Jungulator

Research report

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Team

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Technology (platforms and systems)

Apple Mac + PC + Max MSP

1. EXECUTIVE SUMMARY

Self-generative systems are rule-based structures that unfold in 'real-time', with varying levels of complexity. This paper describes the redesign and development of a new user interface for a self-generative audio-visual (AV) prototype called Jungulator. Modifying an existing version of this software, a new application was created for use with young people (14-17 years) within school settings, community arts education and as a professional artistic-performance tool. Within this paper our iterative, user-centred approach to re-designing this tool and the outcomes from our initial workshops are discussed, along with an outline of progress to date.

The main aim of the project was to extend and improve on the existing Jungulator software. In the original version, the audio and visual components of Jungulator were separate. The project supported the integration of both the audio and visual generators, creating an interoperable tool that allowed users (young people aged 14-17 years) to create their own unique arrangements. Integral to this phase was the development and evaluation of an appropriate user interface that facilitates young people's creativity when working with Jungulator.

We envisaged that Jungulator's two main functions would be as:

1. **A composition tool:** that allows users to input sound and visual sample files, carry out basic editing and manipulate the samples using various self-generative effects. We are also exploring the potential of enabling the tool to allow users to record and save their works.
2. **A live performance tool:** where ad hoc audio-visual samples can be triggered and manipulated in a responsive, spontaneous fashion.

Our key learning and research objectives were:

1. How can we best integrate the audio-visual aspects of the tool and realise the software's full potential as a self-generative tool?
2. What type of graphic interface would best support young people to work with ease when using the Jungulator?
3. 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?
4. What kind of interactions does Jungulator support?
5. What kind of support material would we need to consider developing for the use of Jungulator in school and community centre settings?

As with all Futurelab projects we were also interested in:

1. What this project tells us about the best ways of designing educational digital resources?

2. What this project tells us about how learning processes can be transformed through use of these tools?
3. How this project helps us understand the potential of next generation technologies to create intrinsically motivating and engaging learning experiences?

We have partially addressed the above research goals, successfully designing an attractive interface that retains the flexibility and responsiveness of the original system. We have made initial attempts at exploring how Jungulator may be used within school and community art settings and with a range of teachers from music, film and media. However further work needs to be completed as we have not touched on the kinds of support material necessary to develop for Jungulator. Additionally given that our current evaluations were more akin to in-depth usability tests, we need to examine the kinds of interactions that emerge when Jungulator is placed in a more authentic setting, over a prolonged period of time. To address this we are currently planning a more appropriate test session, embedding the software in a specially designed VJ course at a community arts centre in London.

To date we have shown that the new interface has the potential to engage young people, providing them with easier access to understanding the random generator functions of the software and allowing them to create real-time, novel audio and visual combinations. Feedback from the young people has indicated that Jungulator pushed their thinking in this field, as the random generator 'spews' out previously unthought-of AV combinations. However some work still remains to be done on the graphic interface. Both teachers and young people continually reiterated that its functions need to be made more explicit. Despite this, the young people found the interface enticing, that it warranted further exploration, and supported them in thinking about new ways of combining sound, image and text.

In terms of the kinds of interactions that Jungulator supports it was clear that participants' use of the software depended on their previous experiences and backgrounds. For example, young people from a traditional music background, who were studying music for their A-levels, expressed a preference for having greater control over the generative process. Such young people were more accustomed to having complete control over the compositional processes and found that they needed clearer definitions of when and where the random generator was applied to the material. Many others outside of the music tradition also expressed an interest in controlling the level of generation and also would have liked to have greater visual representations of how and when the randomisation was applied to the samples. For example, some asked for a timeline, which showed when the generator was applied, or a visual that showed when and how the generator was affecting the sample. One of the most responsive and enthusiastic participants was a young person who was already well accustomed to creating multimedia texts. This participant studied music, music technology, ICT and psychology and outside of school time created animated storyboards and comics. It was interesting to note how this participant worked with the software and he discussed how it could lead him to think of new ways to combine material, which he considered very useful and inspiring.

From the community centre evaluations participants also reiterated the need for working with samples that were your own 'type', ie samples which meant something to you or which you had created. This is important and unfortunately for the trial periods was not possible, which is why a second level of evaluations in community centre contexts, for a sustained period of time is necessary. Finally, from the observational notes gathered and from practical experience in demonstrating the software, it is clear that the kind of visual samples that best articulate the random generation possibilities of Jungulator were minimal, clear visuals. What is meant by this is that single-shot images, with only one central object, worked better than images with several objects in them. From the observations, participants who worked with single-shot images tended to get the most out of the visual generator.

Speaking with teachers and tutors from the areas of music, film and art, practitioners in this field found Jungulator an intriguing software, one which could potentially support young people's brainstorming skills as well as acting as an active storyboard or novel form of presentation. In a similar manner to the young people, teachers also considered the potential

of Jungulator in live performance contexts, such as in making visuals for dramas, music groups and in community art settings. However despite teachers' initial positive indications, they were apprehensive about the uses of the tool in secondary school settings, particularly in post-GCSE years. Many expressed concerns over assessment, noting that it was unclear with Jungulator which aspects of the work were the young people's and which were the computer's. Some teachers also questioned whether Jungulator would undermine traditional media skills, desensitising young people and undermining the craft skills which practitioners in this field have fought hard to retain within secondary school contexts. This raised questions about evolving practices in this field and what happens when the computer can do the task better than if a person was to do it manually. This led to a consideration of how such changes will affect practices in this area. Such questions were not resolved in this phase of development but indicated that the software raised a provocative set of questions about the nature of digital media-making practices and the ways in which they are taught in schools. Extending this, teachers also highlighted how Jungulator legitimatised audio-visual practices and provided a novel way of articulating and facilitating multimodal literacy practices. Our next phase of research should extend our work in this area, by providing insight into how a tutor scaffolds and structures lessons around Jungulator and how the multiple forms of expression which the tool supports are combined in a performance situation.

Additionally our evaluation sessions complemented the ongoing quality and assessment tests at the lab, highlighting major bugs which we addressed during the latter period of the project. Although some bugs do remain, we have a working prototype which will be embedded within a community arts centre during November and December 2005. At the time of writing we have already begun to plan these sessions, which will take the form of weekly, three-hour sessions, designed in collaboration with the Futurelab team and facilitated by a VJ tutor. The core aims of this extended period of research will be to address unanswered research questions and gain authentic insights into the use of Jungulator as a composition and live performance tool. Our goal is to build on the findings from our initial period of development, exploring in more depth the strengths and weaknesses of Jungulator from both a young person's and tutor's perspective. We also aim to have better understanding of the kinds of support materials necessary to develop for Jungulator and the skills necessary to use it a teaching tool. Our key questions for this period of development are:

1. How can we best design an appropriate activity to embed Jungulator in a community setting?
2. In this setting, what kind of composition/performance practice and interaction does Jungulator support?
3. What kinds of support materials would we need to consider developing to use Jungulator in school and community centre setting?

In sum, Jungulator builds on previous work in the lab, which explores the use of generative computing systems. The work complements our ongoing research in exploring how best to implement novel uses of computing and digital technologies within learning, by bringing together multidisciplinary teams to co-develop the next generation of digital learning tools. In addressing our key sector area, we conclude with the following key insights:

Educational research community and software developers

Findings from the research to date highlight the continuing need to develop appropriate rich multimodal learning resources (Buckingham, Grahame and Sefton-Green 1995; Gee 2003). Despite such research much of the software developed in this field tends to privilege one form of communication over another. Jungulator is a key example of, in one package, audio, visual and text-based material brought together to support young people's creative thinking and expression. The educational research community should be encouraged to practically articulate their research findings and work in collaboration with the software industry to co-develop meaningful multimodal tools. Jungulator is a step towards demonstrating how such product development can occur.

Teachers, advisors and head teachers

Based on the discussions with secondary teachers in the field of music and media studies, it is clear that the current assessment criteria are hindering rather than opening up the potential for new modes of practice within these fields. Many of the teachers discussed their concerns over the current assessment procedures, where authorship and originality are highly valued and central to grading process. Jungulator throws issues such as authorship into the air as it introduces a new mode of practice to schools, whereby pupils work in partnership with the computer to create new AV compositions. However as authorship and originality are so central to GCSE and A-level assessments, Jungulator was relegated by many teachers to the pre-GCSE years. This waters down the full potential of the tool as teachers considered the software purely as a brainstorming tool and neglected its use as a sophisticated composition and performance tool. In addition, aside from one art teacher who was part of our original expert group, none of the other teachers in this evaluation adequately connected Jungulator to professional art practices. Sadly many of the practitioners we spoke with failed to make the connection between contemporary art practices and the work of seminal artists such as Cage, Stockhausen and so forth and that of Jungulator. In this respect, as many of our previous projects have shown, in making a case for the use of new digital tools for learning, it is crucial that we re-educate teachers and tutors and provide adequate support material, which highlights how the tools we develop relate to real-world practices.

Policy makers

As highlighted in the previous section, the assessment procedures we currently have in place within the UK hinder rather than support certain digital practices. As many (Kimbell 2004; Ridgeway and McCusker 2004) have discussed this situation urgently needs to change. Building on the lessons gained in developing other digital prototypes at Futurelab, it is also clear to us that neatly ordered timetables do not necessarily support rich or prolonged immersion in digital practices. Forty-five minute classes do not provide the necessary time to truly explore softwares such as Jungulator. Consequently policy makers not only need to redefine how we assess digital media practices but also how we meaningfully embed digital resources with schools.

2. INTRODUCTION

Jungulator is the title of a self-generative tool that Bristol based arts-music collective I am the Mighty Jungulator (IATMJ) have been developing over the last three years. The project originally developed in response to the group's artistic and live performance needs. As a collective of artists and musicians the group were interested in developing improvised situations, where the material generated was constantly evolving and emerging through the interactions between the musicians and their material. IATMJ were heavily influenced by the American experimental music composer and writer John Cage (1912-1992), and his concept of 'chance music' or what others have called aleatoric music, where elements of the music are created by chance. Aleatoric (or aleatory) music[1] is music in which some element of the composition is left to chance, or some primary element of a composed work's realisation is left to the determination of its performer(s). The term was coined by Werner Meyer-Eppler (1959), a physicist and director of the Institute of Phonetics at Bonn University, Germany[2].

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[1] Definition taken from en.wikipedia.org/wiki/Aleatoric_music. Access date: 30 August 2005.

[2] Meyer-Eppler was one of the founders of electronic music, creating the first synthesised sounds. He worked alongside another well-known figure in this area, Robert Beyer, and together in 1952 they founded the first electronic studio in Cologne, Germany. In 1950 both Werner Meyer-Eppler and Beyer gave seminal lectures at the Darmstadt summer course for new music; their lectures were highly influential in the development of electronic music and the courses were attended by emerging European composers such as Boulez and Schoenberg. Over the last century Cage, Boulez, Scheonberg and Stockhausen were some of the composers who pushed forward Meyer-Eppler and colleagues' work and redefined our understanding of music and composition.

