instrument *MahaDevibot* (Kapur et al., 2009), in which the composer acted as a "conductor", directing the virtual agents in response to other live performers (Eigenfeldt and Bahn, 2009).

The notion of modelling a software improvising system after human activity was posited by Rowe (1992): "interactive software simulates intelligent behaviour by modeling human hearing, understanding, and response"; however, *Kinetic Engine* is modelled after human interaction using the AI paradigm of multi-agents. Intelligent agents are elements of code that operate without direct user interaction (they are autonomous), interact with one another (they are social), interact with their environment (they are reactive), and make decisions as to when they should operate, and what they should do (they are proactive) (Wooldridge, 2009). Since these are also attributes required of musicians in improvisational settings, the use of agents to emulate human–performer interaction has proven to be a fertile field of research. Whalley (2009) gives an overview of the recent state of software agents in music and sound art.

Multi-agents were the basis of a series of compositions entitled *Coming Together*. In these systems, agents negotiate musical content within a defined musical environment, with or without direct performer interaction. In each case, agents begin with random musical material, and through the convergence of predefined musical parameters, self-organisation is demonstrated (see Eigenfeldt, 2011, for a detailed description of the series). The interaction between virtual agents and humans was explored in *More Than Four* (Eigenfeldt, 2012), which also incorporated a curator agent to create complete compositions for performance from a database of pre-generated movements (Eigenfeldt and Pasquier, 2012).

3.2 METACREATIVE SOUND ART

Sound art is an interdisciplinary practice based on acoustics, psychoacoustics, and music principles, but then often contracts knowledge from a diverse range of other fields; acoustic design (Truax, 1998), genomics (Fargher and Narushima, 2008), or social media (Roma et al., 2009). It may be reified with a physical object (Bandt, 2001), or as tape music. A sound art work can be positioned along a spectrum of non-symbolic electroacoustic music. This spectrum includes purely electronically generated sound works at one end, while on the other we find works of "found-sound": concrete recordings aimed to evoke in listeners associations of a real time and place.

The aim of sound art, as with any musical composition, is to transform a concept, devised by the artist, into a set of decisions and processes that will ultimately result in an acoustic work. For example, Philipsz's 2010 soundscape piece *Lowlands* (Philipsz, 2010) combines abstracted sounds of the human voice, accompanied with the ambient sounds of modern cities to initiate particular experiential events for the listener.

Since sound art does not have a general representation schema, or an established theory, it has proven difficult to formalize, and has not been as frequently explored in metacreation research. The want of these constraints has, however, prompted a few designs of metacreative systems that seek to address the questions of what processes should be used in order to systematize the generation of sound art, and how to evaluate the work that the system produces.

In *Coming Together: Freesound*, Eigenfeldt (2010) populates a database of audio recordings for the retrieval by autonomous software agents. These agents select recordings based upon semantic tags and spectral audio features, and mix them using a restricted set of digital signal processing techniques. In that work, the concept is established by the domain of tags set by the composer, and the selection criteria employed by agents.

Olofsson (2013) also takes an agent-based approach to generate sound content in his *low-life* series of works. The behaviours of the agents in this work are constituted on rules manifesting from the audio synthesis code they reference. He calls the agents in his "self-referential code" system "audio visual creatures", which engenders performative qualities to the artificial system.

A further example of biologically-inspired agents is demonstrated by Thorogood's artificial life installation *Chatter and Listening* (Thorogood, 2007). In this work, behaviour of a bird species is modelled as a dynamical system, equipping multiple interacting robots with bird-like characteristics, producing a synthesized vocalization based on behaviour states.

Another approach to metacreative sound art is the use of knowledge representation systems, which aim to model a particular knowledge base in a domain. An example of this type of system is the *ec(h)o* interactive audio museum guide by Hatala, Wakkary, and Kalantari (2005). The authors describe a formal representation for sound objects that address sound content properties, concepts, topics, and themes, including connection to aspects of the exhibition. That system updates a visitor's auditory display from the input of user data, including physical position of the user, the history of interaction with objects and space, and interests that the user exhibits.

Thorogood and Pasquier (2013) describe *Audio Metaphor* - a system for the generation of sound art from a short text input. The system retrieves labelled audio recordings that have semantic relationships to the input text. These audio recordings are autonomously segmented by a supervised machine-learning algorithm trained with data from human perceptual classification experiments. The semantic and classified segments are processed and combined by the machine based on a composition schema, modelled after production notes from Canadian composer Barry Truax (2008).

