

ToonTastic: A Global Storytelling Network for Kids, by Kids

Andy Russell
Stanford University
andy@popFiz.net

ABSTRACT

Creativity, collaboration, and cultural understanding are becoming increasingly important in our workplace and society. As educators, we are therefore challenged to create new opportunities for children to express their ideas and share their work in collaboratively playful settings, both locally and online the world over. ToonTastic is a storytelling and animation tool that empowers young children to create their own cartoons and share their stories with other children around the world. The software is designed to be used with custom-built multi-pen interactive displays for arts and technology museums, but can also be used online with a conventional mouse. Our goal is to build an online Global Storytelling Network that will inspire creative collaboration and spread cultural understanding through the power of story.

Author Keywords

Interactive Display, Multi-Pen, Storytelling, Animation

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design, Human Factors, Theory

INTRODUCTION

Give a young child a couple of toys or a box of crayons and he or she is likely to play or draw for hours, deeply engrossed in a hyper-visual imaginary world. In both art and dramatic play, children construct settings, create fictional characters, and act out fantastic storylines that would put many Hollywood writers to shame. Yet, ask that same child to write out a story in a blank notebook and you're lucky to capture a fraction of the depth and splendor of his or her imagination. What is it about play that inspires and scaffolds the creative process? How can we harness the power of play to help children capture and share their stories with others?

ToonTastic is a collaborative digital cartoon creator that bridges the gap between play and more formal methods of storytelling. Our goal is to develop a constructionist tool to help children capture and share their stories with others around the world. Our strategy is as follows:

- Seamlessly integrate the creation process with the visual and narrative nature of play
- Scaffold the storytelling process by:
 - Breaking it down into manageable steps aligned to fundamental storytelling principles
 - Providing story starters to jumpstart the imagination
 - Visually mapping emotion to perceptible outcomes
- Harness peer-collaboration to encourage outward creative expression, thereby transforming the child's natural inner-monologue into collaborative dialogue and role-play

TARGET USERS

ToonTastic is designed to appeal to a wide variety of users on different levels. As a drawing and animation tool, it is simple enough for 6-year-olds and engaging enough to entertain adults. Likewise, as a storytelling network, it offers unlimited range of use for all ages. We believe its "sweet spot", however, lies with 8-12 year olds as a developmentally appropriate scaffold for storytelling. We aim to more narrowly define this range via testing over the course of development.

THEORETICAL APPROACH

Constructionist software aims to draw out a child's implicit understanding of curricula and make it explicit through visual and physical representation so that the child may better "debug" and reconstruct his or her mental model [5]. In this way, the software provides a mirror by which the child may evaluate his or her mental model: if the reflection of his or her ideas looks right, then the mental model is accurate; if the reflection is off, then the mental model must be revised.

Debugging is a four-step process via which children adapt their mental models. In Logo, the process is structured around code, the digital model, and visual feedback [5]. The same debugging model can also be applied to interpretive curricula like storytelling by swapping out the software components while maintaining the same cognitive cycle (see Figure 1).

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

TEI 2010, January 25–27, 2010, Cambridge, Massachusetts, USA.

Copyright 2010 ACM 978-1-60558-841-4/10/01...\$5.00.

Our goal with ToonTastic is to draw out the emotive structure implicit within storytelling by providing an explicit template for visually mapping story events and emotions while constructing one's cartoon.

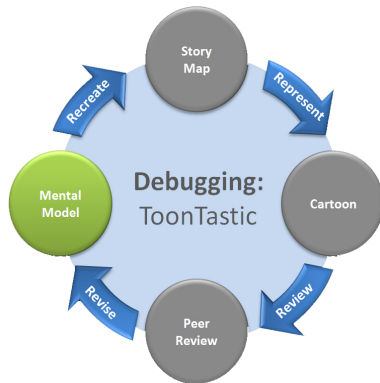


Figure 1. A Constructionist approach to interpretive curricula

Storytelling Techniques

USC film professor Robert McKee proposes that a good story is much more than a simple narrative sequence – a good story is a carefully structured series of events that sweeps the audience through an undulating swing of emotions [4]. To create a template for storytelling, one must scaffold both story events and emotive structure, which together make up the underlying spine of the story arc.

To craft story events in ToonTastic, one begins by selecting the scene types that will make up the storyline. There are five basic scene types to choose from: Setup, Conflict Event, New Challenge, Climax, and Resolution. For each scene, the software prompts the user to construct a story event using story starters in the form of tiles that function much like Magnetic Poetry. For example, a Setup scene prompts the user with “What happens in this scene to introduce your characters and the setting of your story?” The user then constructs a story event for the Setup scene by dragging the desired tiles onto that scene (see Figure 2). The user may cycle through a library of story starters or, alternatively, write his or her own using the blank tile. In this example, the user might use the story starters to write out “astronaut flies rocket”. The goal of this exercise is not to create a script per se, but to establish clear and succinct story events around which the emotive structure will turn.

