Jungulator

A unique self-generative audio-visual tool that allows 14-17 year-old media, arts and music students and performers to create new compositions made up of layers of sound, text and video

Jungulator is a tool that encourages students to be both knowledge creators and information gatherers. Its unique properties and approach to the creative process could herald a breakthrough in mixed arts practice and learning.

Contents

Overview
From studio to stage to classroom

Jungulator was conceived when Futurelab came on board to help turn the unique audio-visual tool 'I am the Mighty Jungulator' into a learning resource for 14-17 year-olds studying or performing music, media or the arts. The original tool came into being during a residency at the Watershed Media Centre in Bristol, when the group of artists, musicians and programmers also called I am the Mighty Jungulator were exploring new ways of developing audio-visual material for the Arts Council England's New Media Projects Fund in 2003.

Initially it was conceived as a recording tool, used in conjunction with other audio and visual editing software for high-octane 'jungle' music, allowing the group to input, manipulate and output self-generative audio and visual material at great speed. They achieved this by programming layers of music or film – either their own or from recordings – with a series of pre-determined 'behaviours', such as an instruction to play at a hundred beats per minute. The emerging musical or visual

patterns can then be super-imposed onto each other, and when played back, are perfectly synchronised by an internal metronome, even if the patterns applied to each layer are different.

Thus a new piece of art, with a different mood, is born with every permutation, creating not just new music but new video imagery. "It creates near-infinite levels of self-invention," explains Jungulator co-originator Nathan Hughes.

As a recording tool it provided the Jungulator crew with a ready source of inspiration as well as fast outputs, and they took things a stage further when they experimented with it live on stage, triggering and manipulating ad hoc audio-visual samples with controlled randomness to create new effects.

Drawing on musical and artistic influences such as John Cage and the I Ching and marrying this with their work in community music, the group were eager to build on the software's potential. "Jungulator's responsive

The responsive environment has great potential to unleash creativity

environment can really unleash young people's creativity. I liken the process to making soup: you add elements and taste them, which helps you to decide what to add next. We find it helps young people to learn to work together as well."

Futurelab, excited by the self-generative aspect of the tool and its potential for supporting creative learning experiences, came on board to support the Jungulator project with a view to developing its educational potential, both in terms of providing an engaging and exciting learning tool and as a stimulus to the creative imagination.

Context
Self-generative systems

Self-generative systems are not something new; they have been around for hundreds of years. Wind chimes are an example as, when the wind hits the chime, it makes a new, different sound each time. Musicians/composers such as John Cage, Karlheinz Stockhausen and Brian Eno have all utilised generative art processes. They were interested in exploring the range of possibilities that could happen by chance and by accidental forces (such as when the wind hits the chime) and, with this in mind, created simple sets of rules to alter the original music in a random way.

More recently computer artists-programmers have adopted the term 'computer-generative art' to describe art that is co-authored with a computer that is programmed to randomly change the work. Jungulator can be considered as a computer-based generative art program: the user inputs the raw audio, visual or text sample, which the computer then manipulates by randomly applying a set of criteria to it, as defined by the user.

As Teresa Dillon, Jungulator's lead researcher at Futurelab explains, "Generative art allows programmers to define a set of rules or parameters which, once set in motion, can create 'real-time' unfolding works, with the added impact of unpredictability and chance. We believe this can lead to a variety of interesting uses in different learning settings."

Project goals

"A song can be created from a single note"

In order to achieve Futurelab's goal of creating an easy-to-use composition and performance tool of real educational value, the original program created by I am the Mighty Jungulator needed development. To start this process, we asked several key questions:

- How can we best integrate the audio-visual aspects of the tool and realise the software's full potential as a self-generative tool?

- What type of graphic interface would best support young people to work with ease when using Jungulator?

- What is Jungulator's potential as a learning tool and how can it support young people's creativity, composition and performance practices in both school and community centre settings?

- What kinds of support materials would we need to consider developing to use Jungulator in school and community centre settings?

With these questions in mind, we began to work with a team of developers and a graphic designer to build the new version. We also worked intensively with end users (teachers, community tutors and young people) from the beginning. They assisted in defining the needs and uses of the program and helped to progress the project.