3.3 METACREATION, NARRATIVE, AND VIDEO

Some of the first examples of metacreation appeared within the domain of visual art: Romero and Machado (2008) present an overview of many of these systems. While some of the described artworks contain temporal change, and may border on video and/or animation – for example, Draves' *Electric Sheep* (2008) – generative video is in a more nascent stage.

Traditional cinematic practice has a long connection with storytelling as a dominant mode (Gunning, 1990). This connection is problematic with interactive or generative media forms – which cannot rely on complete authorial control over the details of the narrative arc. However, the potential for a sense of "narrativity" rather than traditional "storytelling" is possible within a more open computational approach. Bizzocchi claims that the expressive presentation of character, storyworld, emotion, and narrative theme, as well as a degree of localized "micro-narrative" plot coherence can produce a narrativized experience without the traditional reliance on a full-blown narrative arc (Bizzocchi, 2007). We believe that it is also possible to use computationally generative techniques to combine shots, tags, sound and sequencing within a narrativized metacreation aesthetic.

There is a substantial history of writers and artists working across the "narrativity to storytelling" spectrum. Non-digital examples of generative narrativity include a variety of dada and surrealist narrative games from the *Exquisite Corpse* (Gooding, 1995) to Burroughs "cut-ups" (Burroughs and Gysin, 1978). The most extensive exploration of analog generative narrative is probably found in the Oulipo creators (Wardrip-Fruin and Montfort, 2003) and in their digitally-oriented successor groups: Alamo, LAIRE, and Transitoire Observable (Bootz, 2012).

A number of digital works link knowingly to this literary tradition of generative and recombinant narrativity. Hayles claims that "Generative art . . . is currently one of the most innovative and robust categories of electronic literature" (Hayles, 2007). Andrews and Wardrip-Fruin explicitly recognize their own extensions of Burroughs's cut-up aesthetic in the works *On Lionel Kearns*, *Regime Change*, and *News Reader* (Wardrip-Fruin, 2005). Bill Seaman's installation work *The World Generator* (2002) uses "images, sound, and spoken text to create a recombinant poetics that created emergent and synergistic combinations of all these modalities" (Hayles, 2007).

Many contemporary works that rely on generative computation include an explicit commitment to more traditional storytelling. Expressive developments in generative digital narrative works can be seen in contemporary projects such as *Curveship* (Montfort 2009), *Mexica-impro* (Perez et al., 2011), *Soft Cinema* (Manovich and Kratky, 2002), or the series of works by Harrell (2007). Montfort's *Curveship* systematically modifies storytelling modalities (such as voice, style, focalization) in narrative constructions. Perez's *Mexica* uses a computational cycle of "story generation" and "reflection" to systematically move a narrative to its conclusion. Manovich's *Soft Cinema* video artwork uses database and algorithm to build a recombinant cinema aesthetic. Harrell has designed generative systems based on shuffling text and image to build a series of expressive and emotionally evocative narrative systems: GRIOT, GENIE, and Renku (Harrell and Chow, 2008). Montfort, Perez, Harrell, and Campana are currently developing *Slant*, an integrated system capable of generative storytelling (Montfort et al., 2013).

4 | MEDIASCAPE

Bizzocchi has built a computational video sequencing and presentation system entitled *Re:Cycle* which he describes as a "generative video engine" (Bizzocchi, 2011). The system incorporates three aesthetic strategies of his earlier linear video works: strong imagery, manipulation of the time base, and compelling visual transitions. The sequencing and transition decisions in his linear works were very carefully designed during the video post-production process. However, the computationally generative *Re:Cycle* system relies on a recombinant process to combine and sequence shots and transitions drawn from the system's databases. It runs indefinitely, and very seldom repeats any given sequence of shots and transitions. *Re:Cycle* also uses metadata tags and computation to nuance its randomized selection process with an enhanced semantic coherence. The tagging system is quite straightforward. *Re:Cycle* strives for an "Ambient Video" aesthetic, and the content consists of imagery drawn from nature and landscape. The tags reflect the content of the individual shots ("trees", "water", "mountain", "snow", etc.). Short sequences of shots are selected and presented based on these content tags. This very simple computational process significantly increased the visual flow and unity of the piece.

