Art-Based Game Design with the Cyllr App

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ABSTRACT
We present the Cyllr iOS application for in-device game creation. The app enables designers to create a range of digital artefacts ranging from static images through animations, to interactive art installations, toys, game levels and multiple-level casual games, which we collectively call digital fascinators. We describe the underlying implementation, including the generation of decorative images and the user interface which enables fascinator design. We then provide some example fascinators that have been designed with Cyllr, and give a brief overview of a pilot study where participants created games. This leads to a discussion on aura and authorship in an age where consumers and creators are merged, and on the blurring of the lines between digital art forms. We conclude by surveying other in-device game creation apps and describing some future directions for the Cyllr project.

Keywords

INTRODUCTION
Recent technological advances have enabled large numbers of people to express themselves creatively, who perhaps would not have been able to do so previously. With the proliferation of so called casual creator software applications [Compton and Mateas, 2015] that allow easy construction and dissemination of artefacts such as musical compositions, stories and visual artworks, we have entered what could be termed an era of mass creation, perhaps starting with the Web 2.0 movement. A particular subset of casual creator apps of interest here are those which operate on a hand-held device such as a phone or a tablet, i.e., where production takes place on the same device as consumption. Video game design has been somewhat left behind in this respect. While there are a number of platforms such as Scratch [Resnick et. al 2009], GameMaker: Studio (yoyogames.com/studio), Construct 2 (scirra.com) and Technobabble (bbc.co.uk/cbbc/games/make-it-technobabble-game-maker), which enable relatively easy game design, there are very few apps for hand-held devices where games can be created in-situ on the target device.

This is the context into which we introduce the Cyllr iPhone app for in-device game creation, which will be released onto the Apple App store in the coming months. Games produced by Cyllr have at their base pieces of decorative art and user-made drawings. To describe the project, in the following sections, we present our aims and motivations, followed by a technical overview of the system, including some example output. This leads on to a discussion of the pros and cons of mass creation in games and in general, which focuses on the notion of authorship and aura, and on games being part of the visual arts continuum. We conclude by comparing and contrasting four other in-device game creation apps, and we look at future directions for the Cyllr project.
AIMS AND MOTIVATIONS

Our overall aim with the Cyllr project is the democratisation of game design, i.e., bringing the ability to create digital games to a much broader section of society than currently served by existing game design environments. Such environments largely require programming abilities in the game designer and in the particular case of hand-held gaming, access to a secondary (desktop/laptop) development machine. With the Cyllr app, we aim to enable people to very quickly produce a digital game directly on their hand-held device. There are many benefits to such a democratisation of game design, including the following.

Firstly, many children who are would-be game designers are left behind by steep learning curves and the requirement for programming skills in game development environments, including those specifically made for children, such as Scratch [Resnick et. al 2009]. With Cyllr, we aim to minimise learning curves with an intuitive drag-and-drop and drawing interface running on a mobile phone. Secondly, an inordinate amount of time is often spent by independent studios on games that fail commercially, and generally, creative industry best practice is to ‘fail fast’ [Snod, 2013], i.e., work out quickly when a game idea has little value and change track before wasting time in development. With the Cyllr app, for certain game genres, we will enable people to rapidly prototype their ideas in minutes or hours, rather than weeks and months.

Thirdly, in many contemporary art circles, there is active blurring of boundaries between traditionally different digital art forms such as images, photographs, videos, animations, toys and games. By lowering the barrier to entry to producing a game, we hope that practitioners from all art forms from drawing to dance will be able to express themselves via the Cyllr app with interaction, rules and gamification becoming as natural to incorporate in their digital works as line, form and colour are with traditional media. To this end, we have taken an art-centric approach with Cyllr, whereby it is very quick and easy to go from a static decorative art image to an entire digital game with multiple levels, as described below. Finally, we aim for Cyllr to be a platform for Computational Creativity research, i.e., the sub-field of Artificial Intelligence research where we build software that takes on certain creative responsibilities in art and science projects [Colton and Wiggins, 2012]. With parallels to the ANGELINA project [Cook et. al, forthcoming], we will experiment with certain approaches to fully automated game design, where Cyllr provides the underlying game creation functionality, as discussed in the Future Work section below.