Drawing predominantly on the works of Cage and his use of aleatoric processes and chance in composition and art, Matt Olden from IATMJ began to develop software that allowed the element of 'chance' to continually influence the compositional process. To do this, Olden developed the Jungulator, which married features from traditional AV software with random algorithms embedded within the programming language Max/MSP. In using randomisation, this increased the possibility of chance and underdetermined events to occur. Consequently the aim of the software was to increase the possibilities of accidental, improvised happenings by taking away some control from the user and in turn creating a more reactive, responsive human-computer system. In this way Olden created a piece of software which allowed the IATMJ to randomly generate new material every time they rehearsed, recorded or played during live shows.

In developing and refining Jungulator and their live performance style, IATMJ began to use the software within community arts and workshops. Over the years, IATMJ have gained a reputation for facilitating energised, educational workshops which inspire young people of all ages to create their own AV compositions. Much of their work has been with 14-19 year-olds, particularly those from disadvantaged communities, empowering them to use Jungulator to tell their stories.

However despite the success of the IATMJ workshops, they were intensively facilitated by members of the IATMJ group. Often workshops were held with 3-4 members of the group present and much of the work on the Jungulator software was supported by the team. Due to the software's complex interface (refer to Figure 1), the IATMJ team members often had to work side by side with participants so that they could use the software. In addition despite the group's vision to create an integrated AV tool, the audio and visual aspects of the software were separated.
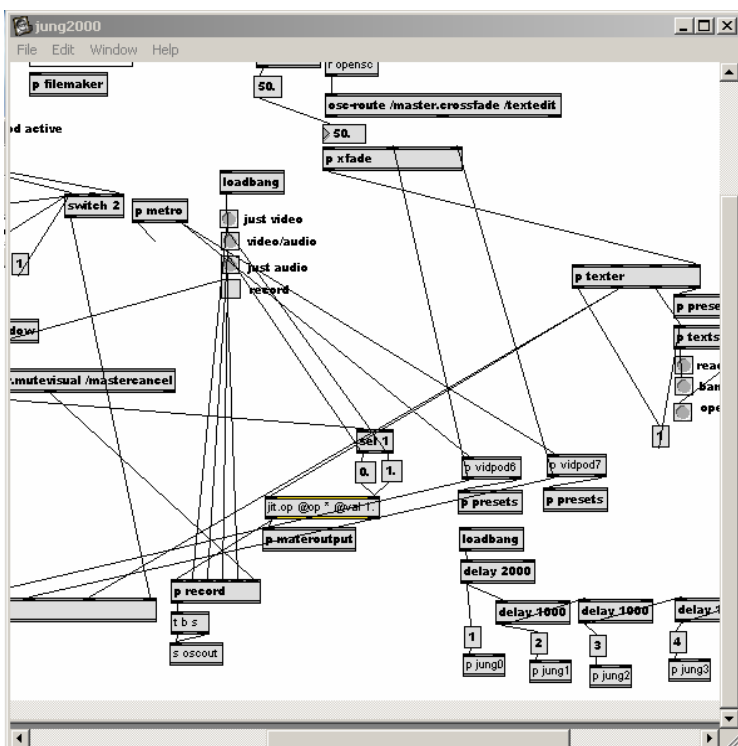

Image 1: The original Jungulator Max/MSP window interface

Consequently in many cases the IATMJ team, rather than the young people, mixed the final versions of the composition. As a result the software was limiting as it failed to allow the young people to take full ownership of the creative process. On a positive note, it was obvious to the

Futurelab team when observing the workshops that the software provided young people, particularly those outside formal learning, with a motivating and responsive tool for creating AV compositions and for developing new multimedia skills. For these reasons, Futurelab was interested in supporting IATMJ in developing the tool and integrating the audio and visual aspects of the software. From a learning perspective Futurelab was also interested in exploring how Jungulator supported multimodal digital media practices, which maximised the tool's potential. Acknowledging the potential of the tool, our key research questions for this project are stated below.

3. RESEARCH FOR DEVELOPMENT AND RESEARCH AIMS

To address our interests it was necessary to develop a new interface for the Jungulator. In doing so our key aims of the project were to:

1. Integrate the sound and visual generators.
2. Develop an appropriate graphical interface, which would allow users (young people and educators) to create their own self-generative audio-visual compositions.

Alongside these practical design issues, we were also interested in exploring the following research questions:

1. How can we best integrate the audio-visual aspects of the tool and realise the software's full potential as a self-generative tool?
2. What type of graphic interface would best support young people to work with ease when using Jungulator?
3. 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?
4. What kind of interactions does Jungulator support?
5. What kind of support material would we need to consider developing for the use of Jungulator in school and community centre settings?

As with all Futurelab projects we are also interested in:

1. What this project tells us about the best ways of designing educational digital resources.
2. What this project tells us about how learning processes can be transformed through use of these tools.
3. How this project helps us understand the potential of next generation technologies to create intrinsically motivating and engaging learning experiences.

In addressing the above learning and design questions, we envisaged that the Jungulator's two main functions would be as:

- **A composition tool:** that allowed users to input sound and visual sample files, carry out basic editing and manipulate the samples using various self-generative effects. The initial Jungulator software did not allow users to edit samples, nor did it provide any way in which created material could be recorded and saved. In upgrading the software Futurelab was keen to add these features.
- **A live performance tool:** where ad-hoc audio-visual samples can be triggered and manipulated in a responsive, spontaneous fashion.

4. THE CONTEXT FOR THE JUNGULATOR PROJECT

The following discussion provides the context for the development of the Jungulator software. It explores the literature in the areas of multimodal digital media practices and generative art. It also reviews the strengths and limitations of the Max/MSP programming language in which the software was produced. Finally, it examines a range of different software packages for music and visual education, as well as professional visual jockey (VJ) tools.

4.1 Overview of current art practices in secondary schools

Since the 1980s, computing technologies have become a core part of many secondary school subject areas. In comparison to must subject areas, within arts and music computers have been become part and parcel of the learning experience, with various pieces of software now commonly used by young people for film-making, photography, animation, product design and music. Acknowledging the use of ICT in art and design, a recent Ofsted report notes:

> "In art and design, ICT is used as: a creative medium – often in combination
> with other, more traditional, media; a research tool; and, especially on
> examination courses, a means of producing written coursework, sometimes
> involving the amalgamation of images and text. Where departments have
> interactive whiteboards and presentational software, teachers are able to use
> ICT to introduce modules of work, explain digital or other, more traditional,
> art processes, or connect the class to materials relating to a particular artist
> or genre. Presentational software is also used by pupils to share research
> findings, for instance." (Ofsted 2004, p4)

Despite these positive findings the report importantly discusses how a third of schools do not use ICT effectively within art and design. ICT practices in such schools fail to challenge or sufficiently engage young people in artistic problems, with computers being used to do little more than colouring in electronically or downloading barely understood material from the internet. Similar findings have also been discussed by researchers (Dillon, Joiner and Miell 2001; Mills and Murray 2000) who have examined the role of ICT in music, particularly in the pre-GSCE years.

From a film and media perspective, schools have also realised the potential of ICT in providing students with the facilities to record, edit and produce their own short films. Although practitioners within this subject area have been responsive to the use of ICT within their teaching practices, as Burn notes (2005), such opportunities raise a series of provocative questions such as:

> "How might students learn what they need to learn in my subject through
> the medium of the moving image, alongside the more traditional modes of
> reading, writing and number; or as part of curriculum areas already involved
> in forms of making in other media, such as Art, or Design or Technology?"
> (Burn 2005, p2)

Within this project, similar concerns have been raised by film and media and music teachers, particularly given that in Jungulator the computer plays a major role in the developing composition.

Questions were raised about authorship and ownership and how, in developing a piece in partnership with the computer, teachers might adequately assess young people's work. For example, how can a teacher differentiate between work created manually and potentially over long period of time, with that created 'on the fly' using Jungulator? These questions arose, in part, in the context of current assessment practices but were equally influenced by teachers' concerns that traditional media practices will be lost. Addressing some of these concerns Loveless (2002a), in her review of creativity and new technologies, notes that assessment is

an ongoing area of concern, and one that has not been satisfactory addressed. This is in spite of the NAACCE (1999) report 'All Our Futures', which called for a re-evaluation of our assessment procedures.

In the current assessment and curriculum context software such as Jungulator tends to be relegated to use in the pre-GSCE years. However this can lead to a situation in which highly creative digital tools, which support outputs that are not easily assessed, are used as simple brainstorming tools, for pre-GCSE years.

4.2 The digital creative process

As Burn and colleagues (Buckingham 2003; Buckingham et al 1995; Burn and Durran 1998) note, the advent of digital production technologies has allowed the lay person to become producer as well as audience of media texts (ie cinema, film). The same could be said for home music studios which now allow 'ordinary people' to make and edit professional music tracks in ways not previously possible (Dillon forthcoming-a). Drawing on a series of studies (Reid, Parker and Burn 2002) carried out in partnership with the British Film Institute, Cambridge University and London Institute of Education, Burn (2005) argues that it is reasonable to consider digital movie making as a:

1. **Creative process** – involving students making aesthetic choices about how to present themselves in their world.
2. **Social process** – in which students take on different roles, collaborate with each other and draw on their cultural experiences.
3. **Cultural process** – whereby students learn about the powerful nature of moving image.
4. **Literacy process** – which involves using a 'language' of moving image with its own 'grammar' of shots, transitions, soundtrack, titles and so on.
5. **Complementary process** – it can support and augment teaching and understanding in other curriculum areas.
6. **Fluid, flexible learning process** – which is best taught by teachers who understand the nuances of the media. It can offer young people iterative learning opportunities (ie learners can edit movies in successive sessions); instant feedback (ie work can be viewed immediately and so inform the next stage); integrated process (ie it incorporates other media and applications) and distributed process (it can be delivered in a variety of ways, DVD, projected, online).

Burn's understandings of the digital movie making process complement conclusions from the Loveless (2002a) and NACCCE (1999) reports, which have highlighted how the unique features of digital technologies lead to the emergence of distinctive working practices and skill-sets.

Loveless further states that we also need to understand how young people actively make such tools their own, particularly when working in different areas. As Loveless notes, "learners and teachers need to have a range of experience in which they engage and, play and become familiar with the distinctive contributions that ICT can make to their creative practice" (2002a, p12).

4.3 Self-generative art

Much of the thinking about how we create work using digital technologies examines a situation where the learner has full control over all creative and aesthetic decisions. For example, users control and decide on the samples they want to use, their arrangement, treatments and so forth (Buckingham et al 1995; Dillon 2003, 2004; Loveless 2002b; Loveless and Wegerif 2004). However in the case of Jungulator, this relationship is turned on its head. With Jungulator there is a more reciprocal relationship between the user's input and the computer's

output; once the user has selected their sample and defined the types and degree of treatment they want, the computer automatically begins to change and manipulate it.