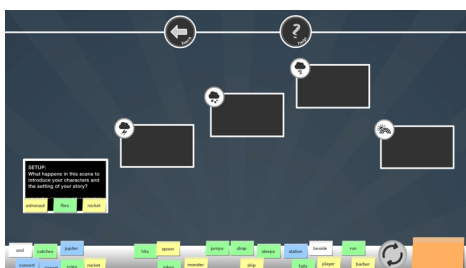


Figure 2. Story prompts by scene type

In ToonTastic, one constructs a story's emotive structure by selecting an appropriate emotion for each story event, thereby determining the background music for that scene. Per Parrot's taxonomy of human emotions[6], emotions are broken down into six basic categories, with three degrees of energy. When editing a story, one can therefore chart the story arc on the X and Y axes, with X representing time and Y representing energy (see Figure 3). For example, in the Setup scene where the “astronaut flies rocket”, one might choose “joy” as the basic emotion that best represents that scene. Given the premise, however, one might increase that scene's energy to “excitement” or even “euphoria” by raising the scene along the Y axis, thereby changing the background music to a more energetic tune. As each scene's energy level is adjusted to match the appropriate mood, the software draws a line connecting each scene to graphically represent the story arc.

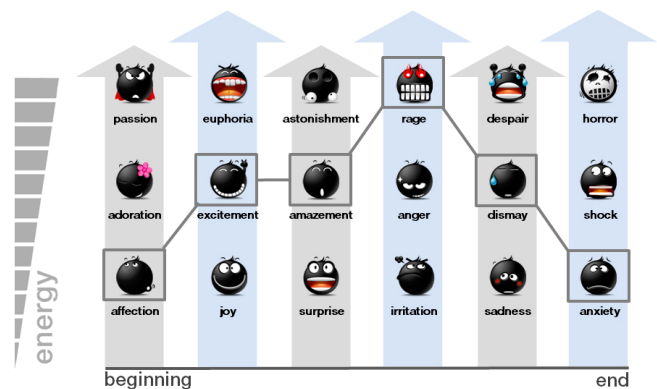


Figure 3. Charting story arc via emotion

Animation Techniques

Of course, crafting a story is only half the battle – one has to be able to retell it in a medium that will capture the audience. We realized early on in the project that perhaps our greatest challenge was enabling children to create engaging cartoons in an easy and fun way. With this in mind, we modeled ToonTastic's animation tool on Performance Animation, pioneered in part by Igarashi [2], Ryokai [7], and Davis [1]. With Performance Animation, one acts out the story while the computer captures the child's input – in our case, narration, sound effects, and image positioning.

One begins a scene by drawing characters and objects on the stage or by selecting from the library of pre-drawn assets. Each character and object should be drawn or placed on its own layer in order to be animated independently. One can also draw or select a background layer or “setting”.

Once the scene's characters, objects, and setting are complete, one can animate the scene by pressing the record button and dragging the characters around onscreen with a pen. The software records the positioning of the characters along with narration and sound effects. With two input points, one can not only reposition objects onscreen, but scale and rotate the objects as well. Combined with the use

of independent drawing layers, this approximates “Squash and Stretch” animation, producing animation equivalent to classic 2D cell techniques found in early cartoons and animated movies (see Figure 4).

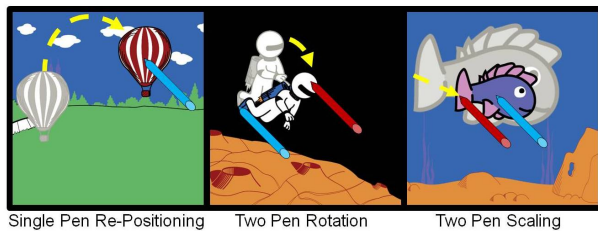


Figure 4. Multi-pen animation techniques

Hardware

Collaborative software requires collaborative hardware. With that in mind, our team has worked closely with a technology design firm in Toronto to develop a multi-pen interactive display that allows multiple users to interact with our software simultaneously (see Figure 5). Our hardware consists of a large LCD display and a proprietary low-cost shadow-tracking sensor for LED pens. The sensor is able to track multiple pens with unique IDs at up to 10,000 frames per second. Minimum processing power is required and the system’s architecture is unaffected by either ambient light or occlusion.

Our sensor represents a significant step forward in optical tracking capability, opening the door for a large-scale display enabling multiple children to work independently and simultaneously on the same scene. This is critical to both the previously described multi-pen animation techniques and the peer-review process at the heart of our Constructionist learning model.



Figure 5. ToonTastic’s multi-pen hardware

A Global Storytelling Network

Storytelling is a vital component of creative expression, a critical skill, and a powerful tool for children today. As such, our students need dynamic and collaborative tools for communication and creative production.