THE CYLLR APP

A fascinator, to a milliner, is a hat accessory which is usually moderately aesthetically pleasing, often animated and sometimes interactive. They are designed to attract people’s attention, but not for long. Certain digital artefacts such as images, short videos, interactive toys and casual games share properties of such fascinators, and for the purposes of this paper, we use the term digital fascinator to describe a range of artefacts on hand-held devices from static images to casual games with multiple levels. We specify that each digital fascinator has decorative artwork imagery at its base and that the artefacts are meant to be somewhat disposable, i.e., consumed for entertainment in minutes and hours rather than over days and weeks. Our use of the digital fascinator terminology is an attempt to move away from traditional delineations of digital art forms, which we hope will in turn help digital games to be accepted as part of the visual art spectrum. We expand upon this in the Discussion section below.
We have previously built and experimented with the ELVIRA evolutionary art system for the production of decorative art images [Hull and Colton, 2007], with an attempt to bring the technology to the iPad described in [Colton et. al, 2011], and its usage in The Painting Fool automated artist [Colton, 2012a] described in [Colton, 2012b]. ELVIRA uses a particle based system to move a set of particles around an image over a series of time steps, with blurring applied at each step. The genome of each image consists of five mathematical functions which determine how the particles are placed and coloured initially (one for the red, green and blue components of its colour, and one each for its x and y co-ordinates), and a similar set of five functions which determine how the particles change at each time step. The functions can contain references to the previous values of each particle, the particle number and the time step, which leads to highly varied and complex iterative functions controlling the particles.

The genome also contains information about the amount of blurring and certain transforms to apply to the particles before rendering, e.g., a transform which produces a kaleidoscope-like image. With the blurring, the rendering of the particles produces complex images with depth effects, symmetry, textures and patterns, which are generally pleasing aesthetically (although we acknowledge that this is a subjective judgement). We have reimplemented ELVIRA as part of Cyllr, in the Swift Programming language for iOS apps, and users have access to a thousand genomes selected by the developers, which can be expanded into images. Each fascinator designed in Cyllr has at its base one of these decorative images, as described below. Moreover, the genomes can be mutated, by swapping the functions, producing new images when rendered. Hence fascinators can be produced with entirely novel artworks at their base. Some example images available in Cyllr are portrayed in figure 1.

![Figure 1. 100 decorative base images in the Cyllr App.](image)

The genome for the images also stipulates whether each particle should be rendered via a line drawn between its previous and current positions, or rendered as a shape (circle, triangle, square) in its current position. The particles in the position they were in for the last time step can be extracted by Cyllr as sprites that can be animated and used in collisions and other game mechanics within the fascinators. Alternatively, the user can specify that the sprites are shapes which are spawned off-screen, and they can specify the screen entry points and timing of the spawning.
Cyllr is implemented as a SpriteKit application for iOS devices, and as such has access to a physics model based on the Box2D framework (box2d.org). Currently, fascinators can be designed in Cyllr with three types of physics objects that interact: friend objects, foe objects and the game controller. Typically friend and foe objects are multiple in number and are shapes, either spawned regularly off-screen or in one go from the particles in the underlying image (as mentioned above). The game controller can either be drawn by the user, or can be extracted as the shape of the underlying image. Note that in figure 1, the decorative images contain shape motifs on a white background, and hence the shapes can be fairly easily extracted and turned into a sprite. The user can specify whether the decorative art image is used either purely as a background on which the drawn controller sits, or is the entire controller, with no drawn element, or that the drawing and image are combined into the controller. The user can also specify a background image for the fascinator and has fine-grained control over the lighting conditions.