In this respect, the computer could be considered as a 'partner-in-kind', reacting randomly to the user's input and influencing the outcomes of the creative process. In such a relationship, although the computer may not be 'intelligently' responding to the participants' inputs, it none-the-less is providing the user with continual, random feedback. This, we believe, can significantly contribute to and influence the artistic process. In this respect the young person *works with* rather than works on the software to create a new product. To better understand this partnership, writings from the field of generative art are helpful.

In discussing 'The Methodology of Generative Art', Ihmels and Riedel (2004) argue that generative art is a way of describing a particular working process or method, which can be found in nearly every area of artistic practice (eg music - Mozart, Cage, Stockhausen, Eno; computer programming – Conway's 'Game of Life'; architecture - Le Corbusier). In analysing these artists' working methods, Ihmels and Riedel claim that a similar story can be told, whereby the artist devises a set of rules or criteria which they impose on their chosen material. For example drawing on the work of the fine artist Max Bense, Ihmels and Riedel (2004) note that quite early in his work, he introduced the concept of 'generative aesthetics', defining it as:

> "…the combination of all operations, rules and theorems […], that can be applied to a number of material elements functioning as symbols and through which aesthetic conditions (distributions or arrangements) can be produced deliberately and methodically." (Bense 1965)

In more recent years the term 'generative art' has been appropriated by the computer art community to describe self-evolving artwork. Such works are generally created by artist-programmers who define a set of rules or parameters which, once set in motion, operate with varying degrees of autonomy to create, often in real-time, unfolding works (Cox 2002; Galanter 2003; Ward and Cox 1999). Unpredictability and chance are considered integral aspects of this kind of art.

In relation to computer-generated art, it is the software itself that begins to 'co-author' the content and so becomes a central player in the evolving piece. In characterising this process, Arns (2004) considers computer-generated art as an evolutionary, diverse process, whereby the artist enters into a creative partnership with the computer. Within this relationship the artist plays with the parameters or rules of the system until the final results are aesthetically pleasing and/or in some way surprising, conveying an emotion and/or begging a question. Through this process new shapes, organisms and connections emerge, which are unexpected and unforeseen[3].

Drawing on such artistic understandings, Jungulator can be described as a custom-made random generator, where users select and input pre-recorded audio, visual and written text samples and set the parameters or criteria for how they are to be treated. Once this is done, the computer begins to randomly apply these criteria, effecting the evolving composition in real-time. In this respect we can consider Jungulator as part of the spectrum of generative art systems in that the program is autonomously influencing the outcome of the composition by generating a different and unpredictable AV outcome each time. Drawing on the characteristics of such systems, Jungulator can be described in the following ways:

- from a basic of set of rules an infinite number of AV combinations can happen
- every time, something different happens
- combinations are random and unrepeatable

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[3] Codemuse, codemuse.net/html_files/GenerativeArt.htm. Access date April 15 2005.

- responses are sensitive to circumstance, condition and situation – ie it responds differently depending on who is using the software, the amount and kind of samples that are inputted into the system
- multi-centred and non-linear – the randomness is applied in a web-like way, which become more or less active as the composition evolves
- throws questions of ownership and originator into the air – it is difficult to define at any given moment whether the computer or the person is the originator of an idea or combination.

Although professional artists have been aware of generative art practices and the use of computers to create art in this way for some time, schools seldom draw on such traditions. Consequently such partnerships between computers and young people are overlooked, despite generative art and the role of chance and indeterminacy playing a significant role in contemporary art practice. In this respect Jungulator provides a way into young people exploring such practices, while simultaneously providing them with the possibilities of working in a more sophisticated way with the computer. As far as we are aware, from an educational perspective, Jungulator is the first audio-visual tool of its kind to explore how learners can co-create art using more reactive computing systems.

4.4 Commonly used audio and visual software for art education

Jungulator can be described as a hybrid 'multimodal' arts tool which combines the practices of music, image and text production and manipulation. It sits most closely within the practices of media studies in school and the culture of VJ-ing. In order to understand what is distinctive about Jungulator, this section briefly discusses the most commonly used software for AV activities in schools and community centres. In the project development process, this review also provided the basis for our understanding of the conventional representational and semantic forms which are embedded in existing AV software.

4.4.1 Music

Within music education the most commonly used packages are sequencing packages such as Steinberg's Cubase[4] and Apple's Logic[5]. Recent versions of Logic now support QuickTime (see Image 2), which allows users to carry out some basic visual linear editing techniques while simultaneously creating the music. These types of technology are designed predominantly for professional use but have been appropriated in learning settings and used to teach traditional music composition, arrangement and editing skills.

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[4] www.steinberg.de/Steinberg/defaultb0e4.html

[5] www.apple.com/logicpro/

Image 2: Apple's Logic window interface

The most successful company to repurpose its music products for the educational market is Sibelius[6]. Sibelius considers itself to be the leader in this field and has created a range of more 'child friendly' interfaces for music education (see www.sibelius.com/education).

Aside from the more traditional composition software there is also a host of music software which is aimed at engaging young people in making pop, dance or hip-hop music. Sampling packages such as eJay or basic composition editing packages such as Apple's Garage Band have also become very popular in schools. Although initially targeted at the entertainment market, these tools have been appropriated in school settings and have become some of the most popular sampling software to be used in primary and lower secondary school settings. Central to the success of such software is its user-friendly interface, which allows young people to 'see' as well as hear their compositions (for further information on the uses of music technology for education refer to Dillon 2003, 2004). However, despite such advances there is a lack of engaging, post-16 music technology for education.

Image 3: Apple's Garage Band interface

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[6] www.sibelius.com/cgi-bin/home/home.pl

The software to which Jungulator is often compared is Ableton's Live. Live is music sequencer software which, like Jungulator, was initially sketched out in Max/MSP and later developed into a commercial package using C++. Similar to Jungulator, but unlike the previously mentioned sequencing software, Live has been designed for musicians by musicians and specifically for live performance contexts. The advantage of Live is its compact interface, there are no hidden windows or pop-up buttons and so all functionality is on a single screen.

Additionally, because of the performance aspect of Live's design, all of the processing is done in real-time, rather than rendering effects prior to playback as is typical in many sequencers and sample editors. Live is predominantly used by electro musicians and DJs, and like Jungulator can also be used to work with live samples, beat matching them so as to make them easier to mix and play. Despite its potential, Live is very rarely used in schools or community art settings; reasons for this are unclear but it may be because, in comparison to the other software, Live is not produced by a large company and would not have the same level of marketing, therefore teachers may not be aware of its existence or potential.
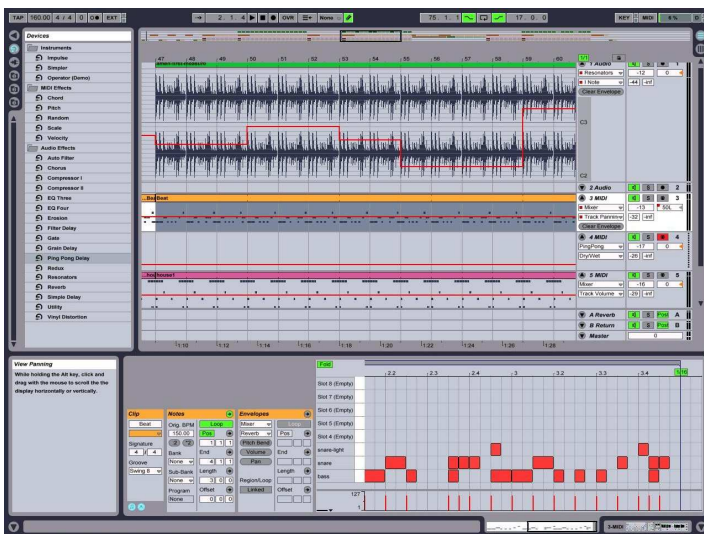

Image 4: Ableton, Live arrangement window interface

4.4.2 Image production and manipulation

The standard image manipulation packages used in education are Adobe Photoshop and Apple QuickTime Movie, with some schools introducing Macromedia Flash and Adobe Premiere to A-level students. As with the music packages, image software was originally developed for professional contexts and repurposed for learning. Due to the success of software such as QuickTime in learning contexts, Apple now has a comprehensive web presence documenting its uses across a variety of international educational projects (see www.apple.com/education/). However, in comparison to music software, which tends not to be platform-specific, most image manipulation software is Apple Mac-based. Photoshop allows users to edit pre-made images and create graphics; QuickTime Movie is used for basic non-linear film-making and editing, while Premiere is one of the top professional packages which allows you to edit and produce high quality films. As with the music packages, visual software has a particular 'language', or what the New London Group refers to as a set of representational resources, through which users interact with the software. As Sefton-Green (2005) notes in his recent analysis of how visual software influences creative processes, many visual software packages follow similar design conventions. According to Sefton-Green this can flatten out differences between media, reducing production to a single process, which influences not only what is created but also how it is created. Dillon has discussed similar issues in relation to music software (Dillon forthcoming-b). In relation to Jungulator it was important for us to keep in mind the forms of representation that young people would be familiar with while simultaneously avoiding the 'flattening' effect.

Image 5: Premiere project window interface

4.4.3 VJ-ing

The concept of mixing live visuals with music has a long history, which can be traced back to early explorations in cinema and moving image. Over the last ten years, with the rise of the visual jockey (VJ) in clubs, a host of live visual mixing software has come on the market. Most VJ-ing software shares the timeline interface common to musical and video programmes with the image-clip window commonly found in video editing programmes. The majority of existing VJ-ing software (eg ArKaos, VJamm) allows users to edit and manipulate a visual stream in real-time via customisable effects and double monitoring management (ie two windows in which you can see your work and its outcomes). The majority of VJ-ing software is compatible with music sequencing packages such as Cubase, Logic or Cakewalk and can usually run on both Macs and PCs. As with the music and visual software previously discussed, VJ-ing software is predominantly developed and used in professional contexts. Few schools tend to have such software, except for some specialist arts centres, eg Weekend Art Centre (WAC) in London. Consequently WAC was the ideal place to embed Jungulator over a sustained period of time.