The ingredients
## How we got there

The core programming environment

The software for Jungulator was developed using the graphical programming environment, Max/MSP, which enabled the developers to work simultaneously with layers of sound, image, text and video, as well as to write the necessary random functions. The end result was that in the new version a full nine layers of juxtaposed sound, visuals and words are now possible.

"Originally we wanted to be able to create music our own way, how we wanted it to be," says Matt Olden of Jungulator, "but we were constrained by a lack of technology. When we discovered Max/MSP it really clicked with us, but we took it a stage further when we added the visual element to create Jungulator as it is now."

Central to Jungulator is the mathematical element – keeping everything in time. Movie clips are matched for time to the sound clips,

and the sound clips are synchronised with each other by a metronome package. "It's essentially a clockwork machine modelled into the program," says Olden. "I call it a Meccano set for music – we've added bits on and joined up the elements to create a complex audio-visual tool."

For Futurelab to take the project to the next level, though, certain inherent disadvantages within the original programme needed to be overcome. First a new graphic interface, which would allow ease of use for young people, was required. Second, high-end graphic machines were needed to run the software due to the large amount of memory required. Third, there were various incompatibility issues between the Max/MSP programming environment and other systems (eg Director), which were overcome during the development period.
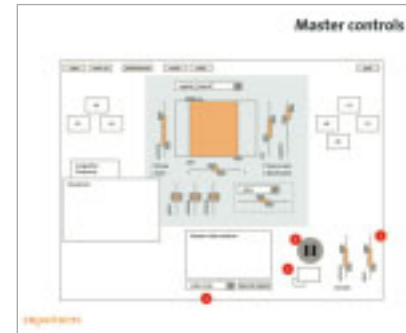
"It's like a Meccano set for music"

The software builds a symbiotic relationship with the user, creating new variations which can light the spark of an innovative idea

How it works

The starting point for creating a piece of music and film using Jungulator is to choose a musical sequence. Numerous sequences are pre-programmed, such as a cha-cha-cha rhythm – or a recorded or even live piece can be used.

Up to six music sequences can be chosen, and each can have different basic instructions or behaviours programmed onto it as the layers are built. These include:

- speeding the sequence up, or slowing it down; this alone allows the user to totally reinterpret the tempo of the piece – and create a whole song from a single note
- reversing the order of the notes or changing the order at random
- pitch – moving the piece up or down an octave
- pan – from left to right speaker at selected times, to create the effect of movement
- volume – can be increased or decreased at set moments
- mute – specified sections can be muted
- effects – echoes, resonance and other sound effects can be applied.

All the layers are put together and synchronised by setting the metronome to a specified pulse, eg a thousandth of a second. The sequencer pitches each part of the sound individually, creating a note from it, and puts the notes together to create music.

When video clips (maximum of two) are introduced, other parameters can be set including speed, order, hue and colour saturation. A text file can also be added, to move backwards, forwards or, at random, quickly or slowly across the screen. These layers are synchronised to pulse in time with the music.

Moreover, at the click of the mouse, the parameters can be randomly or logically shuffled, immediately creating a new audio-visual output every time, based on variations within the pattern. "It's like musical origami or the branches of a tree multiplying – every time you add or reprogram a layer, you create a new variation of the piece of music," says Olden.

The interface

A graphic interface for learners needed to be developed from scratch. A graphic artist and an interface architect were brought on board, and an extensive research and development programme started. The team also worked together in streamlining the original Jungulator, refining the functionality and making it more suitable for young people. Our main goals were to develop an interoperable tool (which links all the elements together), which allows users, no matter what their artistic background, to use Jungulator, as well as to create a tool of real educational value.

The Jungulator interface is now very different from the original Max/MSP version. "We had to make it much more user-friendly," explains Futurelab's Teresa Dillon. "Bearing in mind that our target audience is young people aged between 14 and 17, we had to make it much more intuitive and accessible. It was quite a challenge to keep the complexity of the options available on one screen page, within an easy-to-use composition framework. We had to balance maximum functionality with maximum usability."

The evolved Jungulator interface is, in Matt Olden's words, well suited to young people's needs: "It has bright colours, easy steps to follow and it takes a holistic approach which allows users to find the options available to them and create progressively more complex audio-visual output in a safe and friendly interface environment." Teresa Dillon adds: "We didn't want any risk of the interface putting young people off playing with it."