Once the artwork and the spawning of the sprites in the fascinator have been specified, the user can move on to designing movement, interaction and scoring mechanisms, if they so desire. There are various ways in which the game controller can be moved and rotated by the player, and some of these involve using physics constructions such as pins and springs. Also, various fields such as simulated gravity, noise and vortex fields can be combined and tweaked to produce movements on the friend and foe sprites. Moreover, what happens when friends, foes and controllers collide can be specified, e.g., whether they bounce, stick together or pass through each other, or whether one or both is destroyed, and aspects of the nature of the collisions can be detailed, e.g., how bouncy each type of sprite is. Finally, the user can specify rules for scoring and winning/losing conditions, if they want their fascinator to have these game elements. Up to five contributors to an overall score can be specified with parameters which dictate the type of sprite and type of action on it (knocked out of the screen, stuck to the controller, exploded, etc.) that lead to the score change, and how that change happens. If the score goes below a user-specified limit, the game ends in failure, and similarly ends in success if it goes above a limit. Alternatively, the user can specify a time limit, at the end of which a certain score must have been achieved for success to be attributed.

It has been a challenge to implement a graphical user interface on a phone-sized device which enables the setting and testing of dozens of parameters for fascinators. One design decision we made was to have the fascinator constantly playing in the background, with the design screen overlaid, and changes made in the design instantly altering the background fascinator in a live fashion. With alternative setups, we found that disconnects between the design screens and the fascinator being designed were disorientating. We also decided that each new fascinator would be based on a previous one, and we supply numerous preset fascinators in a ‘base camp’ screen. The motivation behind this is for users to avoid blank canvas situations. After choosing a base fascinator, which may have some of the elements required in a new one, the user modifies it until it achieves the desired fascinating effect. Such ‘modding’ is a well known and popular approach in game design [Sotamaa, 2010]. Note that no aspect of fascinator design is hidden, so, in principle, any fascinator can be made from any other, given the correct edits.
There are currently eight design screens, as portrayed in figure 2. The first one presents the preset fascinators and the second one stores the new fascinators made by the user. It is straightforward to transition between designing and playing with a fascinator, and Cyllr has a saving mechanism which requires the user to write some text to describe the fascinator and to save a screenshot. We wanted the user to be able to very easily make alterations to the fascinator in such a way that serendipitous situations might arise, i.e., changes made at random could introduce an opportunity that the user hadn’t thought of in advance, as per one of the examples in the next section. To this end, the third design screen enables random mutation of characteristics of the fascinator. The interface is used like an old-fashioned telephone dial whereby the aspect of the fascinator to be changed is dragged to rotate the dial, with more rotation indicating a higher level of change. Hence, a small dial rotation only slightly tweaks that aspect of the fascinator, but a full rotation changes every part of the aspect.

In the fourth design screen, the user can scroll through the 1,000 preset image genomes, represented with a thumbnail. When one is chosen, the genome is turned into a full-resolution image via the particle method described above. The fifth design screen enables the user to draw a game controller and in the final three design screens, the user can tweak in fine detail all the parameters of the fascinator. In particular, the sixth screen enables edits to the image generation and the lighting effects; the seventh screen enables edits to the movement and collisions of the sprites in the fascinator, and the final screen enables changes to the interaction and scoring mechanisms. Each of these final three screens has sliders which show the numerical value of each parameter and/or some more visually communicative
version of it, for instance, some of the sliders contain images or blocks of colour, and others contain informative icons. The slider interface was implemented for efficacy, so that we could test parameters for fascinators in development, and will be replaced with a more intuitive design interface before Cyllr is released.

**EXAMPLE FASCINATORS**

Cyllr is still under development, but a fully functional alpha version was signed off for recent experimentation. Figure 3 shows screenshots of five designs which illustrate part of the space of fascinators that Cyllr can be used to produce. For testing purposes, we decided that the example fascinators we used Cyllr to produce should employ all the functionality available, and hence the fascinators described here are more akin to game levels or mini-games than to toys or animations.