Image 6: Arkaos interface

4.4.4 Self-generative music software

The most well-known commercially available self-generative music software is SSEYO's KoanPro (refer to Image 7). Koan was developed in collaboration with the artist and musician

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Brian Eno, who since the 60s has pioneered generative music. Again Koan is a made for professional rather than educational uses, and the screen grab below shows that like all music packages it works on a timeline basis and packs a significant amount of detail into the main project window.
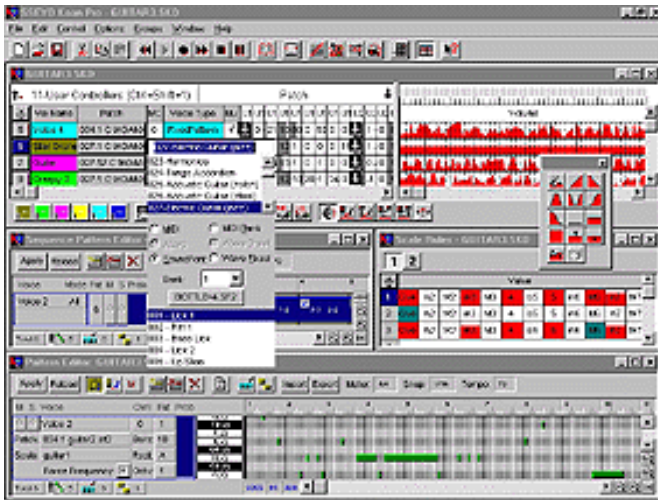

Image 7: KoanPro, SSEYO generative music software interface

Aside from Koan, which explicitly markets itself as a generative music package, there is a host of research and related generative music projects which fall under the heading of artificial intelligence. There is also a wealth of research in this area, in which musicians/programmers have used rule-based systems to generate computer music based on understandings of tone, harmony, voice, melody, body movements, styles and genres of music (Baird, Blevins and Zahler 1993; Dannenberg and Bates 1995; Thom 2001; Walker 1997). For a comprehensive overview of such work it is worth reading de Mantaras and Arcos' (2002) review.

Although it is relevant to flag up this AI music research as it links into the previous discussion on self-generative art, Jungulator should not be considered as intelligent, it is a random generator and in this respect does not make intelligent decisions based on users' input.

4.4.5 Implications of overview of audio-visual software for learning

This overview emphasises the absence of AV software in schools designed to allow young people to mix sound and image in the same way as Jungulator. Such software that is used has been designed for professional situations, and has been reappropriated for school contexts. As a result, such software usually does not take into account learners' needs and requirements, and has overly complex levels of control and buried functionality (Dillon 2003, 2004, forthcoming-b; Sefton-Green 2005).

In the light of these conclusions our key design goals were:

- to reduce the level of complexity offered by the previous Jungulator system
- to streamline Jungulator by bringing to the fore key effects that young people could use to achieve a wide variety of outcomes
- to provide a clean, simple-to-navigate interface which invites users to play
- to bring the generative aspects of the software to the fore
- to provide a tool which would allow learners an easy entry level but also provide more experienced users with appropriate levels of progression.

5. DESIGN PROCESS

Once an initial scoping of the market and literature (as outlined above) had been completed, the next stage in our design process was to identify schools and community centres as well as advisors from educational research and teaching who could act as external expert critics of the project throughout its duration. The following sections summarise the key findings from our initial discussions with these groups.

5.1 Working with end users in the development process

To achieve our design and research goals, we draw on what has been termed as 'informant design' principles (Preece, Rogers and Sharp 2002; Scaife, Rogers, Aldrich and Davies 1997). The aim of informant design is to discover something not previously known. Rather than treating young people and educational practitioners as equal partners in the development process, this approach involves user groups at various stages when their expertise can be maximised and their knowledge is required. Young people and educational practitioners are conceived as 'native informants' who are able to identify problems from within their educational experiences, and separately identify the kinds of problems that they encounter within specific subject-related contexts, as their views are likely to be quite distinct (taken from Williamson 2004). During the period of development we worked with external experts and young people aged 14-17 years in school and community centre art settings as described below.

5.1.1 Expert workshop 1

On 21 October 2004, Futurelab held a one-day external expert workshop. The aim of the workshop was to bring together key experts to discuss their views on the Jungulator software and how they would use it within their own practice (eg within the school curriculum, as an artistic tool, or as a community centre resource). The external experts were also asked to identify previous research and practice, to challenge the project against its educational objectives, and to provide a disinterested perspective on the project.

Attending this workshop were specialists from the fields of visual and film arts practice, secondary school music education, secondary school arts education and music technology (see Appendix 1 for list of attendees). On the day, workshop participants were given an overview of the project followed by a period of open discussion focused on three key questions:

1. What might be the role for self-generative technologies within interdisciplinary arts practice?
2. How would self-generative tools impact on the curriculum, assessment, artistic development and learning?
3. What do you consider important when designing digital resources for interdisciplinary arts practice?

Overall the outcomes of the expert workshop (refer to Appendix 1 for bulleted details) provided the design team with a concentrated understanding of the needs that each expert had in their given area and provided insight into how they would use the software in their professional educational practice.

For example, in relation to the above questions each practitioner did see a role for such software but had questions around the type of learning we were trying to support and the kinds of tasks that the software would be useful for (eg collecting sounds 'on the fly' when doing a sound walk with young people; introducing 13-14 year-olds to the musical composition process; as a means of creating multimedia installations in fine art). The issue of assessment and in particular the concern in schools around originality in relation to computer-based work was discussed, alongside the issue of control and autonomy. One of the main conclusions was that it would be best if there was a mix of both self-generative and 'normal' controls. The self-

generative aspects of the software also needed to be made more visible so that users could better understand how the computer was manipulating their work. Experts agreed that Jungulator provided learners with another level of abstraction but that it was necessary for such learning resources to have varying levels of user control and the necessary functionality to support reflection and evaluation (eg basic save functions which the software in its original versions lacked).

In relation to the kinds of learning experience we are attempting to develop the experts considered that Jungulator would be an appropriate 'entry level' programme, where users can develop skills such as sound and visual manipulation, improvisation and idea generation (eg the computer could support young people to think in new ways about sound and visual combinations). The importance of how these experiences were represented to the young people and the necessary levels of functionality (eg number of samples required to make meaningful compositions, the kinds of effects included ability to save and record) were reiterated throughout the day, alongside the need to develop an interface with functions that would be recognisable to the users (ie not dissimilar to other sound and visual software). These points were taken on and it was decided that there would be only six audio, two visual and one text-based 'pods'. Pods was the name given to the sample manipulation boxes, which once activated would display their functions. In addition, the functionality available to users in the original version was scaled down and the decision was made to colour code the software so as to make it easier and more attractive to users (eg grey 'off' state; visual, text and image pods would be colour coded).

In relation to the context of use, it was considered that Jungulator would be most suitable for art and media studies, in particular with 13-14 year-olds where there were less curriculum pressures and examination criteria to fulfil. It was also considered a potentially useful tool for A-level students, but for this group it would be important for them to be able to indicate where their work had originated. Outside school, the software was considered a potentially valuable tool for engaging 'hard to reach' young people and supporting them in creating sound-visual representations of their lives. There was a particular concern to ensure a simple and easily accessible interface in order to meet the needs of a wide range of different groups. Building progression into the tool was also considered important, with the suggestion that there should be limited barriers to entry level use, but more detailed resources to support the advanced user.

In sum, the conclusion from the expert workshop was that Jungulator could provide users with an introduction into learning the basics of composition (eg introduction to sound and visual samples, pre-set effects, generative effects). Simultaneously and uniquely Jungulator was considered as providing users with a tool for improvised performance and multimedia installation work, which could allow young people to work sensitively with varying levels of control in live performance situations. Interestingly many of the experts saw Jungulator as a kind of 'digital scrapbook' where students could 'dump' ideas and run the random generator to see what new ideas may emerge from the sounds and images they collected. In this respect the software was considered as supporting hybrid art forms where students could build portfolios of work, explore possible connections between images and sound and begin to learn how to make creative and aesthetic decisions.

5.1.2 Young people's workshop 1

The main aim of this workshop was to discuss with nine young people (14-17 years, comprehensive secondary schools, Bristol) their impressions of the 'old' Jungulator (ie Max/MSP interface version) and their primary impressions of early paper-based versions of the new interface (this included very early ideas on the functionality and design of the new interface). Two sessions were held (Group 1 and 2, refer to Table 1) lasting approximately 60 minutes each. The session was held in the 'free room' in the music department. During the session participants were introduced to the 'old' Jungulator, given a demonstration by the researcher about how it works, provided with an introduction to self-generative software and allowed to have a quick 'play' with the kit. After this round-table discussions were held where

the researcher led the group in a discussion about the pros and cons of the 'old' version and discussed possible designs for the new version. Participants were also asked how they would consider using Jungulator.

Prior to the workshop parental/guardian consent was obtained. Present at each session was the students' teacher and two members of the Futurelab team (researcher and design director). The sessions were recorded on video and audio recorder and later analysed by the researcher, with attention paid to sequences where the participants discussed their impressions of the software.

Although the participants were familiar with some music software (eg Logic, sequencing software and Garage Band, arranging/mixing software), they had little experience with visual software packages (some had a basic knowledge of Paint and Photoshop). Participants also did not appear to find the concept of random generation difficult and willingly engaged in discussions about the new designs. For them, colour and clearly labelled functions were the most important elements of the design. They also considered how they would use such software in school concerts or for making their own music videos or presentations of their ideas in their art and design classes.

	Participant	Age/years	School year/Key Stage (KS)	Subjects (details as provided by students)
Session 1: Group 1	C (female)	15	Year 10/KS4	Music;
	A (female)	14	Year 10/KS4	Music; Graphics
	D (male)	14	Year 9/KS3	Music
	T (male)	14	Year 9/KS3	Music
Session 2: Group 2	L1 (female)	16	Year 12	Music technology/Art
	L2 (female)	15	Year 11	Music
	M (male)	17	Year 12	Music Music technology, ICT, psychology
	J (male)	15	Year 11	Music, art, graphics
	R (male)*	16	Year 11	Music

* R only present for this initial session

Table 1: Participant profile: concept workshop

5.2 Building the wireframes

Once the initial concept workshops were completed, a review of the users' needs and impressions of the early sketches for the new interface was carried out and fed back to the design team. This in turn influenced the kinds of functionality and design decisions made during this period of development. For example, the ability to save and record material was considered crucial by the experts and young people. This resulted in the decision that users could save the state of particular effects and reload them when they re-entered the programme. Users could also save the master output, which included the mix of sound and visual material they created during a session. Following the principles of informant design, the design team transformed the users' needs and issues into "high level functionality requirements for multimedia implementation" (Scaife et al 1997, p346). For Jungulator this

involved developing a 2D wireframe of the prototype which included a detailed functional specification.

5.2.1 Young people's workshop 2

After the 2D wireframes and graphic interface design were established, we returned to our core user group. The aim of this second session was to discuss with the young people their impressions of the 'new' Jungulator interface design. Two sessions took place (17 January 2005) at the same secondary school, with the same group (refer to Table 1, all except for participant R, who dropped out and did not join us for the remaining sessions). Each session lasted approximately 50 minutes. During the session the participants were given a brief update on Jungulator's development, reminded of the look of the 'old' Jungulator and shown paper versions of the new designs (refer to Image 8), which they were asked to discuss.

As before, parental/guardian consent was obtained prior to the trials. Present at the sessions were the Futurelab researcher and the pupils' teacher. The sessions were recorded on video and audio recorder and later analysed by the researcher for key moments which highlighted the young people's opinions about the new interface. Prior to the session the young people's teacher was also asked about her opinion of the interface design.