In its new format, Jungulator allows users to evolve their skills at their own pace, in tune with their own learning patterns. They can either focus on one layer of sound or film at a time, experimenting with the various options until they feel they understand them and are happy with the output, or they can throw everything together and then take the time to deconstruct and recreate it. The software allows young people to work simultaneously in all three modes – audio, visual or text – or they can concentrate on one mode over the others.

"We had to balance maximum functionality with maximum usability"

The audience

Jungulator is aimed at young people in the 14–17 age group, with a view to helping them explore their creativity inside or outside school. "There are lots of professional sequencing packages available for both sound and visual manipulations, used in professional studios, which are also used in schools," explains Dillon. "However, they do not always suit young learners. Also, there is a lack of quality software for this group which combines image, sound and text in the same way as Jungulator and which can be easily used in live performance modes – as far as we are aware, no educational software like it currently exists."

The value of developing such a tool is that it can release young people's creative potential and broaden access to new digital, multidisciplinary practices and learning. Additionally Jungulator provides young people with the opportunity to concentrate on their preferred mode of expression.

"The other thing we want to do is change the relationship between young people and computers," says Dillon. Currently the relationship is one-way, as what you put in, you expect to get out. With Jungulator, something else happens as the computer begins to randomly change your input. This fundamentally alters the relationship you have with the computer and challenges, for schools, the importance placed on quantifying individual authorship and originality of a piece of work. This is an exciting avenue to explore and questions the nature of the artistic process, where influences can be incorporated from many sources, as well as how such work is evaluated.

The research

The initial consultations started with an ideas-led investigative workshop which brought together an expert panel of secondary school arts and music teachers, community workers, and teaching software and technical experts.

The purpose of the workshop was to draw out three things:

• the role for self-generative technologies in the field of inter-disciplinary arts

• how such tools could be used in practical terms, to work with the curriculum and lead to suitable assessments in music and/or art exams

• the value of the software in terms of developing young people's knowledge and understanding of IT, along with the developmental questions raised concerning authorship and collaboration.

Following this, a practical workshop was held with a group of nine 14–17 year-old music students at Key Stages 3 to 5. The idea was to find out how the young people related to Jungulator in its original form, to define what was too complicated, and to show them paper designs for the modified, more user-friendly version. It was also important to find out what other experience they had had of music software, to see how that would influence their appreciation and understanding of Jungulator.

The information gathered was then drawn up into a wireframe sketch by an information architect, defining the new functionalities (such as the ability to save and edit work). Two further evaluation sessions were held to track progress and demonstrate the updates, followed by an intensive development phase, after which the refined version was then shown to:

• the same group of music students, to see how the specification had improved

• a new group in a community centre, as Jungulator also has great community arts potential

• a group of film and media teachers at a UK Film and Education Conference to see how the evolved Jungulator might serve the wider needs of multimodal arts development.

Findings

"Jungulator provides young people with an immediate, responsive multimedia tool and opens up the world of generative art"

1. Expert panel

One of the main questions raised by the expert panel was around originality – how does a teacher assess what part of the work is original, when the key assumption of Jungulator is one of self-generation? Therefore, relating particularly to the question of music, art and media exams, the panel recognised the need to be able to break Jungulator's use down into assessable chunks, by creating a history of the student's experiences with it. This led to the decision to incorporate save and edit functions to track progress.

Determining levels of progression was another vital issue. Teachers would need to be able to track a student's use of Jungulator, and students would need to be able to take easy-to-follow steps to progress from basic use to more advanced features. This opened up the debate about what support materials would be needed to guide students through defined stages which, in turn, led to further definition of the requirements for a user-friendly interface.

The capacity of Jungulator to stimulate creative thought and open up new ways of interacting with computers was confirmed.

2. School students

The students were given the chance to experiment with the original software and the sessions were recorded on video for analysis. They identified the need for colour, as well as clearly labelled functions so the user could be intuitively involved in different levels of activity at the same time, without losing grasp of what they are doing. The symbols also needed to be more easily understandable to allow users to take in bite-size chunks of information.