Figure 3(a) shows the “Rebel Forces” fascinator, where rebel ships as white circles (friends) are being attacked by imperial ships as blue circles (foes), which are both spawned off-screen. Collisions between rebel and imperial ships cause the former to explode. The aim is to have 40 rebel ships on-screen at the same time, and a drawn flask-like controller acts as a forcefield which can shield the rebel ships. In this case, the background is a brightened (in Cyllr) image of the night sky and the decorative art image acts as a backdrop rather than a controller. The designer has specified in Cyllr that both rebel and imperial ships are attracted to the centre of the screen with some noise added, and both bounce off the controller, which can be rotated by the player to collect rebel ships and repel imperial ones. Moments of drama happen when imperial ships find their way into the forcefield and destroy the rebel ships. Figure 3(b) shows the “Friends and Foes” fascinator, where, after two minutes have passed, the score is calculated as the number of green balls minus the number of red balls, and a score of 20 or more indicates success. Each ball (red or green) bounces off the controller, which is taken from a decorative art image, but given enough contact time, they will stick to the controller, which can be rotated around its centre. The tension in the game comes from batting away the red balls while trying to give the green ones enough time to stick.

Figure 3(c) shows the “Pendulands” fascinator, and its design illustrates the way in which random changes can influence the game mechanics. That is, the designer was aiming for a fascinator where the controller doesn’t repel the balls as in Friends and Foes, rather the balls pass over it, but they will stick if the controller is moved to be under them for long enough, i.e., a catching/landing game mechanic. The purpose of the game is to get five balls to stick to the controller. During the design stage, the designer randomly mutated both the lighting controls and the interaction mechanism. The resulting fascinator had the controller pinned to the centre of the screen via a spring, so that when the player stops dragging on-screen, it springs back to the centre. Moreover, the lighting was mutated in such a way that the spotlight follows where the finger drags onscreen. Taken together, these two changes produced interesting gameplay: to be able to land the balls on the controller, it had to be moved, and so it would be natural to drag the controller directly. However, this obscures the view, and causes difficulties as the balls hit each other and explode, hence it is useful to drag the screen slightly away from the game controller’s position. Releasing the controller causes it to return rapidly to the centre of the screen, which usually causes the balls that have been landed to hit others and explode. Hence, players tend to keep a finger dragging the controller at all times, which means that the controller is always in the shadows, as the spotlight follows the finger. We see that interesting mechanics and a shadow aesthetic was introduced with the random shuffle of parameters initiated by the designer. The designer capitalised on the aesthetic with choices for the background and normal
maps bringing a grungy look to the fascinator. The name Pendulands comes from the pendulum-like movement of the balls in some of the levels.

The first three fascinators in figure 3 were designed by the developers of Cyllr (second and third authors), to demonstrate the kinds of games that can be produced by an expert user. In a controlled pilot study, 10 participants with no experience of designing with Cyllr were given the app, and one hour to produce a game. The results were mixed: while the participants largely enjoyed their time with Cyllr, only two were able to produce a game they were willing to share, and most participants cited difficulties in using the design interfaces to achieve their aims. One aim for the experiments was to see whether the participants could produce game mechanics which the developers of Cyllr had not previously envisioned, and in this respect, the experiment was a success. In particular, figure 3(d) shows a game called “Friendfall”, which is similar to the Friends and Foes game described above, but where balls immediately stick to the controller. Here, three new mechanics were introduced: (i) foes disguised against the background (ii) collecting friends in the same place, and (iii) wiping away stuck foes by moving them off-screen. Finally, figure 3(e) shows the “Fishtank” game/toy where the drawn controller is used to collect fish food descending from the top of the screen. This collection and overflow mechanic is similar to the protection mechanic in Rebel Forces, but was not envisioned by the developers of Cyllr.