To assist thinking in this area the researcher provided participants with a brief background to interface design and ideals of interface design, illustrating this by discussing software that they were familiar with such as Microsoft Word and Logic (music package). Participants were asked what they knew about interface design and what software they most liked the look and feel of. Participants were then led through the designs for the new Jungulator interface (refer to Image 8) and asked to comment on each of the 'pages' and what they thought the different functions symbolised.

Image 8: The new Jungulator graphical interface as discussed with the young people

All participants (the young people and their teacher) thought the user interface was much better than the old version; they responded enthusiastically to it and did not have any major problems understanding what the functions were about. However they did have some questions about what specific functions could do and felt that some of the symbols which identified these functions were not clear and in particular that rollover functions and labelling of the 'audio' and 'visual' boxes was necessary. They decided, however, that given that Jungulator was a new kind of software you would have to 'try and see' it before concluding whether all design issues were resolved. Overall participants particularly liked the graphics, colours and shape of the different pods and liked that it was a blank slate when you started. They also thought that it was much better that you could import and save work and considered how they could use it for creating film previews, adverts, slide shows, music and TV films, music videos, live mixes.

The outcomes of the workshop were fed back to the design team, with particular action points to consider, such as: rollover labels to be included where necessary; symbols to be made more understandable; save button and functionality to be included in the audio and visual pods. However despite the young people's comments, it was decided by the design team not to label or symbolise the 'audio' and 'visual' pods.

5.3 Evaluation

Trials of the revised software and interface were carried out over two days in May 2005 (16 and 17) both in the secondary school that we worked with during the development period and in a new setting at a community arts centre. For various reasons in both settings we were unable to speak to the young people's teachers or tutors. Consequently a separate session was held with secondary school media studies and film teachers at Film Education's[7] 'Critical Practice, Creative Processes and Cultural Perspective' (CP3) conference, held in Brighton, Sussex on 14 July 2005. The following sections briefly summarise the main findings from each of these sessions.

5.3.2 Young people's evaluation in schools

The young people involved in the evaluation (16 May) were the same groups who had participated in the concept and interface workshops. The purpose of this session was to continue exploring with this group their opinion and views of the final version of the software as well as attempting to gain some insight into the kinds of interactions or potential activities that Jungulator might support.

As before, prior paternal/guardian consent was obtained before carrying out the session. All trials were video and audio recorded and later examined by the researcher for relevant sequences of action and dialogue. Present at the final trials were three members of the Futurelab team (researcher, design director and learning assistant). The sessions were carried out in the same room as before and in a similar way (computer by wall, video and audio camera capturing data). No teacher was present during the session but the Head of Music did sporadically join us to ensure the session was running smoothly.

The introduction to each session lasted approximately 20 minutes and included an introduction to the final version of Jungulator, a review of what the young people remembered about the software and self-generative systems, and a demonstration of how the software works. The group were then asked to choose six pre-made sound samples and four visual samples from the Jungulator library and were also asked to create one short text file. Once they had chosen the files they wanted to work with the young people had approximately 30 minutes to compose a piece. After each session a 5-10 minute Q&A session was held (refer to Appendix 3 for questions).

During each session the researcher made field notes (refer to Appendix 4). The following sections discuss the young people's opinions about the pros and cons of Jungulator. What is interesting about these sequences of dialogues is how they reflect the young people's particular interests and backgrounds.

School Session	Participants	Age year/School year	General description of participants composition style
Group 1	D (male)	14/Year 9	Used the microscopic flies sound sample predominantly, running this in and out of bass samples and other effect samples. Did not use any text. Worked well with effects such as resonance and the cuts and jumps. Participants tended to
	T (male)	14/Year 9	

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[7] www.filmeducation.org

			keep overall control of the composition via the master outputs and synced up sounds and images. They did not use the sequencer. Worked well together and had discussions about how to 'end' the composition.
Group 2	A (female)	Year 10	Created a very delicate composition, worked intensively with one or two sound and image samples for long periods of time. Working more with image than sound. For example worked very well with the 'star burst' visual sample, creating nice effects. Did not work much with the master controls and did not try use text.
	C (female)	Year 10	
Group 3	L (female)	16/Year 11	Worked with a lot of samples at once, creating 'big sound'. Worked more with sound than image. Breaking sounds down and layering them up. They did attempt work with the sequencer getting deeper into the random generator and also synched some visuals up with sounds.
	J (male)	15/Year 10	
Participant 1	M (male)*	17/Year 12	Unfortunately M experienced quite a few crashes but he was very quick into getting sounds and image working together. He worked really well playing with visual effects such as mirror wrap, while simultaneously working with one sounds. M very keen to get a copy of Jungulator as he related to his own practice writing comic books and would like to get a copy of the software.

+ Including introduction, demo, composition and Q+A

* M's partner did not turn up at the session, so he worked alone

Table 2: Participants profile and composition details: school evaluations

Limitations of the interface and issues of control

The following sequence (Sequence 1) highlights how Group 1's music-orientated focus called for extra features such as a timeline. This need derives from the group's experiences in traditional music composition practice, where it is necessary to have full control over the composition process. Participant D was particularly keen on this, noting that it was necessary for Year 10 compositional processes. This is an important point and one that had been echoed by his music teacher and by experts in the initial workshop. The design team also discussed this in detail but decided not to include this feature for several reasons. In the first instance, it would have been very difficult to incorporate and take a lot of time. Additionally although timelines are useful, as D notes, this can take away from the randomness and unpredictability of the software. This question was discussed by the design team, who debated the balance between creating a tool within which you submit to the computer, and having greater control over the process as in more traditional editing packages. Other groups (Group 3) from this setting also discussed issues of control, saying that they would have liked to be able to start different tracks or sounds at particular times rather than having them all run at once. In discussing this they made reference to the software eJay[8] (sample-based CD-Rom, which turns your PC into a mini-sample creation and arrangement suite), which allows you to bring tracks in when and where you want.

Participant	Dialogue **Context: Q&A session, in response to the researcher asking them what they thought was good and bad about the software**
T	Well it's a lot easier to use than
D	Than the first time… we used it (laughing running over T)

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[8] www.ejay.com/splash/default.htm

Re	Yeah
D	Than the first time we used it (T and D talking together)
Re	The first time, where it, it was only the guts of it
T	Em isn't all that clear of what each pod is for, if, if you just, say had the programme and you were not told what pod was what for what, it, it's quite confusing, which, until you open it, your not going to be too sure about what… (pauses)
Re	What to do (finishing T's sentence)
T	Yeah
Re	So how do you think we could sort of address that?
T	Well you could maybe, you could put maybe, like a title over the side or over the top of each pod or something
Re	Just, for, like what? Sound pod or…
D	Or you just have a symbol in the background, where (T and D talking together)
T	Or just, yeah (T and D talking together)
D	Which is kind of a sound symbol, where (talk overlapping as they address each other)
T	Yeah (talk overlapping as they address each other)
Re	OK, oh right so they are not clearly distinguished enough at the moment
T	Em I think also it could have a timeline, although that would reduce the randomness but it would make it clearer at the moment
D	Yeah (agreeing with T)
T	It's still a bit unsure of what you're actually achieving
Re	Right, OK (Re confirming that she understands T)
T	All at once (continuing from previous utterance)
Re	I think that is a really good point actually, I mean it is something we did consider when we were building this and we were aware that a lot of people, particularly I think music students would ask for that
T	Yeah (agreeing with Re when she says music students)
Re	I mean what's your feeling on it, how, would you see something like this useful in the stuff you do at the moment?
D	Not really (ie not really useful)
Re	Not really, how?
D	Coz in year 10 and so on, next year, there will be a lot of composition and for that so you need a lot of order for that
T	Mmm (agreeing with D)
D	I suppose if you were doing media this would help
Re	How would you see it working for media?
T	Kind of working with film
Re	Yeah
T	And music combined

Re = researcher; T and D = participants

Sequence 1: Group 1: Limitations of the interface and the issue of controlling 'randomness'

In contrast with Group 1 and 3's call for further control of the process, Participant M (refer to Sequence 2) said that he enjoyed how the software took over and the potential for the computer to change your material and quickly turn it around in a short space of time. What was interesting about this participant in comparison to Group 1 is that M discussed his own artistic practices and the fact that outside of school he makes books where he writes text and combines different images to make new images. In this respect one could say that M's practices were more in line with the kind of hybrid artistic approaches that Jungulator best supports. In comparison, Group 1 were coming from a more traditional music composition background. In this context the emphasis is on becoming a competent composer, which for most genres of music requires command of the arrangement process. Jungulator is not designed to support such skill development. Instead, it focuses more on ideas generation and the creation of new hybrid sound and visual combinations, which emerge through interaction with the software, rather than the arrangement of chords and notes.

Finally, from a design perspective some participants noted that the interface could be bigger on the screen and a few commented that some of the icons in particular could be larger, which would make it easier to play.

Participant	Dialogue **Context: Q&A session, in response to the researcher asking them what they thought was good about the software**
M	The fact that I em, I could add in the sounds and then change what I wanted, yet it was changing it for me, so I didn't haven't to do any more than select what I wanted it to do
Re	Yeah
M	And then change what I wanted, yet it was changing it for me, so I did haven't to do any more than select what I wanted it to do
Re	Yeah
M	Em
Re	And you found that quite good, you did not have a problem with that?
M	Yeah and I found it kinda quite interesting as well
Re	Yeah
M	Yeah and that it did all that in the space of time that its taken me to put it in there and to mess it around, it's already done it for me

Re= researcher; M = participant

Sequence 2: Participant 1: Computer control

Jungulator as an experimental tool for developing new ideas

Although not highlighted in Sequence 1, Participant T later discussed the use of Jungulator as an 'experimental' tool which could extend his work with the GarageBand[9] software. He said that when using GarageBand it could get "a bit boring" and considered Jungulator as a way of providing new ideas or extending the work he created in GarageBand. Participant D, however, disagreed and again discussed issues of compositional control. This higher level of control was the reason for his preference for GarageBand, which again highlighted his preference for being aware at all times of how the composition is progressing. Further conversations between T and D about the uses of Jungulator suggested its application in the areas of film (Participant D) and as an experimental tool to support the development of new ideas (Participant T). In discussing what they liked about the software both participants enjoyed effects such as pan and resonance and cut and jump, but again would have liked more control over the random generation of cut and jump effects.

Positive feedback and perceived uses

Overall, all groups found the interface 'a lot simpler' to earlier versions (eg Participant J, Group 3), found it easy to use and allowed them to combine sound and image effectively. All groups noted that it was the kind of software that you just had to play with to see what it was like and Participant M, noted that it had an interface 'you just wanted to go in and explore'. While Participant C (Group 2) noted 'it is easier than using a keyboard, coz you can layer out stuff on top of each other, so it's easier to put something together'.