With ToonTastic, we hope to not only empower a new generation of storytellers, but to use storytelling as a bridge to cultural understanding amongst children around the

world. Social Learning and Cognitive Development Theory propose that social interaction plays a fundamental role in the development of cognition. Instruction can be made more efficient when learners engage in activities within a supportive environment and receive guidance mediated by appropriate tools. Beyond the initial creation experience, it is our goal to build a peer-to-peer storytelling network that will provide opportunities for children to learn about the world via stories from other children. As Vygotsky suggests, children often learn more from social dialogues at a peer level than from formal adult instruction [8]. In this spirit, with ToonTastic we aim to create a *Global Storytelling Network for Kids, by Kids*.

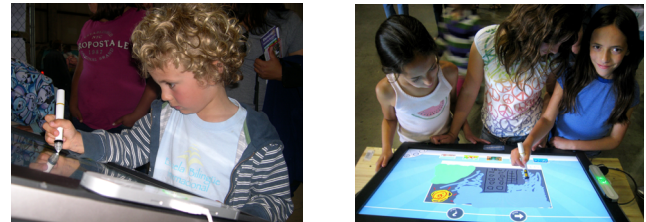


Figure 6. Testing at the museum

TESTING & DESIGN EVOLUTION

Throughout the development process, our team has worked closely with the exhibits and education teams at a local arts and technology museum. Our software is currently in beta testing at the museum, where we are looking closely at how children interact with the multi-pen hardware and its corresponding user interface.

Since starting this project in September 2008, our software has evolved dramatically from a straightforward sketch and animation tool into a structured tool for storytelling. This evolution is a result of both positive and negative feedback from testing. It became clear early on in testing that our software held great potential for enabling children to express themselves in new and engaging ways. It was also clear, however, that good stories are not created in an isolated bubble, which led us to develop the multi-user collaborative table that helps to facilitate the critical step of peer feedback.

We also learned early on that storytelling is not a natural skill for most children and that they needed some help in crafting an engaging and compelling story arc. We have subsequently learned, however, that providing too much structure and focusing too much on individual scenes can obscure the larger picture of crafting an emotional current that will guide the audience through the story.

To test the effectiveness of our storytelling template in scaffolding story events and emotive structure, we begin with a pre-test interview to determine the subject’s awareness of basic storytelling principles. The subject then creates a cartoon using the software and, when complete, views a cartoon previously animated by another child. For the post-test assessment, the subject draws out a story arc of

the previously animated cartoon. We code this process for references to basic storytelling principles.

Early testing results of our latest iteration suggest that the interface and animation process are appropriate for children ages 6-12 when offered guidance from an adult during the early stages. Despite our efforts to guide new users with a tutorial and help audio throughout the interface, many of the younger users in particular failed to follow verbal instructions. We plan to investigate more visual means of instruction for the next iteration.

With regards to the storytelling curriculum, early testing has proven quite promising, with younger children showing an improved understanding of character, setting, and scenes, while older subjects make notable references to emotive structure and story events.

CONCLUSION

With ToonTastic, children bring their drawings to life as animated cartoons by simply playing with them as they would paper dolls or cutouts. Our goal is create a seamless and natural extension of drawing and dramatic play that empowers children to create and share their own stories with other children around the world.

To achieve this, we have designed and built a low-cost multi-pen interactive display with which children can draw and animate using simple gestures and give voice to their stories through recorded narration. Combined with an interface designed to scaffold story arc through the creation of story events and emotive structure, we believe that we can empower young children to create and share wonderful stories about their lives.

Through that process, we hope to not only teach good fundamentals of creative expression, but give children the opportunity to learn about each others' lives and gain greater cultural perspective through story. Beyond the testing phase, our next steps are to launch the software online and to begin distribution of our multi-pen interactive displays to arts and technology museums and classrooms throughout the country. We also hope to build an online communication forum for users to communicate with each other and provide feedback on cartoons – a critical component of our constructionist learning model.

REFERENCES

1. Davis, R. C., Colwell, B., & Landay, J. A. (2008). K-Sketch: A "Kinetic" Sketch Pad for Novice Animators, *In Proc. SIGCHI*, 413-422.
2. Igarashi, T., Moscovich, T., & Hughes, J. F. (2005). As-Rigid-As-Possible Shape Manipulation, *ACM Trans. Graphics (Proc. SIGGRAPH)*, Vol. 24, No. 3, 1134-1141.
3. McKee, R. (1997). *Story: Substance, Structure, Style, and the Principles of Screenwriting*. New York, NY: HarperCollins.
4. Papert, S. (1980). *Mindstorms*. New York: Basic Books.
5. Parrott, W. G. (2001). *Emotions in Social Psychology*. Philadelphia, PA: Psychology Press.
6. Ryokai, K., Cassell, J. (1999). StoryMat: A Play Space for Collaborative Storytelling, *Proc. CHI'99*, 272-273.
7. Vygotsky, L.S. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.