With the Friends and Foes and Pendulands games, multiple levels with similar gameplay were easily produced. For Friends and Foes, 20 levels were produced with less than an hour of design time, simply by changing the decorative art image and background. As the art image is integral to the nature of the game level, different shaped images produce different playing experiences, and levels require quite different tactics to each other. For instance, the game becomes much more difficult when the decorative art image is a smooth circle, as it is hard to repel the foes while keeping the friends close. With the Pendulands game, 17 levels were produced in around four hours of design time. Each level differed in the decorative image and background, although an overall dark, grungy aesthetic was employed in each case. For each level, however, the way in which the balls and the controller interacted was changed, which required some experimentation. In particular, functionalities such as the following were changed: the balls having more/less random forces act on them, with more/less wave-like features; balls exploding/bouncing/sticking on collision; spawning positions and timings. Each level is distinct to the others and requires new skills to be learned, whilst also requiring skills learned in previous levels to be re-employed.

![Figure 3. Screenshots of digital fascinators: (a) Rebel Forces (b) Friends and Foes (c) Pendulands (d) Friendfall and (e) Fishtank.](image)
DISCUSSION

As frameworks like Cyllr contribute to the democratisation of game design and increasing numbers of people make games, issues of quality, authorship and artistic context begin to arise. We can draw an analogy between Cyllr and other apps such as Instagram, which has enabled artistic rendering of photographs via image filters to be done on hand-held devices, rather than requiring desktop tools such as Photoshop. As the world has been flooded with artistic renderings of photographs, it is often difficult to find particularly good examples according to specific tastes and needs, and it could be argued that the value of an individual image is now highly diminished because there are so many. We might argue that we have gone from the concerns raised by Walter Benjamin [2008] about the loss of aura of individual artworks in the age of mechanical reproduction, to concerns about the loss of aura of authorship of artworks in the age of mass creation. Robinson explains the current situation well:

“Nearly everyone can publish if they want to. Hence the division between author and public disappears. It is simply a functional division – the author is whoever happens to be writing at a particular time. Any reader can become a writer. Hence, modern humans have a claim, perhaps a right, to be reproduced. Everyone can now claim to be the subject of culture, as in more recent theories of ‘a right to narrate’.” [Robinson, 2013]

Benjamin [2008] describes the aura around an artwork as arising from its uniqueness, its presentation, its location and the rituals it is involved with, for instance a religious work in a church. Previously, while individual artworks such as a photo or a film lacked an aura due to their reproducible nature, the aura of their authors could sometimes make up for this. That is, the uniqueness of the artwork is substituted somehow by that of the author, and provides additional back stories, talking points, controversies, divisions and ultimate cultural impact over and above that of the actual work. Hence, the argument goes, when everyone can take photographs, auras around photographers and their works diminish, which further degrades photography as a cultural driving force. However, a counter-argument to this could be constructed from the examples of people such as Felix Kjellberg, who very much has an aura as the PewDiePie games vlogger, which was afforded by the mass creation tool YouTube.

Theorists such as Barthes [1967], Foucault [2001] and others have argued that a diminution of the role of the author in the appreciation and evaluation of art works is a positive advance, as the work can be judged on its own, and the lack of authorial prescription of the meanings of work empowers readers to interpret more freely. Indeed, “the death of the author is the birth of the reader” [Barthes, 1977]. Also, many individual artists and movements have insisted that works of art are taken at face value, and their aesthetic value alone should be used in appreciating/evaluating them. For instance, addressing an inherent intentional fallacy, Wimsatt and Beardsley asserted that “the design or intention of the author is neither available nor desirable as a standard for judging the success of a work of literary art”. They reject the stance that: “In order to judge the poet’s performance, we must know what he intended” [Wimsatt and Beardsley, 1954, pp. 3].