During the two progress-tracking sessions the students had the opportunity to compose a piece using the new software, and were then asked to assess its progress. On the practical front, the school children observed a marked improvement in usability, but had some further issues over the clarity of the labelling of specific functions. In qualitative terms some pupils, especially those not from a traditional musical background, found the randomness liberating. However there were some who would have preferred more command over the arrangement process.

3. Community centre students

These young people were from different backgrounds to the school group; many were not in traditional school and had different needs.

However, they observed many of the same things about usability as the school group, liking the user-friendly interface but also articulating the need for clearer cues and visual representations of how and when the computer was manipulating and changing their chosen raw material. Notably they were, if anything, more inspired to develop their own raw material; as one participant observed about the pre-programmed samples, "But they're not ours... or our type of music." On the whole, they felt empowered to take ownership of their creations and enthused to find out more.

4. Film and media studies teachers

The focus of this group revolved around literary and IT skills and, as arts and music teachers, they were encouraged to see a teaching medium which gave prominence to the visual and the aural over the written word. They saw Jungulator as an active storybook or 'digital scrapbook' which legitimised the visual arts along with music, and as a very useful tool for creative brainstorming.

Drawing on the discussions with the film and media practitioners it was concluded that, for inter-disciplinary arts to be successfully introduced into the educational system, teachers need to be familiar with the software and develop the skills for teaching combined musical, artistic and textual concepts, so as to enable students to learn in these various modes.

However, they expressed concern over the loss of traditional media skills, such as the potential to lose the ability to compose from scratch.
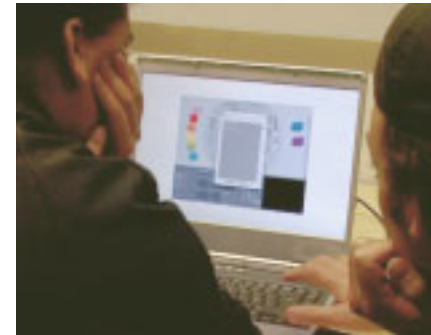
"Jungulator legitimises the visual and musical arts"

Next steps
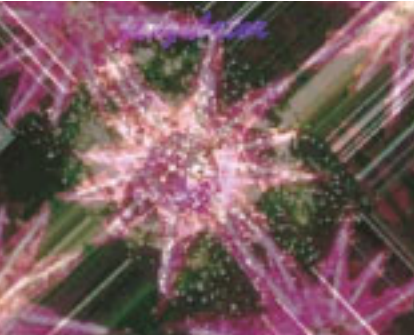
With so much valuable feedback gathered, and the project definitely heading in the right direction in terms of providing a sophisticated but easy-to-use tool for learning and creating, one next step has been to use it for a month at the Weekend Arts College (WAC) in London.

A VJ (visual jockey as opposed to disc jockey) has designed a teaching course for this month at WAC, further defining how it can be used as a teaching tool in a community arts setting. This month will also provide the opportunity to evaluate Jungulator as a live performance tool and to see what is needed in terms of support materials for teaching.

Futurelab would be keen to see Jungulator used as an active tool in young people's development, providing access to music and multimedia skills for those to whom traditional lessons in these areas are unappealing or not viable. However, within the school system, it will be necessary to develop suitable support material and assessment criteria, so that

Jungulator can become an active part of the media, arts and music curriculum. Our future vision is for the presentation of a digital scrapbook or performance of a piece composed and influenced by Jungulator to be acceptable for a music exam, fully linked to the curriculum with identifiable and assessable elements. In the meantime, the immediate goal is to see Jungulator being used in community arts projects as well as in live performance.

Into the future, it is hoped that a download of the software will be available, which does not need the high specification computers currently required. We also aspire to extend Jungulator's use into the field of professional music and film development.

"We'll now be able to assess Jungulator's role in live performance"

The team and our partners

The whole is always bigger than the sum of its parts and this project is no exception. Futurelab would like to extend its thanks to those that worked on Jungulator:

• Matthew Olden, Nathan Hughes and colleagues of I am the Mighty Jungulator

• Richard Caddick, information architect

• Philip O'Dwyer, interface designer

• Christian Wach

• the Department of Trade and Industry

• Max/MSP, Macromedia Director and Jitter technology.

