Tom Klein

Animated Appeal

A Survey of Production Methods in Children's Software

Introduction

The graphical style of children's software has often strongly resembled that of traditional cel animation, yet the requirements for implementing graphics into computer games necessitated changes in the working practices of animators. In some of the earliest videogames for the home market, the means of creating sequential moving images was far removed from traditional methods of animation as a hand-drawn art. Computer graphics had to be manually typed in as lines of code which provided display instructions instead of actually being drawn. The earliest credited role of an artist in a videogame was for Atari's *E.T.* in 1982. At that time, the only way to see if the programmed lines resulted in animation was to compile the code and assemble the game. (Warshaw, 2003) Eventually software was written which was more intuitive for artists to use and which displayed the artwork they drew. This made it feasible for animators to work in a more familiar visual context.

However, the graphic limitations of personal computers remained a barrier through much of the 1980s. This changed in the early 1990s when PC manufacturers adopted the CD-ROM format. Whereas software developers had previously worked within the storage constraints of floppy discs and within the performance limitations of pre-Wintel PCs, the data storage capacity of compact discs coupled with increases in processor speeds rapidly allowed them to create more complex and compelling media. The early 1990s witnessed a rush of CD-ROM development, as consumers were eager to purchase content to make use of the new disc drives in home computers. Many of the rushed-to-market titles were more informational than entertaining, or were considered multimedia titles, not necessarily games. As the initial novelty aspect of CD-ROMs wore off, consumers became more discriminating in their purchases. Animation began to play an important role in the appeal of computer entertainment.

With the visual sophistication of software becoming a benchmark of quality to consumers, more companies hired staffs of animators to create captivating products. This article describes the contribution of animators and the practical working methods employed at the most prominent North American studios creating children's educational and entertainment titles from the early 1990s to the early 2000s. This genre of games grew to be commonly referred to as edutainment.

Edutainment Publishers

As sales of software shifted away from computer specialty stores to big-box superstores like Best Buy and Costco, a consolidation of the industry occurred. Only those products which demonstrated strong branding and consumer loyalty were able to secure a continued retail presence at these chains. (Ito, 2007) The shakeout which followed reduced the field of major players by the mid-90s, and since the best-selling software was typically branded with cartoon characters who served as hosts of the game, the major American publishers of computer edutainment during this period will be identified not only by company name but also by their popular brands for children. They are, in alphabetical order, Broderbund (*Living Books, Carmen Sandiego*), Davidson & Associates (*Math Blaster*), Disney Interactive (*Winnie-the-Pooh, Mickey Mouse*), Humongous Entertainment (*Putt-Putt, Freddi Fish, Pajama Sam*), Knowledge Adventure (*JumpStart*), and The Learning Company (*Reader Rabbit*). These companies all rose above the

crowded field of competitors to achieve great success, though there are some other companies who arguably could merit inclusion, such as Scholastic, Sierra, DK Multimedia, and Edmark. In Europe, Coktel Vision had success with its ADI line of children's software.

Broderbund, Davidson, Disney, Humongous, Knowledge Adventure, and The Learning Company all owned the rights to the characters within their games. Ownership of this intellectual property provided a basis from which to easily expand brands without licensing expenses. It also offered a great deal of creative authority to the producers and animation staffs working at these studios. With the exception of Disney, whose characters were already well-established, the designs and evolving personalities of characters were managed internally by the software developers. It should be pointed out that, although these companies all owned the intellectual property of the characters within their core product lines, nearly all of them also released some titles using outside licensed brands, such as The Learning Company publishing with *Sesame Street* characters or Humongous publishing *Blue's Clues* games.

Production Methods

The working practice of animation at these studios in many ways offered a dynamic environment for young American animators. One should recall that, in this same period of the early 1990s, the sudden boom in feature and television animation spurred by such hits as *Beauty and the Beast* (1991) and *The Simpsons* (1989) provided employment for many artists, but typically these traditional jobs did not yet involve individual usage of computers by animators and the best of these jobs often went to seasoned professionals. By contrast, game studios generally required artists to have both character animation skills (yet were more tolerant of limited professional experience) and proficiency with graphic software. This confluence of factors led many companies to hire young artists, especially since certain college programs were reliably turning out graduates with these requisite skills.