We recently began work in combining Bizzocchi's generative video system with Thorogood and Pasquier's *Audio Metaphor* and Eigenfeldt's generative music software in a new work entitled *MediaScape*. *MediaScape* incorporates the *Re:Cycle* recombinant generative system to sequence and display its video clips. In the combined *MediaScape* system, this visual display is enriched and enhanced through the addition of music and sound effects. *MediaScape's* audio generation process produces an audio track which can relate to the video track in any one of three different modes: descriptive (a literal

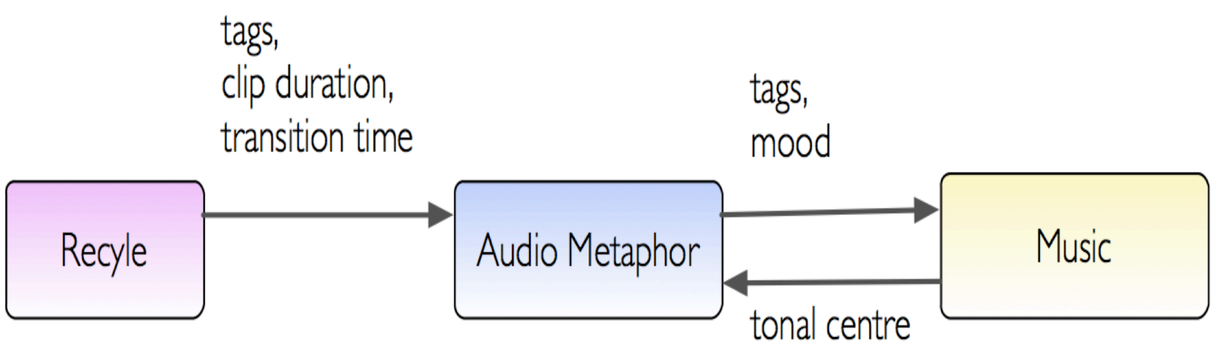

Figure 1 | *MediaScape* subsystem integration. Video clip metadata is communicated to *Audio Metaphor* for analysis and processing. Semantic tags and mood data is transferred to the music generation system. Tonal information is then sent back to Audio Metaphor to influence the ambient soundscape track.

audio interpretation of the picture track), metaphorical (audio which complements the picture), or contrapuntal (audio which runs counter to the aesthetics or the content of the pictures).

Creative use of text-based tags (selected by the artist) for the video clips drives the selection and sequencing of the visuals, as well as providing triggers for the selection, processing and playing of the music and soundscapes. As shown in Figure 1, these commentaries form part of a pipeline that communicates video, mood, and tonal metadata between the subsystems of *MediaScape* using the Open Sound Control (OSC) protocol (Wright and Freed, 1997).

4.1 VIDEO

The generative video system currently contains 5 databases: a list of content tags, a short list of segment tags, a list of video file names associated with tags, a video database which contains all video clips, and a transition database. Before the system starts, the running time of each video clip and the time for transition is determined by the artist.

There is a hierarchy to the tagging and sequencing logic. The system first identifies a subset of the clips based on segment tags defined by the artist. The current version has two possible segment choices - based on the available video footage: "winter" or "not-winter" (we will be adding more segment tags as we gather a larger and more visually diverse set of seasonal footage). Within a given segment, a content-tag is randomly selected from the content-tag list, and the video clip sub-set is analyzed using a content-tag filter; resulting in a new filtered list whose output contains only videos with the current segment tag and the selected content-tag. Video clips are selected at random from this filtered list. The filenames of these selected clips will be fed to the video control module, to be displayed in the live video output. For *MediaScape*, each segment contains five content-defined sequences, and each content sequence consists of three video clips.

Transitions between the shots are generated live by utilizing the pixel values of the shots (luminance and chrominance) to replace the outgoing shot with the incoming shot. These transitions are well suited to the Ambient Video aesthetic and further engender the sense of constant but subtle change the artists desired. The system runs indefinitely, alternating the seasonal segments as it proceeds. For this work, there is no beginning and no end; shots do repeat, but not in the same order or context.

The effect of this method is the automatic generation of a series of coherent shot sequences nested within a larger thematically-based video segment. The artist's creative use of both the initial settings and the segment and content tags drives the resulting generated video thematic progression and viewer experience. There is still an element of randomness in the sequencing selections, which builds in an ongoing variability. This constant variation helps to maintain viewer interest over multiple viewings. At the same time, the tagging and selection mechanisms maintain ongoing content coherence and visual flow. This unifying connection of sequencing decisions produces an experience that is often 'read' by the audience as a traditional linear video built upon human-produced visual and semantic integrity.