5.3.2 Young people's evaluation in community centre

This session was held in a local media arts centre in Bristol. The purpose of this evaluation was to explore how young people with different schooling experiences would use eJay. Again this session was run in a very 'lab-like' way with the young people invited into a room where the computer and recording equipment was set up by the Futurelab team (researcher and learning assistant).

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[9] www.apple.com/ilife/garageband/

Additionally, as the community centre could not guarantee who would attend the session, the young people's consent could only be obtained on the day.

Community centre session	Participants	Age/years	Current education situation	General description participants compositional style
Group A	F (male)	16	Local FE: construction	Although this group did suffer from software crashes they worked well together, discussing what they were doing and turn taking. Created interesting effects working with taxi and ape images.
	J (male)	16	Local FE: construction	
Group B	T (female)	16	Out of school	This group experienced two big crashes during their session, which was distracting. Had some problems navigating the interface and provided interesting feedback (refer to below comments). Due to crashes it is difficult to comment on their composition.
	L (female)	16	Out of school	
Group C	M (male)	15	Year 11 (in school)	This group had never met before the session and given that they were a teenage boy and girl, there were 'shy' in their approach to working together. Despite this they created a delicate piece, taking turns and listening to what the other person created before adding a new element. M tended to focus on visuals, while L experimented more with sound.
	L (female)	15	Year 10 (in school)	

Table 3: Participant profile and composition descriptions: Community centre evaluations

Developing your own raw material

The following sequence (Sequence 3) of dialogue highlights how important it is when using Jungulator that participants can use samples they have either created themselves or downloaded via the internet. Due to the limitations of this evaluation session participants were asked to choose from a set of pre-selected samples taken from IATMJ archive. This sequence brings our attention to Participant F's call for ownership or a sense of connection to the raw material that you input into Jungulator. He importantly highlights that the samples they used were not the kind he would have chosen and that this influenced his level of interest in using the software. This did spark a debate between Participants J and F about the merits of using pre-made images or visuals you created, concluding with an agreement that both pre-made and personal samples would be useful. This sequence again flagged the need for embedding Jungulator into a meaningful learning situation where participants have the time to fully explore the potential uses of this tool and create their own samples.

Participant	Dialogue Context: Q&A session, in response to the researcher asking them what they thought about the software
Re	What did you think of this, of it?
J	It's got good samples in there, music and video and that
F	But they're not our samples, our samples or our type of music in there
Re	Yeah
F	Coz you just said we've not got time to put our music so we just got to mess like, which is not normal xxx
J	Crashing and that
Re	Yeah (overlapping and agreeing with J)
J	Obviously it's still dodgy and that
Re	Yeah (agreeing overlapping with J utterance)
J	It is, but you can see it is good (continuing from previous utterance)

Re = researcher; J and F = participants; xxx non-transcribed words

Sequence 3: Group A: Adding your own samples

Participants also suggested the following applications for Jungulator:

- backing for school band – creating images
- at home - to make their own tracks by adding samples, downloading samples into it and changing samples
- school – participants said they would use it if such software was available in schools; Participant F also considered it as an upgraded version of eJay.

Interface issues – labels, rollover explanations and 'knowing what you did'

As with the school group the community centre participants also called for more explanation of how to use the interface and asked for labels on functions and rollover explanations.

Participant	Dialogue Context: Q&A session, in response to the researcher asking them what they thought about the software
Re	If you were to speak to the guys who designed this, and you were to say one line, like you said boys would like this more than girls and things like that, what would you say to them to improve it, to make it easier to use and less confusing
T	Put some labels on it, you know like
L	Yeah
T	Where the scrolly bottoms are and everything, just like next to it, tell, every time you click on it, it tells you, what it does before like, you actually are able to, like, I don't…
L	Yeah, so you click on it and it give you an extra little bit
T	Yeah
L	Like a sentence or something
T	Just says this adds something or this something like this
L	Yeah

Sequence 4: Group B: Labels and roll over

Although all the community centre groups liked the clean and colourful layout of the interface and the kinds of effects you could create, participants did find the interface and what was actually happening confusing. Participant T (Group B) articulates the contradiction between the clean interface and how it's unclear how the computer is changing your work:

> "…it is confusing, it's easy, but it ain't easy, I don't know, you got to know what you are doing on there." (Group 2, Participant T)

Adding to this she notes:

> "…I'd like to know how I did it; I just clicked the buttons." (Group 2, Participant T)

Participant T's concerns echo those of the school participants. Participant T articulates the need for clearer cues and visual representations of how and when the computer is manipulating and changing the raw material. This need was reiterated by other participants in both settings. What is clear from this evaluation is that users want some form of visual feedback as to how the computer is affecting the process. In this respect there is an underlying tension between the interface and the sophistication of the random generator. Young learners in particular need to be able to 'see' the mechanics of the working process they are involved in. This helps them to understand the processes they are engaging with and also to delve deeper into the work.

What the Jungulator interface currently provides is a much more accessible way into engaging with the software, and although it does 'show' the final outcomes of the visual generator

process (in the main output window) and you can 'hear' the effects of the sound generator, the young people would like to 'see' more of the process of the generation. However, to do this requires quite a complex, real-time representation which would have demanded high levels of computer processing time at the loss of other features. In this respect we had to make a trade-off in the design. What we anticipate is that the next evaluation period will reveal how the tutor's role may provide the support needed by learners in understanding and reflecting upon the generator's effects

5.3.3 Media teachers' evaluation

The opportunity to explore the views of teachers in the fields of media and film was provided via the Film Education conference[10], 'Critical Process, Creative Practice and Cultural Perspectives', held in Brighton, 12-16 July 2005. The conference was a residential event where teachers from the profession attended a mix of theoretical and practice-based workshops aimed at developing the field, debating ideas and disseminating new and best practices.

On 15 July 2005, two sessions, approximately 75 minutes each (refer to Table 4) were held with delegates. The sessions involved demonstrating Jungulator to the teachers and discussions of the potential uses, strengths and limitations of the software in supporting learning in these fields.

Media and Film Teachers Session	Participants	Expertise
Session 1	S (male)	City Learning Centre, Director
	T (male)	A-level film and media teacher
	P (male)	Arts and design secondary teacher
Session 2	A (female)	6th form AS and A-level film media teacher
	J (male)	Primary school teacher; PGCE tutor

Table 4: Participant profile: Media and film teacher session

Issues that the above practitioners raised during the conversations touched on:

- the relationship between the user and the computer
- the need for a more explanatory interface
- the kinds of literacy skills the Jungulator could support
- issues of authorship and the potential loss of traditional media skills when using Jungulator.

There were a number of other interesting discussion points raised in these sessions. One participant, for example, asked whether the use of Jungulator could be considered to be fully 'collaborative' as the decisions made by the computer were random and did not rationally build on what the user had input into the system. Sequence 5 includes a discussion of the potential role of the random generator as a means of supporting new modes of thinking about narrative.

A central theme was the question of how learners' Jungulator compositions could be assessed. Participants asked how assessment practices could encompass both a young person who created an interesting self-generated sequence and someone who had come up with a similar sequence without software support. There was a sense that enhanced formative assessment processes would be required in order to explore the young person's understanding of creation with such resources.

Participant	Dialogue
A	So they could go off and film their basic ideas and then brought it back. You wouldn't edit it, you would bring in (ie into Jungulator) the whole clip

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[10] www.filmeducation.org

J	It is quite interesting, it takes away from the whole idea of sequencing and everything, you just don't think of that coz, it made me think in terms of telling of in terms of telling a story, ah we could use that bit there first
A	Mmm (in agreement with J)
J	ah we could
Re	ah that's good
A	Mmm
	ah you could, you would start to think about new ways of putting those bits together, to make some sort of either narrative or some sort of thing

Sequence 5: Session 2: Media practitioners – new ways of creating narrative

Participant	Dialogue
J	The presentation (ie referring to IATMJ presentation of their work) just then, sort of made me, well, there was a few conflicting messages
Re	Mmm
J	With what they were saying
Re	Mmm
J	One hand there seemed to be saying that using this kind of software enable the children to
J	To, mmm, enable the children to mmm, sort of takes away, takes away some of the
Re	Decision making
J	Yeah, they were saying they don't need to think about composition, so they can focus on the aesthetic
Re	Yeah, yeah
A	mmm
J	But hang on a minute those two things I don't see as a distinction and there, that worried me, well worried me, what made me think was are you taking away some of that, kind of important, authoring processes with this generative, self-generative product
Re	Yeah, yeah
J	And I was a bit worried about that
A	Given that media studies is considered the soft option for kids that 'are not a bit kind of not bright' or whatever
Re	Yes I see
J	If they are doing something self-generative isn't that, but it properly doesn't work that way, it doesn't look like those kids were not involved but doesn't it, the use of that kind of language might suggest there are doing less and less

Re = researcher; J and A = media practitioners

Sequence 6: Session 2: Media practitioners – new ways of creating narrative

As with the young people, all the practitioners believed that the interface looked attractive but that it was not 'readable'. Issues they raised were that the software needs to spell out what it does; it was unclear what the pods did; there were no rollover functions or pop-up windows. In addition the teachers were puzzled as to why the text box was the same as the image boxes when it supported different types of content; and why words like 'text' could not be used instead of representations such as 'ABC' . Recommendations made were that the interface needed to be clearly labelled and that it may be useful to have more iconic pod shapes which reflected the kind of content that was meant to go into them.

6. SUMMARY AND NEXT STEPS

6.1 Summary of perceived uses of Jungulator

This phase of development of the project identified a wide range of potential sites in which Jungulator might be used. These are presented here to offer an indication of the diverse potential applications for the tool:

Film and media practitioner's ideas of how they would use Jungulator:

- community arts festivals
- presentation tool - live art presentations or active workbook
- supporting critical literacy skills – legitimising the 'image'
- improvised jamming sessions
- active storyboard or notebook
- creative brainstorming tool
- random sequencer – eg put in a whole pre-made film and randomly generate it to see what new combinations emerge.

Young people's ideas of how they would use Jungulator:

- experimental/layer tool – to support thinking about new ideas and creating new combinations of images and music that you would not have thought about before
- media studies – to make short films, making intros to films and adding effects to films
- summer concerts – making projections for the band
- drama - making drama projections
- personal artistic expression – Participant M considered using it to make support the books he made by making new single images from two different images.

6.2 Outstanding questions and areas for research

The development of the project raised a number of significant questions and areas in which further research would be beneficial. We do not have the scope to address these issues in our current phase of development, but hope that researchers working with Jungulator in future, policy makers and practitioners working to develop new forms of practice, and developers interested in creating resources in this area might find these of interest in stimulating further thinking:

- What are the implications of using Jungulator (and all self-generative tools) for traditional 'craft' skills in film, music and media?
- How are self-generating tools impacting on professional practice and what are the implications of this for formal education in these areas?
- How could existing assessment regimes be changed in order to enable the exploration of such new practices at older ages (GCSE and above) in schools?
- What assessment approaches might be needed when young people are working with self-generative tools?
- What new concepts of 'originality' and 'authorship' are required in the emergence of these new practices?
- What scaffolding and support do young people most need when working with these sorts of resources?
- How can researchers in the field of 'multimodal literacies' collaborate with developers in the design of such audio-visual creative tools?
- What support is needed for teachers in creating links between their practice and emerging professional practices?

