
Lost Time Accidents

A Journey towards self-evolving, generative music for interactive multimedia content

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Abstract:

Lost Time Accident is a series of compositions exploring the creation of interactive real-time soundscapes and compositions for the new media opera, *Ausländer und Staatenlose*. This paper explores the background to these compositions including the systems they are based on and the possibilities for a generative *sensorium* for multimedia and virtual reality content.

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Introduction

“The artist [is] an evolutionary guide, extrapolating new trajectories... a genetic sculptor, restructuring and hypersensitising the human body; an architect of internal body spaces; a primal surgeon, implanting dreams, transplanting desires; an evolutionary alchemist, triggering mutations, transforming the human landscape.”

“The act of playing the game changes the rules.”¹ Computers have the wonderful ability to make sense of distortion and turbulence, to fathom phenomena that we can but guide. And guide we do, by design and invention the algorithmic creations that process the complex array of tasks we have set aside for them.

Artists have played an important role in perceiving and ultimately developing new applications for computers. The most significant and obvious of these are evident within the realms of multimedia, virtual reality, the film and music industries. But there has been a long desire amongst many artists to produce work that utilises the elements of randomness, of chance. With the advent of computers, much exploration has been done towards the infinite, towards regeneration, within in the fields of digital imaging and sound.

In the late 19th Century, Ada Augusta, Countess of Lovelace and daughter of Lord Byron, inspired by the work of Charles Babbage, considered the possibility of a machine that could write music. That if one could define “the fundamental relations of pitched sounds in the science of harmony and of music composition ... [then] ... the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent”.²

In 1932, the journal of the League of Composers, *Modern Music*, published *Electricity, a liberator of music*, an essay by the Russian composer and musicologist Joseph Schillinger. A self-described scientist of artistic production, Schillinger believed that artistic creation “could be converted into a process of combining mathematically quantifiable factors of production.”³

Nearly one hundred years after Babbage’s work on the Analytical Engine, with avant-garde composers such as Karlheinz Stockhausen and Pierre Boulez at the helm, machines for composing, processing and analysing music were being constructed. Music, in particular electronic music, evolved into a science. Computers followed and became integral to the compositional process.

¹ Gleick, James. *Chaos: The Making of a New Science*. 1987, Penguin Books, New York, NY (ISBN 0 14 00.9250 1).

² Pratt, V. *Thinking Machines*. Oxford: Basil Blackwell, 1987.

³ H.H. Stuckenschmidt, *Twentieth Century Music*, World University Library, 1969.

Origins

Perhaps the earliest known generative music technology was a self-generating Aeolian harp, a Greek instrument named after Aeolis, the God of the Winds. It consisted of box with strings drawn across its openings. On windy days the strings would vibrate, modulating the air enough to create a soft, soothing chord. It would become to be known as the “Aeolian Mood”.

In the 1940's, Muzak developed *Stimulus Progression* programming, an “elaborate system that arranges songs according to tempo and time of day, taking into account the typical lulls that hit workers mid-morning and mid-afternoon.”⁴

Stockhausen is considered to have pioneered serial techniques⁵ in electronic music, a means by which a short series of notes, duration's, dynamics, timbres, etc., are manipulated by a combination of live instruments with electronics and multimedia performance. Composer, John Cage and many others inspired by his work, went on to create soundscapes comprised of arbitrary noise that was often punctuated by silence. These works were designed to be random, engaging the listener within the sonic construct of the environment they were either performed or installed within. But it was the minimalist composer, Brian Eno, who gave the elements of chance a more global audience.

Eno predicts that children of the 21st Century will wonder why we listened to the same music over and over again. Eno, since his early tape loop experiments, was creating systems “to make music with materials [he] specified, but in combinations and interactions that [he] hadn't.” Originally inspired by Steve Reich's 1960's tape pieces *Come Out and It's Gonna Rain*, Eno went on to create music that influenced the direction and proliferation of ambient music. He went on to become increasingly interested in the possibilities for publishing musical systems as opposed to pieces that had a definable beginning and end.

In 1995 the UK based company, SSEYO, sent Eno a CD of ambient music that they had created with their software, Koan Pro™, a generative music authoring package. Shortly afterwards, Eno impressed by what he heard, began working with and released in mid-1996, *Generative Music 1* on diskette. His vision, to distribute systems for music that were never to be heard the same twice, had been realised.