4.2 AUDIO

Ambient soundtracks are generated by *Audio Metaphor*. Separate mixes are generated for each mode of tags associated with a video clip.

First, a commentary is analyzed for semantic and sentiment-based identifiers that are used for retrieving sound files from a database. A technique of searching for sound describing words is based on a premise that people use a simple syntactic structure for describing the acoustic environment (Dubois et al. 2006). The semantic analysis is a straight-forward methodology of keyword feature extraction and search query generation (see Thorogood and Pasquier, 2013), which returns recommendations, if available, for each of the keywords.

The emotional valence of an input text is determined by the sentiment analysis algorithm called *Synesketch* (Krčadinac et al., 2013). The algorithm classifies a text sentence as belonging to one of six emotional categories: happiness, sadness, anger, fear, disgust, and surprise. We compute the valence of a sentence by first calculating the accumulative scores for each of the six emotional categories. The maximum value of sadness, anger, fear, or disgust is subtracted from the value of happiness. The continuous value of valence is then returned, and used to sort the affective labelled audio segments.

Next, sound file recommendations are segmented and classified by supervised machine-learning algorithms and labelled with perceptual and affective properties. An audio signal is analyzed and segmented based upon classification of the sound as background sound, foreground sound, or a combination of both. The classification methodology is similar as that described in (Thorogood and Pasquier, 2013). The mood of an audio signal is predicted with a supervised machine-learning algorithm trained with data from a psychoacoustic study (Thorogood and Pasquier, 2013b). Multiple regression models are used to predict responses along two axes of an affect grid, which results in a second level of mood labels applied to audio segments.

Selection, arrangement, and mixing subsets of the labelled audio segments are then executed in terms of a planning problem, with constraints requiring a set of audio clips to be scheduled on a finite number of tracks, and a strict mix duration. In the *Mediascape* implementation of *Audio Metaphor*, background and foreground sets of audio tracks are created for each keyword group. The set of labelled audio segments associated with keywords are positioned along the timeline.

Each background track is made as a continuous audio layer by inserting and crossfading individual audio clips up to the duration of the mix. Any audio material additional to the mix duration is cut. Foreground tracks consist of an arrangement of audio clips based upon a criterion that increases the probability of a clip being inserted the further along the timeline after the end of the previous clip on the track. Levels of audio clips are automatically attenuated relative to a global value set by the author for background and foreground tracks. Future work with the audio mixing engine will investigate different planning algorithms and the interaction of audio clips' spectral properties.

Lastly, generated "dry" mixes are processed through a bandpass filter, reverb, and delay effect using the SuperCollider3 audio software (Wilson et al., 2011). Parameters of these effects are modulated based on tonal information received from the music generation subsystem of *Mediascape*. The processed multi-track mixes are output for real-time playback with the video clip.

Generating rich ambient audio tracks in a real-time environment provides challenges due to the time cost associated with processing high quality audio files. This problem is overcome by sending the commentaries and duration of video clips ahead of the video clip transition. Figure 2 shows the temporal order of messaging and generation of audio media. A message is sent from the video system at the start of