6.3 Interface and functionality

The new interface seems to have the potential to engage young people and to provide them with easier access to understanding the random generator functions of the software and allowing them to create real-time, novel audio and visual combinations. Feedback from the young people has indicated that Jungulator pushed their thinking in this field, as the random generator 'spews' out previously unthought-of AV combinations. The young people found the interface enticing, that it warranted further exploration, supported them in thinking about new ways of combining sound, image and text. Requests were made for 1) labelling and iconic

representations on the interface, 2) a timeline highlighting when and how the generator is being applied, 3) the facility to control the level of generation.

From the community centre evaluations, participants also reiterated the need for selecting and creating their own samples. At the same time from the observational notes gathered and from practical experience in demonstrating the software, it is clear that the kind of visual samples that best articulate the random generation possibilities of Jungulator were minimal, clear visuals. What is meant by this is that single-shot images, with only one central object worked better than images with several objects in them. From the observations, participants who worked with single-shot images tended to get the most out of the visual generator.

In terms of the kinds of interactions that Jungulator supports it was clear that participants' use of the software depended on their previous experiences and backgrounds. For example, young people from a traditional music background, who were studying music for their A-levels, expressed a preference for having greater control over the generative process. Such young people were more accustomed to having complete control over the compositional processes and found that they needed clearer definitions of when and where the random generator was applied to the material. One of the most enthusiastic participants, however, was a young person who already was well accustomed to creating multimedia texts. This participant studied music, music technology, ICT and psychology and outside of school time created animated storyboards and comics. It was interesting to note how this participant worked with the software and he discussed how it could lead him to think of new ways to combine material, which he considered very useful and inspiring.

6.4 Next steps

We now have a working prototype, which will be embedded within a community arts centre between mid-November and mid-December 2005. At the time of writing we have begun to plan these sessions, which will take the form of weekly three-hour sessions designed in collaboration with the Futurelab team and facilitated by a VJ tutor. The core aims of this extended period of research will be to address unanswered and newly emerging research questions and to gain authentic insights into the use of Jungulator as a composition and live performance tool. Our key questions for this period of development are:

1. How can we best design an appropriate activity to embed Jungulator in a community setting?
2. In this setting, what kind of composition/performance practice and interaction does Jungulator support?
3. What kinds of support materials would we need to consider developing to use Jungulator in school and community centre settings?

6.5 Acknowledgements

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8. APPENDICES

Appendix 1

Jungulator Expert Workshop 21 October 2005: Participant List

TD, Futurelab, Bristol
JM, Futurelab, Bristol
NH, I am the Mighty Jungulator, Bristol
MO, I am the Mighty Jungulator, Bristol
RC, Information Architect, Cxpartners
CB, Music Teacher, Kingsfield School, Bristol
PM, Multimedia Art Teacher, Backwell School, Backwell, Bristol
KJ, Researcher + Music educator MIT/TCD, Dublin
JM, Film-visual/Community artist, Bristol

Bulleted outcomes of the expert workshop:

JM: Visual artist's reflections

- Overall interested in the software especially the 'random' effects very attractive – it moves away from linear narrative.
- Functionality: high resolution images required in professional contexts, current resolutions of the images too low (current resolution/jpeg, 32x240 used at the moment). Solution might be that the self-generative effects operate at low resolution but the overall image is high resolution.
- Motivation: when working with young people in out of school contexts, the session cannot feel 'too school-like' especially if they have not been at school for several years. In this respect you need to 'bring' the editing suite to the young people – make it portable and user friendly.
- Interface design/visual appeal: how can you visualise the randomness and the manipulations you trigger? (eg zooming in and out in not interesting, applying random sequencing to the film is interesting, eg random shoots or changing events in a scene)
- Aesthetic decision-making: the ability to make unusual combinations, eg attaching sound motifs to certain images or actions is attractive. Also the way in which the computer in collaboration with the user can support new ideas, decision-making process – in this respect are you developing a tool that supports idea generation/origination?

CB: Music teacher's reflections

- Clarifications regarding the samples – samples are predefined but you can record live sounds into the system via the mic. You cannot play in keyboard notes but you can connect the software to other MIDI interfaces. You can load in different scales – eg pentatonic etc.
- Overall bit a bit sceptical of the software usage especially in relation to the demands of the music curriculum. Problem with the National Curriculum and the specification for GCSE and A-level coursework – pre-recorded sample-based compositions not considered valid works.
- Application: great beginners tool for composition and introducing young people (13-14 years) to sounds and how you can input certain sounds and in the end have something different. Not good for 16-17 year-olds where they have set coursework and exams.
- Interface design: the interface is far too complicated and daunting – needs to be really clear, eye catching, click and drag, simplified – instead of all samples on one screen have two screens so not all the information on one screen.

PM: Art teacher's reflections

- Overall very excited about the software, it is forward looking and complements cross-curricula aims. Cross-curricula-based work becoming quite common particularly in schools that have special status in the arts or performance.
- Art curriculum – less restrictive than the music curriculum and the self-generative aspect could be used in current curriculum. Art curriculum similar to the music curriculum in that across all key stages you have to be able to:
  - record work
  - experiment with work
  - analyse and be critical of your work – reflection etc
  - share and disseminate work.
- Functionality:
  - the software needs a history feature currently this is not present in the software and is necessary so that reflection is supported and you can build a portfolio of work
  - also necessary to have a panic button – so that you can go back in stages through the work
  - different levels – need for inbuilt progression in the software.
- Design and semiotic or 'naming of labels': the tool sets and their names need to complement other software's – shared meanings across different media tools and functions.
- Effects: (x-ref to JMG) the ability to connect sounds to motif - in still images and film would be an attractive advantage.

KJ: Music technologist's reflections

- Overall impressions - thought the software had many interesting applications and several technical questions.
- Context: what are you designing for, whom are you designing for?
  - age of young people
  - competent expert to facilitate the session (eg teacher, external workshop leader/arts or technical assistance) – is this necessary and what are the implications
  - context also determines that level of functionality and what you'll need.
- Learning: what are they learning? This has serious question for the functionality eg:
  - with Jungulator you're not going to learn about harmony
  - with Jungulator you're not really going to learn about texture – they are textures but are limited in how they manipulate those textures.

- Transparency: making learning transparent and explicit, eg I learn best if I can see the effects and outcomes of my manipulations. Currently this is not clear in the software because the interface is obstructive - not supporting transparency and reflection.
- Certification: for the software to work within a curriculum context it needs to be approved and get the appropriate certification. How it currently stands would fail as 'control' issues are questionable – this is not necessarily a criticism of the software and says more about the current state of the music (not art or media studies) curriculum.
- Ownership – questions about what part of the composition did you make and what part of the composition did the computer make and creative decision making – what parts of the creative decision making process are you making available to the user and what parts of the decision making process are you leaving the computer to make? (links to transparency).
- Design: visual and symbolic representation of effects:
  - visual feedback - allows the user to reflect on what they have done – this works at multiple levels and quite a big part of what is currently missing from the system, eg:
    - I pull in a sample, chop it up - you need to be able to 'see' how the sample has been chopped
    - system randomises, my sample re-orders, I can see that and hear that – I'm getting double feedback
    - how do you represent the changes and make this visual? Make clear/transparent the actions and manipulations – one-to-one correspondence between action and consequence/effect
    - ownership/control: in relation to examination/assessment – at what point are you allowing control/decision making – in Jungulator you are allowing control along certain axis and not on others
    - not allowing control of individual sounds or notes
    - allowing control of chunks of textures.

RC: Information architecture: general questions

- What types of software are art teachers most commonly using in schools – Photoshop, iMovie?
- What kinds of work are young people developing in school, eg is installation work common? But also in performance – interesting to make performance and installation work and layering working using multimedia.

General interface issues (divided into the following themes)

Current interface - all experts clearly stated that the interface is not appropriate (TD recapping):

General issues

- Overall discussion centered on the importance of the representation, functionality and transparency – what we are trying to achieve and what learning experience we are trying to support (TD recapping). Main questions:
  - how many samples (how many samples to make meaningful composition but where is the cut-off?)
  - age of users (13-14 years, introduction to composition)
  - context – what is used for; what kind of learning and interaction are we supporting – is it a composition or performance tool?
  - labelling of functions (rollover help etc)
  - levels of sophistication – entry level, beginner progressing to expert.

Number of samples

- Number of channels or voices – minimum one sample, the maximum number of samples used at any one time depends on the hardware (RC).
- Also number of samples used at any one time depends on the age of the user and how many voices or samples a person can distinguish from the overall texture (can depend on cognitive capabilities of the person). For example in orchestra there is 30+ - the number of voices depends on the genre of music you are trying to create (KJ).
- Singer, guitar, bass, drums, etc – band set up (four samples) (MO) - four is too little (KJ) – that is only for a band context (KJ).
- Final conclusion: six samples.

Manipulating samples and representing your manipulations

- Currently a lot of preparation is necessary to edit the samples for Jungulator which at the moment is not supported – necessary for a basic edit function to support this (TD).
- There are lots of different things you can do to a sample – at first you want to visually represent the most obvious effects (KJ).
- Ability to pull in one sample, manipulate it, switch to another, have the previous one going on if necessary and have feedback to the others – be able to change your level of perspective (RC). In my experience the learning happens when you have to go from one view to another and in this transition, in recognising that transition that is when you learn (KJ).
- What is important is when you affect a sample – what happens to it – that is what is important – are we supporting the creation of linear narrative, multiple narrative, overlaying etc? (PM).
- Conclusion: six samples; you manipulate one at a time by changing the perspective; all samples therefore at some point can be running together and this output is fed to a single output channel.

Context and age of users

- Important to think about having 30 14-15 year-old children in a class - range of ability – the option that you can have one or six samples running at the same time is important as it allows for different entry levels (CB).
- Conclusion: working with 13-15 year-olds - Jungulator most suitable for art/media studies and early years 11-13 of currently music curriculum.

Levels of progression

- What is important is that there is a low floor, high ceiling so that the novice and more advanced learner/user can enter into the software (KJ).
- Ability to progress and add more samples is important (PM).
- Eg iMovie very simple – what's good about it is that more advanced features are hidden away so if you want to explore you can dig into it, but you can make complex creations at the simple level (JMG).
- Conclusion: high ceiling – not necessary for prototype – at the moment this is a proof of concept, the appropriate interface first point (TD). But necessary to keep the low-high progression debate in mind for the future. For now entry point: mid-way between low-high.