Koan's generative music had its origins in 1986 when SSEYO founders, Tim and Peter Cole, “wanted to create a computer music system which could affect you on an emotional level, by enhancing or filtering your perceptions, and provide ever-changing, eventually interactive, music.” In 1990 they developed the SSEYO Koan Music Engine (SKME) that enables the composition and harmonisation of music in real-time according to parameters set by the composer.

Koan Pro offers up to 150 “variable controls to influence and produce ... music as it goes. The values of these controls, some of which are time sensitive, are written into a SSEYO Koan 'piece' ... They determine the notes and melodies generated when you play the 'piece' through the ... SKME.”

⁴ Davis, B. Quote from *Hold The Elevator Muzak Gets Hip*, <http://www.timecast.com/story/muzak1.html>.

⁵ Serialism: a method of composition by which a short series of notes, durations, dynamics, timbres, etc., is manipulated by various means.

Generative Music and the Web

SSEYO's mission, according to their publicity, was to "...to create ever-changing beautiful music ... that can be integrated within a personal aural environment. The experiential and personal nature of music the SKME generates is ideally suited to WWW sites, and 3D WWW virtual worlds and gaming."

For those with access to the Internet, Koan-based music can be heard with a web browser plugin. The plugin is invoked by an embedded Koan file, which in turn calls up sounds from your soundcard. If you're using anything less than a General MIDI⁶ capable soundcard Koan files will sound terrible.

The plugin and all Koan player software contains the SKME. A web site kited out with Koan files will create new aural spaces every time it is visited. Koan files are generally smaller than MIDI files. An eight hour piece could conceivably take up less than 300k of valuable disk space.

The Web is transformed slightly by Koan. One enters an ambient, contemplative environment as opposed to a warehouse, a distribution point for information. Whether it becomes the Muzak™ of the web remains to be seen, but for now if one wants an aural metaphor for the ever evolving, ever changing and expanding web, generative music would have to be it. The web you surf through tomorrow will be different to the one you left today.

Generative music could be considered to reflect the organic nature of life itself, but in its present stage of development is incapable of growth. On their own, Koan pieces mutate but do not germinate. In that sense their generative capabilities are finite, but only with stand-alone pieces playing back through the SKME. However, creating generative music in real-time involves an additive process that further enhances the role of chance.

⁶ General MIDI - A set of sound patches agreed to by all major manufacturers.

Towards Interactive Composition

In April 1996 I spent a week in Sydney presenting a paper, *Generation - a digital aesthetic*, at the 1st Digital Aesthetics Symposium. I returned to Melbourne eager to listen to the pieces I had surrendered to Koan. It was as if each composition had journeyed far and wide and had returned, like close friends, to tell me tales of their adventures, mis-adventures and more.

I listened to them for at least an hour or more until I began to want to involve myself in the generative process. I wanted to work with the SKME in real-time and perhaps involve other people within installations, public spaces and multimedia.

The concept of interactive composition is not a new one. Improvised music is perhaps the most popular and well-known form of interactive composition, but mostly reliant on musicians processing and communicating musical ideas as fast as they possibly can. Computers can process much more information faster and over longer periods of time. If I could provide a computer with a cornerstone, it could perhaps construct an entire city whilst I populate it with new ideas. That city would continue to grow, to mutate and evolve in ways that I couldn't perceive. I was looking for an additive process in addition to the generative components of the SKME.

On February 2, 1994, the contemporary Austrian composer, Karlheinz Essl, performed *Lexikon-Sonate* as a live broadcast during the radio program *Kunstradio - Radiokunst*. Essl was exploring the performance aspects of "interactive real-time composition". Whereas Koan pieces re-generate, or mutate within given parameters, Essl's *Lexikon-Sonate* never repeats itself, providing "...a challenge to invent a particular performance situation that utilizes ... interactive facilities...".

Essl used a Bösendorfer SE Grand Piano and radio listener as players. Listeners could interact with a computer program by dialing a certain telephone number. "Whenever a call came through, *Lexikon-Sonate* would change its compositional behavior by adding a new and randomly selected module into its combination chain. In this way the totality of radio listeners would *govern* the form of the music, even though nobody could know the exact effect of their contribution."

If Koan changes the "compositional behavior" of the piece and other participants and I contribute to the sounds it would work with then we could perhaps head towards the notion of an evolving interactive composition.

Though primitive in nature to Essl's work, I nonetheless managed to achieve a series of interactive compositions by coupling up Koan via MIDI to various synthesizers and samplers. Each external component was fed by an individual pre-composed track within Koan. This in-turn was altered in real-time. Pitch settings, semitone shifts, ambient duration changes and mutation factors, panning, velocity and numerous other parameters were available. Pre-sampled audio files were inserted into Koan tracks and sounds on all the outboard equipment were changed, modulated, tweaked and re-tweaked in real-time to taste. All this was done whilst retaining the integrity of the original composition but allowing for change as determined by Koan and the data it was processing over the 5-10 minutes of each composition.