These young artists, mostly in their twenties, were providing the design, layout and final character animation for the games. Because of the technical particulars of delivering art assets for programmers, the animation for CD-ROMs was not as easily outsourced as it had become for TV, giving rise to new full time employment opportunities. Although 3D computer animation was a burgeoning new field during this period, the primary character work for children's software among the major brands was usually done as traditionally drawn art. 3D animation had a strong enough association with violent videogames at that point to keep edutainment publishers largely aligned with the aesthetic sensibilities of a classic family brand like Walt Disney.

Even though CD-ROM games were perceived as new media at that time, such companies as Humongous Entertainment and Knowledge Adventure were heavily invested in paper animation, effectively the same process as a Hollywood studio animator would have used even in the 1930s. However, instead of a traditional ink and paint staff preparing cels of the art to be shot to film, a Humongous animator would have his or her paper drawings scanned into a computer by production artists. The animation was then reassembled in order using proprietary software called *Splat*. After review by the animator, the *Splat* file went to the Ink and Paint department, where the final lines and color fills were digitally applied. At Knowledge Adventure, *Director* (commercial software from Macromedia) was used to reassemble the scanned frames.

Another digital animation process was the use of drawing tablets. At Davidson & Associates, the publisher of *Math Blaster* games, this became the exclusive method of animation. This bypassed the need for scanning paper and most cleanup work because the gestures of an animator's stylus on the surface of a tablet were recorded in the computer. In the early years of

CD-ROM games, tablets were considered costly, yet they proved to be worthwhile expenses because of the production efficiencies they introduced. The most widely used tablets were from Wacom, which released the UD series in 1993 and the *ArtPad* in 1994.

An animator named Ben Harrison came to Davidson from American Film Technology in San Diego. AFT was most famous for its process of digitizing classic black-and-white films into color, but it had also expanded its business to include paperless digital animation provided for Gahan Wilson's Diner and the first entirely computer-generated TV show, Fox Kids' *Attack of the Killer Tomatoes.* Harrison demonstrated the paperless method for staff members at Davidson, and proprietary software named *SpriteMaker* was then created to allow the direct import of tablet animation into the Atlas game engine. Initially, animators used *SpriteMaker* to also process the resulting layers of art for programmers. This generated a sprite, a bitmap graphic of an on-screen moving image. However, when it was eventually realized that this was employing a considerable amount of the animators' time, the role of graphic technician was established to offload this more technical chore (Kreidel, 2007).

Animation at a number of smaller studios was also paperless, using a mouse or tablet, including Fanfare Software, which developed the first *JumpStart* games for Knowledge Adventure. This technique often led to some shortcomings in quality, though, as the learning curve of producing fluid animation in this manner was challenging at first to most animators, and those without formal backgrounds in animation who might instead have been hired on technical merits were more likely to create limited sequences without smooth motion.

The argument in favor of paper drawings, however, was less credible in regards to anything that was not principal character animation. If a game graphic needed to appear small on-screen, then the opposite was true because the artwork would have to be more carefully finessed at the level of its pixels. In essence, the scanned source image became problematic because a production artist would have to exert so much creative license over the miniaturized details of it. It made more sense to simply animate it entirely digitally, and this led to a separation of work methods even at paper-based studios. *Deluxe Paint* (often just called *DPaint*) was a software application that grew to be especially useful for just this purpose. At Humongous, these specialized animators were called clickpoint artists. They made the smaller, non-character gags (sometimes called "clickables") that were activated when a player clicked around in a game environment.

The division of labor in a full animation hierarchy, the way the craft had been practiced on feature films for over fifty years, was a luxury that few software companies could afford. Also, considering the smaller sizes of most production teams, an economy of scale usually precluded this approach. A game animator needed to draw every frame of his or her sequence, not just roughs or key poses that were handed to assistants the way it was done on features. Humongous Entertainment, viewed as the gold standard in the business, was notable for its large budgets and large staff, yet it too adhered to this industry practice. Edward Pun, a Senior Artist for many years at Humongous, described that "an Art Lead might draw in the root or one or two key frames in the scene, but the animator was responsible for every frame of an assigned scene."

Disney Interactive maintained a high quality of animation in its titles, yet it was reliant on contracting most of its art production to outside studios, finding talented traditional animators at the nearby company Creative Capers, as well as from companies in both Ottawa and Wisconsin. Because of the consumer expectation for Disney animation, producers were demanding in regards to quality. However, Disney was a relative latecomer to educational games. Its grade-based line of software, originally an innovation of Knowledge Adventure, was not more advanced or compelling than competitors' curricular titles, but their branding with Mickey Mouse and

Winnie-the-Pooh allowed them a strong introduction into the retail market. Disney also released storybook and arcade-style games that took advantage of the great success of its feature animated films at that time.