Design: relearning design paradigms

- Relearning new design paradigms adds another level of complexity – across ICT tools recognisable functions eg rubber erases – difficult to introduce new labels and expect young people to relearn how to operate a tool (this is something that is constant decision point in FL work). Getting good aesthetic for your design and balance between creating something recognisable is necessary (KJ).

- We shouldn't be comparing Jungulator to what already exists – great you can see different viewpoints in Cubase but that is not what Jungulator is trying to do to - straitjacket certain ways of making music or image (NH).
- Above debate relates to documentation and representation – is Jungulator a tool to make money (ie you sell it to professionals) or is it just a tool for learning – it depends on what its being used for that dictates the design paradigm (JMG).
- Conclusion: labelling of functions needs at this point in the design process to be similar to other softwares – or if new labels are added that are recognisable and self-explanatory.

Design: graphic interface – representation

General

- Difficult at the moment to visualise what aspects of the software are actually self-generative? We need to symbolise the self-generative aspects so that you can realise what you are doing and manipulating. Eg one sample pod at one time, add your standard effects, then your self-generative effects, see their influence and so make visible the joining between the user and the computer (ie creative collaboration) – then you have cracked the moment of learning, the moment of Eureka (TD).
- Relating interface design and transparency – any interface design is going to surface some things and hide others and you need to decide these – what is facilitated – what do you want to support? (KJ).
- Interface built in Max is not appropriate to make the interface – maybe easier to make the interface in Director, Max is too specific and will not allow the functionality that you want to achieve (KJ).
- Predefined effects with preset characteristics - having a mix of those plus self-generative effects would be good (RC).
- Being able to see the samples in different ways is very important. Children learn in different ways – the ability (eg in Cubase) to see the sound output in wave, dot, notation form is important as children/young people will interpret the way that best suits them (CB).
- Visualising the output (KJ) – at the moment cannot (RC) – the sound wave that you input remains the same, even when you add effects – again it is necessary to capture the change – this is important (RC, KJ, TD).
- Soundwave - children cannot understand sound waves in my experience (MO). What you are representing however is the concept – doesn't need to be the actual physical wave form (KJ).

Visual

- What about representing the video? Will this work the same way as the sound – ie you working on one sample and then the other? (RC).
- How many visual streams can you work with at any one time? (RC) – if you are doing linear narrative you can only have one, if you are mixing then you can have as many as you want (JMG) – traditionally there is the A+B stream which you then mix into stream C (JM).
- There are physical barriers with the technology in how many visual samples/streams you can deal with at one time – only four streams at one time at low level + the music (MO).
- With the current system you cannot tell how long the video sample is - which is not very helpful. As a professional filmmaker you need to be in control of certain things, I need to be able to see the timeline etc. Is this a tool for intuitive use or a spur for creativity, this will determine the necessary level of control (JMG).
- Currently the system scales the visual to the audio bpm (beats per minute) and it can handle two visual streams (MO).
- Young people are used to working with many different visual inputs - the number of visual inputs at one time should easily be up to six (like the sound) (PM).

- Conclusion: four visual samples at once. You effect/treat them like the audio samples, ie manipulate them using predefined effects and self-generative effects and then output them to one main channel (that has a cross fader).

Training and teacher requirements

- Training and infrastructure (eg inbuilt help, rollover help).
- Is there any implication for teachers regarding how the sound is represented (RC)? Teachers may want to be able to lock; or to turn certain things off so to allow or demonstrate certain aspects – not recommended way of teaching but it is often something that teachers may want (KJ).
- Building support into the system without the need for external help manuals etc – you cannot have hundreds of pages of help etc – that needs to be built into the software in an easy way. Learning tool should allow learning to happen easily (KJ).
- Regarding training teachers can also tap into INSET training - that is if this software goes national (PM).
- Conclusion: simple in-built help only in this version.

What learning are we trying to support?

- What are young people learning when using this software? Reflective composition is different to on the fly performance, allows for different things – we need to decide what we want this to do (KJ). Are they learning about:
  o composition
  o performance
  o entertainment.
- Potentially three different versions of the software to support the above: 1) very linear version, that's quite constrained and supports very specific things; 2) more open version that allows for free expression; 3) pro version (KL).
- However if you start to differentiate learning from other meaningful experiences you run the risk of losing what is at the heart of the tool – also at the moment we're still developing what experiences or modes of expression the software will be supporting finally (TD).
- The learning uses of the tool are not difficult to comprehend - this tool offers another layer of abstraction, another way of interacting and another dimension – it is just another tool. I don't think it will be difficult for it to operate in school – but it needs in-built support for refection, evaluation – if these opportunities are created you'll satisfy the curriculum for the next 10 years and the idea of personalised learning (PM).
- The tools also allows you to move through different levels of control (TD) – things get thrown back at you, fresh space, scrapbook motif (NH).
- Conclusion: the tool aims to support basic composition skills and performance. Basic composition skills, eg introduction to sound and visual samples, pre-set effects, generative effects. On the fly improvisation/performance skills – eg working sensitively with varying levels of control in live performance situations. The tool also supports idea generation – eg scrapbook, portfolio building. Hybrid art form – mix skills and modes of thought (procedural, aesthetic, decision making, exploration, kinetic (TD/KJ).

Saving

- Complete record of what the user does – and have print out of this - helps reflection (KJ) – this can happen at the moment, eg make text file but then the problem is getting the information back in, in that it takes time to give information out and causes delays in the system (MO).
- Conclusion: save and history functions as essential requirements for this phase of development.

Assessment

- What are valid compositions? What is the future of schools and assessment criteria? (TD).
- Self-generative – who made it, this is difficult for the teacher, where does the decision process lie – but they engage in new materials and new way – self-generative provides a floor to support the composition it makes it easy to manipulate (KJ).
- Conclusion: the tool challenges current approaches to assessment and our relationship with computers as creative partners.

Richard Caddick: walk through the interface – initial reflections

- Eg OSS on Mac – number of users in the screen that you can move navigate easier – eg you can move in and out different desktops and expose – multiple views at one time (RC).
- With the music you could be looking at one screen – one sample, loop and you do a number of things (eg echo, reverb etc) – instead of all clips at one time – you can move though different perspective like the Mac, Photoshop – representing multiple points of view (RC).
- You need to be able to see all working at one time (KJ) – need to be able to easily move between different views (RC).
- Video – also to be able to see more than one thing at one time –the tweaking view up front (RC).
- Other question - when you put the output of the music together with the output of the audio also needs to be addressed – overall mute buttons, volume button etc (RC/TD).
- Have the samples under each other – so that you can see that in a more linear way – it is difficult to see (CB).
- Cultural legacy that time goes from right to left – but that is difficult to get away from and maybe you want to change this? (KJ).
- External controls also worth considering, eg midi keyboard, slider box etc (not necessary for now but also worth considering for the future) (MO) – that relates to school equipment etc (CB).
- External controls – relates to performance setting and single input device (mouse) - mix of the composition and it as a live tool is what is the most exciting (TD).

General points of discussion

- Does this software allow someone with little music talent make great music? Eg Photoshop (large range of actions – can take years to learn – you could get seduced by the acrobats of the software – you need to know what you want to achieve before you go to the computer (or at least this is how Joe works) (JMG).
- In response to above - mindset – 'I cannot compose' – is something you'll come up against – how can you make the interface simple that leads people to believe that they can – provides accessibility, that the interface is simple enough and has levels of depth/layers (KJ).
- Activity system – where the digital tool fits into the overall things scheme of things (TD).
- Knowing how professional practitioners work – supporting through the interface the young people becoming involved in the artistic communities of practice (TD).
- Packing what Matt and Nathan do within their workshops to be integrated within the system (JM).

General technical issues that needed clarification (Kevin Jennings):

- Length of movie clip controlled by the sample.
- Currently the output is saved as a standard application (ie saves as MAX executable) and AVI, which can be changed into WAV file.

- How many samples at any one time/start - up to 12 samples or voices, their length depends on memory of the computer, program 8mg).
- To make a composition – you need to make and save and then build in another sample or make it live - so cannot easily make the architecture of the composition. Although you can use the self-generative aspects but cannot easily determine or differentiate self-generative effects (ie what is self-generative and what is not).
- No presets at the moment – presets would allow you to save on the fly.
- Pitched samples (eg scale) – if you have two different samples different voices are working at the same – there is no inbuilt smart harmonisation – in this respect Jungulator is not self-generative like Koan etc, the self-generative aspects do not work out mathematical formula for the pitches etc.
- The system only works on patterns (pitch up or down, no musical knowledge underlying the system) – eg like loading a bag of notes and randomly assigning properties, which are controlled by a metro so that you can control which pattern you load at which time.
- Samples (eg rhyme samples) have to be loaded as loops – the systems assumes people know the sample is a loop and if it is not it makes a loop.

Appendix 2: Questions for final Futurelab trials (May 2005)

School evaluation session

1. What did you think of the software?
2. Did it do what you thought it would do?
3. What did you find best about it?
4. What did you not like about it – what was difficult?
5. How would you use this software in school?
6. How would you use this software at home?
7. What would you improve about the software?
8. Was it easy working in pairs using the software?
9. Have you any other comments on the software you'd like to make?

Community evaluation session

1. What did you think of the software?
2. Did it do what you thought it would do?
3. What did you find best about it?
4. What did you not like about it – what was difficult?
5. How would you use this software at home?
6. What would you improve about the software?
7. Was it easy working in pairs using the software?
8. Have you any other comments on the software you'd like to make?

Appendix 3: Observation sheet and demonstration text notes

Jungulator trial sessions: place: date	
Teacher contact	
Participant 1:	Age and school year (if app):
Participant 2:	Age and school year (if app):
Audio samples selected	
Visual samples selected	
File name	
Composition name	

Jungulator trial sessions:	
0-15 minutes	FIRST THING – YOUNG PEOPLE CHOOSE SAMPLES AND CREATE PROJECT FOLDER Demonstrate software
15-50	Create music video
50-60	Semi-formal interview/post discussions

Demonstration text

Your task today is to create a short music video using two images and six samples and text (one line).

First go through the samples with them – create project folder with chosen audio (6) and visual (4) samples. Create one line of text and save.

Then boot up Jungulator (C drive; Projects; Jungulator; current file; FLOSC text file; Jung2000; wait for Jitter cat; version 29 April the launch front-end)

Go though the interface:

- Do you remember what Jungulator is?
- Do you remember how the interface looked?
- Can you tell me what the different buttons do again?
- Show how to browse files from project folder and add files (DROP IMAGE STRAIGHT ONTO POD. (IF NECESSARY USE HAPPYHATS AND BLOCKYDESERT AS AV EXAMPLES)
- Demonstrate each type of sample – audio, visual, text
- Show each function – go through each function
- Note: arrows circle – rotate
- Eye - flick on/off
- X - on
- Problems with master controls
- Problems with master save – although can save settings (show how to save).

Observation notes + reflective comments	
Time/minutes	
Extra notes	
Quality of composition	
Bugs/glitches	