After several hours of experiments in both the studio and live performance/installation situations we arrived at a body of work entitled *Lost Time Accident* - the result of a synergy between composer and machine, each composition evolved via an engaging process unique to human/computer interaction.

A selection of these compositions can be heard with RealAudio software on the web site, <http://www.toysatellite.com.au/losttime/>. The site documents the process as opposed to offering the process in real-time itself.

A generative acoustic for multimedia and VR content

Although interactive and often engaging, multimedia CD-ROM titles generally offer static, repetitive experiences. Many new games on the market incorporate basic AI⁷ and Fuzzy Logic⁸ methodologies enabling the player's experiences to be "learned". Such an additive approach is yet to be fully explored within general multimedia content.

Given the generative qualities of Koan and the compositions and soundscapes created with it, there is great potential for the implementation of it within multimedia content. The creation of an acoustic space that never sounds the same twice offers the user a refreshing experience in addition to interactive content. Generative music is engaging. A fresh aural environment is created whenever, say, a CD-ROM title is fired-up, providing for new experiences and creative use of the content.

Several web sites already employ generative music, but very little, if any, creative work has been done in collaboration with other forms of multimedia content. It is my feeling that whole new area of creative content creation is yet to be extensively explored.

Imagine this... you fire-up your favorite CD-ROM title. You know all the introduction screens will be the same, the options and paths will be mapped out for you. But, the majority of sounds and all of the music will never sound the same twice. In fact, you'll want to get into that CD-ROM just to hear where the music might be going, and perhaps where it might take you.

⁷ Artificial Intelligence.

⁸ Fuzzy logic is a superset of conventional (Boolean) logic that has been extended to handle the concept of partial truth – truth values between "completely true" and "completely false".

Future music?

Will generative music influence the music we will listen to into the next century? Will Eno's vision for a commonplace generative music be realized? Will children be asking us questions about our current listening habits?

With ready access to software that provides for the creation of generative music we may find it filtering more and more into public spaces, including multimedia and web sites, than on radio. The genre is not yet fully defined, but its scope is broad.

Generative music adds to the creation of more holistic environments and experiences for people; whether it be a shopping centre, public mall or restaurant. These environments always change. Why shouldn't the music? The Muzak corporation has successfully integrated generative music concepts into to their *Stimulus Progression* programming evident in the *Music Plus*⁹ and *On-Premises*¹⁰ catalogue.

But much of our urban environments contain pre-constructed acoustic experiences. Shopping malls throughout the world are rife with re-constructed environments. Why create a lie for our ears? Generative music, and in particular the *Lost Time Accident* compositions, are not trying to replicate nature nor construct a pre-determined environment. They are comprised of the sounds and influences they were created in. Could such a process be integrated into the production of an opera, multimedia and virtual domains?

Walk through and listen to most urban neighborhoods and you will hear a rich diversity of language. Much like an ever-changing piece of music, language is perhaps the most original form of generative music; it evolves, mutates, and interacts, "transforming the human landscape", playing the game and changing the rules.

⁹ Muzak's 16 Channels of Satellite Business Music.

¹⁰ Muzak's Business Music selection.

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About the Author

Andrew Garton is a composer with an extensive background in experimental electronic composition, the performing and digital arts. He has spent a large portion of the past seven years working on public access computer networking/Internet projects in Australia, Southeast Asia and Indochina.

Andrew is founder of Toy Satellite, an artists run multimedia production house specialising in web site design and digital audio applications. It is comprised of a team of net-connected artists, designers, composers, programmers and consultants.

His most recent compositions received a merit award in the 2D Time-based category of the Melbourne Fringe Festival and Contemporary Art and Technology Digital Imaging Awards. They will be released mid-1997 by the Australian based record label, Psy Harmonics.

Andrew is also collaborating with the performance artist, Stelarc, on a range of generative soundscapes. His 30-minute composition for radio and real-time audio streaming on the Internet, *Sensorium Connect*, is being produced with the Australian Broadcasting Corporation's national radio program, The Listening Room.

He is currently engaged in a project-based MA at the Royal Melbourne Institute of Technology's Centre for New Media Arts, a non-traditional web-based opera titled *Ausländer und Staatenlose*.