We can revisit these theories in the age of computing, in particular now that software can automatically produce stories, poems, paintings and games of sufficient quality to be taken seriously. This is important in the context of the Cyllr project, because we aim for Cyllr itself to become a creative producer of digital
games itself, in addition to an app which enables mass human creation. Our hands-on approaches with creative software such as the ANGELINA game designer [Cook et. al, forthcoming] and The Painting Fool automated artist [Colton, 2012(a)] have brought us into context with a wide range of views in many cultural spheres. These experiences have led us to believe that it is impossible to ignore that the humanity that goes into producing something is very important to the general public when they assess works of art, and this is still true if the author is anonymous, in which case romantic substitutions about their (human) life are often made [Colton et. al , 2014, Colton et. al, 2015]. Finding out that a much-loved poem was written by a computer is almost as bad to many people as finding out that it was written by Hitler, because the human connection they made with the author through the poem has been vastly degraded by this revelation.

In such a context, the idea that authorship should be ignored in evaluation becomes just a particular well-meaning point of view, which doesn’t capture reality particularly well. In the case of computer generated artefacts, there have been a number of cases of so-called silicon bias against the output of software, but also some cases of more favourable evaluations. For instance, as reported in [Cook and Colton, 2014], the ANGELINA software was used to generate two games for a Ludum Dare game jam. One game was submitted anonymously and one was submitted with details of the ANGELINA project added. While both games were relatively similar, the latter game was given better scores by evaluators, and we hypothesise that this is because people were impressed that it was produced automatically. For further reading on authorship, from the perspective of film studies, see [Caughie, 1981].

Taking another point of view, one could argue that digital cameras and apps such as Instagram force professional artist/photographers to raise their game in order to stand out from the crowd, which could be a positive thing. Arguments about mass access to artistic photography devaluing work can confuse personal value and artistic value of photography. While it is true that digital photographs are not as treasured as analogue photos were by the people who took them, and many digital photos are never even viewed twice, great quality photographs of artistic value are still being produced, some via the Instagram app. One could therefore argue that the propensity of images has raised the bar for artistic photography, and the problem is with the lack of filtering/curating over the world's vast image bank, rather than Instagram itself. Balancing this, one could argue that in the fields of writing and game design, fan fiction and fan level-design is a popular form of mass creation, but tends to encourage pastiche and niche creation, because the work produced must adhere to the fictional world/ludic principles inherited from the original. While such artefact-centric user generated content is valuable to publishers – with no better example than MineCraft (Mojang/Mojang, 2009) in gaming circles – as it keeps the franchise alive with little effort on their part, it’s arguable that it has less cultural value than the more original creation. Fan cultures are discussed further in [Hills, 2002].

Notwithstanding the above discussion, it is important to note that the main value to society of Instagram, and most other casual creator apps, is not to produce vast quantities of content, which is only a trivial interpretation of a side effect of the purpose of this app. Rather, Instagram is valued for two reasons: (i) the empowerment it gives non-experts to express themselves artistically through photography and image filtering, and (ii) the enabling of people to share their lives through images and text to their social network. Bringing the discussion back to the current project, we believe that, like Instagram, the Cyllr app could help raise the bar in game design and be similarly empowering for people to be creative in new
and fulfilling ways and to share their creations while building their personal social networks. However, given that the mode of creation in Cyllr starts with an existing fascinator and modifies it, we need to be alert to questions of pastiche and originality, and enable users to quickly move away from their starting points, while retaining authorial control.