Our thanks to all the young people, designers, artists and educators who worked with us on this project, and in particular many thanks to Tim Warren and Christine Bruzon, Kingsfield Secondary School, Bristol; Carolyn Hassan and all at the Knowle West Media Centre, Bristol; Ian Wall, Jane Dickson and colleagues at Film Education, London.
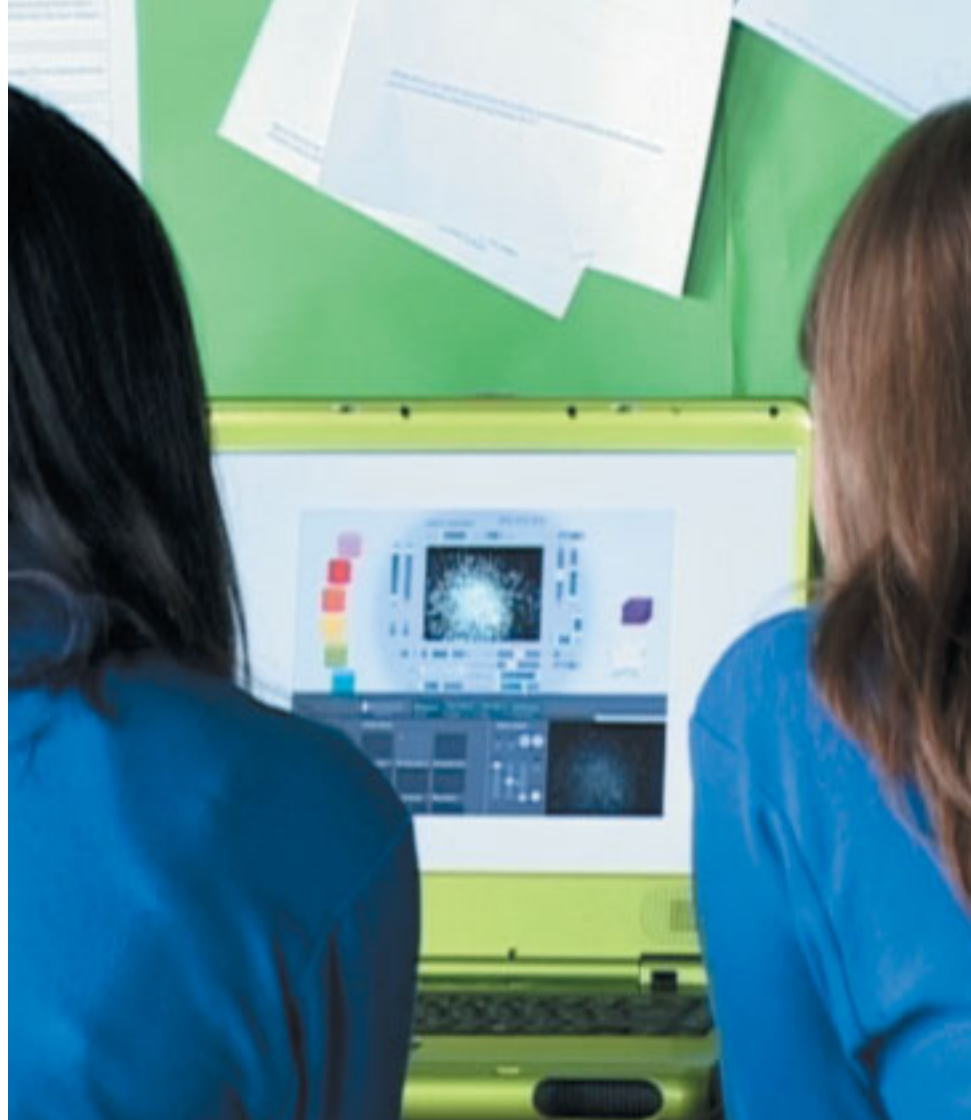
futurelab

Futurelab is helping to transform the way people learn. We're using new and emerging technologies and ideas to create rich learning resources that are involving, interactive and imaginative.

By bringing together the creative, technical and educational communities, Futurelab is pioneering ways of using new technologies to enrich and transform the learning experience.

Our activity comprises three inter-woven strands: research, prototype development and communications. These core activities enable us to act as a think-tank that nurtures new ideas and gathers intelligence: as an incubator and tester of early-stage and untested concepts; and as a hub supporting the multi-directional flow of information and knowledge between practitioners, policy makers, creators and learners.

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