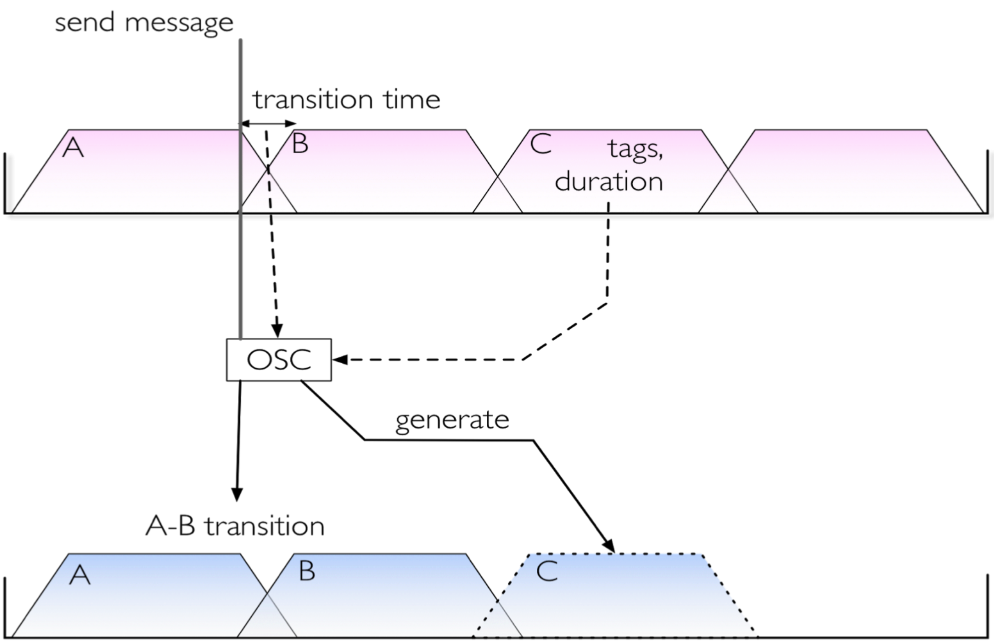

Figure 2 | The generation of ambient tracks is done ahead of the appearance of a video clip in order to allow for analysis, processing, and mixing of audio clips.

Figure 3 | Schematic of *MediaScape* system.

a transition, packed with the transition time from the current video clip to the next, and the commentary and duration of the video clip one more step into the future. *Audio Metaphor* receives this message, triggering the actions of crossfading into the next cued track, and generating the subsequent track to be cued.

4.3 MUSIC

Music generation is done in a free-standing system – *PAT*, or Probability And Tendency – which generates short compositions whose duration extends through three video clips. New compositions are initiated during the transition period of a video clip, and take approximately three seconds to generate; once created, the performance information is sent to *Ableton Live*, using *Max For Live*, for real-time performance. Compositions last between 84 and 96 seconds, ending before the transition of the third video clip; a new clip is then generated and its performance initiated prior to the transition.

PAT generates four musical parts: a melodic line, an arpeggio part, a harmonic sustained part, and a sustained bass part. All generation is based upon analysis of a given musical corpus. For example, the first material generated is the harmonic progression using algorithms described elsewhere (Eigenfeldt and Pasquier, 2010). Melodic material is then generated using a similar algorithm, followed by figuration (i.e. arpeggios) and drones. As such, each performance can be dramatically altered by providing the system with a completely different musical corpus.

As this is a continually running installation in which audiences will view the work for longer than three video clips, care is taken to alter not only the material generated by the music – the algorithms guarantee that each generation has a different melody, harmony, and bassline – but also its "feeling" and overall impression. These larger parameters include varying the music's tempo, the amount of activity of each part, the number of musical phrases per composition, the density of the phrases in the overall context, and the density of the drone material within user set constraints. Lastly, each part has a number of different timbres (synthesizer presets) from which to select for each composition: only one timbre can change between compositions, thereby ensuring a degree of consistency between consecutive compositions, while allowing for a random walk through the timbral space.

Further variation between music generations are achieved by utilizing *Audio Metaphor*'s semantic- and sentiment-based identifiers derived from the video's metatags. At the start of a three-clip video sequence *Audio Metaphor* sends its analysis of the video's tags to *PAT*, which uses this information to further alter its parameters for melodic, harmonic, and rhythmic generation. *PAT*'s harmonic information is sent back to Audio Metaphor, specifically the changing tonal centres, so that it could correlate filter cutoff frequencies within the audio tracks to the music.

4.4 PRESENTATION AND FEEDBACK

MediaScape was presented as a two-week installation as part of SIGGRAPH's Expressive 2014 Festival (http://www.ecuad.ca/about/events/314663).

Figure 4 | *MediaScape* in installation with viewers listening to separate generative audio streams.

The work was exhibited as a single video channel with four separate audio channels, presented to the audience through four headphones (see Figure 3).

Documentation of *MediaScape*, with examples of the different audio and music channels, can be experienced at http://www.sfu.ca/mediascape (see Figure 4).

Viewers were presented with an option to fill out a short questionnaire, that asked them about their response to the overall work, the different soundtracks, and whether knowing the computational basis of the work affected their appreciation. While not a scientific qualitative analysis, we did receive 25 completed surveys, with overwhelmingly positive feedback; some respondents did appreciate knowing its generative nature, while others simply appreciated the continually varying images and audio.

5 I FUTURE DIRECTIONS

From what we have seen in the literature and practices outlined here, research in regard to metacreative art is concentrated within individual domains rather than across media forms. We propose to continue to integrate our work in order to explore its metacreative multi-mediated potential. We will do this through the development of generative video systems that are fully integrated with sound and music metacreation.