As mentioned previously, contemporary artists are increasingly blurring the lines between digital art forms which have traditionally been viewed as distinct, which is a movement present – in analogue media – throughout the 20th and 21st Centuries. Moreover, games are increasingly being seen as part of the art continuum, with obvious overlaps with film, theatre, dance, literature and installation art. As one of numerous recent examples, Proteus (Key & Kanaga, 2013) has been presented as a game, but doesn’t have some traditional game elements, such as a scoring mechanism, and would be equally well presented in a gallery as an interactive art installation, as it was in the You/Me/It exhibition in Ljubljana, 2014. As another, more commercial, example, in iOS 9, Apple have introduced live photos, which combine photography and short video clips. These are all part of the push towards transmediality [Kryzwinska, 2013], where an artwork is not conceived as existing on one particular platform (to be perhaps ported, or enhanced, across platforms later), but rather a work is conceived as being eventually rendered on multiple platforms, which, of course, is closer to real life. With game elements being added to other art forms, and digital game technology regularly finding its way into broader artistic contexts, it appears that the argument for games to be seen as important art forms is being won, even though critical analyses of this idea, such as that of Ebert [2010a], are still influential, even after the author apologised for making an analysis he admitted he was not qualified to make [Ebert, 2010b].

With the Cyllr app, we are contributing to the blurring of artistic borders in a very practical way. Within seconds by just changing a few values in Cyllr on an iPhone, an artist can transition from a static image created with particles, to an animation where those particles move in a natural fashion, to a toy where players interact with the particles, to a game level where that interaction contributes to a score. We hope that such a high level of fluidity in digital art making will encourage the acceptance of games as an extension of visual arts (for those people who need encouragement in the acceptance of games as art) and will encourage transmedial thinking in artistic production. We have introduced the term ‘digital fascinator’ to span traditionally separate forms, encourage fluid and transmedial thinking about digital artworks and encourage consumers to be producers. Expanding on this last point, we hope to narrow the gap between game designer and game player, as per Robinson’s point between author and public above. It is clear that level design functionality in games such as Little Big Planet (Media Molecule/Sony Computer Entertainment, 2008) and Super Mario Maker (Nintendo/Nintendo, 2015) is very popular amongst players, who express themselves creatively through the extension of a game world. To further prove the point about popularity, as discussed in [Sotamaa, 2010], some games companies have traditionally released source code, so that third parties could modify it and release their own versions. While this requires more technical skill than level design, it has been an integral part of game culture, and points to the need for a variety of tools to enable players to become designers if they want to.
RELATED WORK

There are a number of environments which bring down barriers to entry for game design. It is beyond the scope of this paper to provide a comprehensive survey of all such environments, and we concentrate here on applications for in-app game design on hand-held devices, as this is our initial target platform.

The Createrria 2 app from Incuvo (www.createrria.com), for iOS and Android devices enables users to customize levels for a platformer game, in the same mould as the level design functionality of games such as Little Big Planet (Media Molecule/Sony Computer Entertainment, 2008), as discussed in [Fares and Schuh, 2011]. Createrria 2 appears to be a successful project, boasting 70,000 games having been made by 140,000 users. It uses a wizard style approach to level creation, guiding users through various choices, and has an interface aimed at children, who make up 75% of their users. It is possible to introduce novel graphics through a drawing interface, and customise many aspects of the level. However, changing the fundamental interaction, scoring or other gameplay mechanics is quite limited. In this respect, Cyllr offers advanced game design functionality, as players are able to alter game mechanics and discover new ones, as investigated in the pilot study mentioned above. Createrria 2 has a design community, and uses advertising models for revenue.

The Playr app by Chris Galzerano offers limited game design, whereby users can supply new skins for a set of game templates, which are largely clones of well known games, such as: Space Invaders, Doodle Jump, Bejewelled, Air Hockey, Snake, Flappy Bird and others. Some of the templates are only available as in-app purchase. The skinning mechanism allows designers to upload their own images and sound effects, using the microphone if required. However, each game is exactly the same as the template in terms of the game mechanics. While we will encourage initial exploration of the game space with Cyllr via modding existing templates, as mentioned above, designers will have the ability to change game mechanics and introduce new ones.

The Coda Game app from Coda Rica (codarica.com) is aimed at children aged 6 to 12, and allows the modification of two game templates (clones of whack-a-mole and a sidescroller) by the specification of actions which happen when certain triggers occur. The actions cover some fundamental game aspects such as scoring and the triggers include user events and scoring events. Some of the parameters available to designers using Cyllr express trigger/action events, but this is only a subset of what is available.

Hopscotch (gethopscotch.com) is a coding environment for the iPad with a partner app for the iPhone which allows users’ creations to be played with. The aim of the project is to introduce children to the art of programming. The programming environment consists of a drag and drop interface for sequences of instructions, somewhat similar in nature to the influential Logo programming project [Harvey, 1997]. There are similarities with Cyllr, in that programmers have used the environment to produce a range of digital artworks, including animations, interactive art installations (e.g., enabling the production of kaleidoscope-like images) and games. Our aim with Cyllr is to enable the same kinds of expressivity by children and adults alike as in environments like Hopscotch, and for people to learn fundamentals of programming and game design through design choices rather than writing code.
CONCLUSIONS AND FUTURE WORK

We have described the initial stages of the Cyllr project, where we are building an app which we hope will help to democratise game design and enable more people, and in particular artists, to think in gaming terms when expressing themselves. The benefits of this project are likely to be in enabling rapid prototyping of games, in providing a route for children to explore their interests in game design, and in encouraging the blurring of rigid definitions of digital art forms. We hope that Cyllr will represent a beginning for many artists: a framework to turn their art into an interactive toy for playful contemplation, and/or to experiment with scoring mechanisms and rules. In addition to advancing the democratisation of game design, we hope Cyllr will enable visual artists to begin to appreciate games as “an experience created by rules” [Anthropy, 2012], and play with this idea artfully, appreciating games as important art forms as well as popular entertainments.

We have various technological issues to solve before the first release of Cyllr. In particular, we plan to make the user interface far more intuitive, with more instant and comprehensible feedback in response to design changes made. In particular, one lesson learned from the pilot study described above is that the drawing interface was the most popular, and we will enable more aspects of fascinators to be defined through drawings. We also plan to expand the space of fascinators which can be produced with Cyllr, by adding more functionality. To do this, we will look at types of arcade/casual/puzzle games, such as space invaders or asteroids, question whether such a game could be produced in Cyllr, then expand the space in order to cover it. The aim is that the expanded space then not only includes that particular game, but also a wide variety of games which combine the added mechanics with the pre-existing ones in novel ways.

In addition to expanding the space of fascinators, we will enable fascinators to communicate ideas, so that the games can be personalised with uploaded images which match the stories describing the game worlds. We also plan to enable control over pseudo-random events in the fascinators. For instance, in the Pendulands game described above, part of the drama in the game arises from hero-to-zero moments, for instance when the player has landed four balls on the controller, but through a disastrous move and piece of bad luck, loses them all in seconds, and zero-to-hero moments when good luck and skill enable many balls to be landed very quickly. The occurrence of these and other such moments can be engineered to occur more or less often than random, and this will be enabled through a new design screen in Cyllr. Finally, we will introduce server-side functionality so users can share their fascinators with a developer and player community, with social networking functionality to make this a fun and rewarding experience.

Cyllr is a research platform for Computational Creativity research. Our work so far has been in identifying a space of fascinators which is sufficiently rich to continue to empower, surprise and inspire designers, sufficiently easy to navigate with a user interface, and sufficiently dense to eventually support fully automated construction of fascinators. Once the first version of Cyllr is released, we will look into building a secondary system, which will sit above Cyllr as an automated game designer, in the same mould as the ANGELINA system [Cook et. al, forthcoming]. We are particularly interested in solving the technical difficulties associated with automated game design, incorporating methods such as Monte Carlo Tree Search [Browne et. al, 2012] for automated play testing of Cyllr’s games, and personality models for the secondary system. We plan to test the hypothesis that watching an Artificial Intelligence system create a bespoke fascinator is entertaining in itself, and doubly enjoyable given that it will bring into the world a new digital artwork.
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