Clearly, there are several difficulties with which we are faced, perhaps the greatest being that many of the tools used in music and sound analysis do not translate easily into video. Techniques such as recombinance work well in these domains when there is some understanding of the material; within audio, this can be derived from tools found within music information retrieval (Tzanetakis and Cook, 2000). While methods of meta-tags are already used in *MediaScape*, the machine learning utilized in *Audio Metaphor* has as of yet to be written for video analysis.

Further, we have begun research toward a system of generative sound design. Leveraging the successes from *Audio Metaphor*, this new system analyzes sentences and systematically selects and segments sound files. Using a state of the art planning algorithm, composition plans are generated and evaluated based on existing principles of sound design (Murch, 2007). This research has already shown encouraging directions for generative sound design. We see that the ambient video generation and this new development as a promising avenue for further investigation.

The current *MediaScape* aesthetic reflects the “Ambient Video” mood of the earlier *Re:Cycle* project. It relies on nature footage and slow pacing to create an experience that offers ongoing audiovisual pleasure, but does not require the viewer to pay close attention as she would in a traditional cinematic experience (Bizzocchi, 2008). Our future work will begin to reflect a more directly engaged aesthetic. We propose to explore the potential of an “open documentary” form as articulated by MIT’s Open Documentary Lab [1] that will involve two significant creative extensions on our part: the first is content gathering, and the second is a revised tagging/sequence structure. The content gathering will require a great deal of original media production work in new creative directions, possibly based on urban imagery. This will result in a sizable logistical challenge, as any new film would.

However, the second extension is more intellectually challenging. We will need to develop a more complex hierarchical tagging structure and a more sophisticated sequencing logic. *Re:Cycle* benefited significantly from the lower level tagging/sequencing mechanisms, but the fact that the goal was an ambient experience limited the need for more robust semantic coherence. An “open documentary” approach engaging more complicated cultural and

[1] http://opendoclab.mit.edu

social themes will require an increased sense of content sequencing, thematic progression, and movement to closure.

Our next set of works will fall short of commitment to a full-blown narrative or traditional “storytelling” operation. The development of a true story engine is a difficult task - one we will approach incrementally. Our goal will be a sense of “narrativity” rather than a classic narrative story experience. We have identified a sense of the dimensions of “narrativity” in computational forms through the analysis of interactive narrative in video games (Bizzocchi, 2007; Bizzocchi and Tanenbaum, 2012) and other media genres. Popular forms of narrative – such as mainstream cinema and novels – typically rely on the complete commitment to the narrative arc as the backbone and the engine for the storytelling experience. Other narrative forms, however, such as video games, song lyrics, television commercials, and the long history of generative narrative art show that narrative can follow other paths. The potential for “narrativity” exists in the design and presentation of character, storyworld, emotional tenor, and thematic sequencing. The development of micro-narratives and associated moments of narrative coherence within a generative system can approximate the work of the unitary narrative arc from more traditional forms.

Our work may ultimately approach a more complete commitment to unitary storytelling and the metacreation of a tight narrative progression and conclusion. However, this is a much higher order problem to solve – one that may or not be attainable in the context of our current project. A generative and recombinant storytelling system implies significant control over the details of plot sequencing, narrative arc, and narrative closure. This, in turn, will require much higher standards for computation, metadata tagging, shot selection, and sequence creation. The commitment to a less-constrained but still evocative sense of “narrativity” in an “open documentary” context is a far more reachable intermediate goal. The ongoing development of our documentary system will inch towards ever-increasing narrativity. We will analyze the works we create during this process to see how closely the system approaches the narrative coherence of a true storytelling system.

6 | CONCLUSION

In general, there is a continuum between traditional praxis or performance tools, and metacreations. At one end, the software simply acts as a tool to be manipulated by the creator: the artist or composer has to do most, if not all, of the creative work, by manipulating the various functionalities of the tool. On the other extreme, pure metacreations are autonomous and proactive in their creative choices, and require no human intervention once running (although human intervention is still needed at design time). Interactive systems that allow for a constructive dialogue, or interaction between the system and its user, are situated in the middle.

We have described several successful metacreations within music and sound art, including our initial exploration of interdisciplinary video/music/sound art work, *MediaScape*, which we believe to be the first such work. However, the history of generative narrative demonstrates an even deeper exploration of interdisciplinary metacreation. Our next step will be the exploration of the “open-documentary” form.

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