There were compromises that animators faced in the making of games. One of the frustrations was the unexpected result that might occur when the assets were implemented into the programming. In effect, the animator lost control of his timing. This is as an inherent aspect of interactivity. Because a player's actions during gameplay are intended to control the playback of animation, the animator needed to anticipate how sequences would link together in the game. Usually an asset list was provided by the producer with all of the states that were needed for a particular character, such as a walk, run, blink, idle, etc. As the animator completed work on the different states of action, he or she would have to convey information such as how many frames composed each state, whether there were repeating or held frames, and whether there were frame layers.

A paper animator would usually describe the desired playback of frames and the linking order of states by filling out a form or template called an exposure sheet. This term was lifted from the vernacular of film animators because of its similarities to a traditional exposure sheet. Usually there was staff that acted as a liaison between art and programming, and communication problems could lead to undesired results with the final in-game animation. At Humongous, for example, an animator could review work in Splat to see if his animation had been properly interpreted from the exposure sheet, but that did not necessarily ensure that a mistake of some sort would not subsequently occur during programming.

Sometimes problems occurred if no one had anticipated the need for certain states to act as transitions between existing actions, especially when creating arcade-style play, for which it was always more challenging to create seamless animation. As production teams became more experienced, lead animators grew more capable at working with producers and staff to anticipate these oversights, but it should be realized that game development was always an iterative process that required staffs to constantly adjust to changes and to review the various builds of a game in-progress in order to refine the results.

Another limitation was the use of 8-bit color palettes, a restriction that only 256 colors could be on-screen at any given time. For animators, this color restriction could be even more imposing, as a lot of the color slots in a palette might have to be reserved for an illustrative background. A "common palette," potentially just a few dozen colors, would be chosen by a lead animator or art director at the start of a project. The final animation for all characters in the game then needed to exclusively use these colors.

Additionally, the final line quality of the art in a game had to be dealt with to mitigate the visual compromise of pixelation, as the screen art was ultimately displayed at a 640x480 resolution. Pixel edges of sprites were blocky and aliased, not smoothed. Different approaches could be used to improve the appearance of sprites. One that was used in the original iterations of *JumpStart*, among others, was to keep the outline thin, only a single pixel width. This was also used on *Reader Rabbit* titles, but was more consistently softened by stroking the inside of those black outlines with a mid-tone color. A similar approach, seen in the first two Putt-Putt games, was to use colored outlines and shading, as this could reduce the contrast with the background art and interior color fill. Many of the titles released by Humongous in the late 1990s were notable for another approach, the use of black aliased outlines with variable thickness. This called attention to the pixel edges, but the comic book aesthetic of brush-like line weights added to the classic cartoon appeal of its animated characters. Considering these various limitations, game

animators experienced a very real sense of satisfaction when their work was appreciated simply as good animation, when they had worked past the likelihood of compromise, often owing to the supporting role of production artists.

Every aspect of a finished game, from the art to the audio to the flow of play, was managed in the computer by a game engine. Macromedia Director was a widely used application for multimedia authoring, and although it worked well for simpler interactivity such as Broderbund's *Living Books* titles, it did not stand up to the rigors of most of the major brands in children's software. Instead of a commercially available engine like *Director*, the main developers of children's software built and maintained their own proprietary engines. Having a good engine was vital to a company's success, as this ensured fast click and response times, fast playback rates for animation, and efficient memory management.

Millennial Trends

Retailers and consumers preferred those software brands which provided long hours of gameplay, and developers responded by expanding budgets to ensure that CD-ROMs fulfilled these expectations. In the case of Humongous, it created very engaging games that required logical reasoning for kids to navigate their way through a story-driven adventure. Its most popular brands for children, ages 3-8, were *Freddi Fish, Putt-Putt,* and *Pajama Sam,* and for older kids, *SpyFox* and *Backyard Sports.*

By the late 1990s, the educational publishers were finding greatest success not with specialty titles (topics like reading or math, for instance) but rather with grade-based titles. A brand such as JumpStart would release titles named Preschool, Pre-K, Kindergarten, First Grade, etc. Each title would contain a range of curricular material for a student at that level of education. By playing different games, children would learn and would reinforce their learning through repetition. Knowledge Adventure, Disney Interactive, and The Learning Company all produced extended lines of grade-based software. The *JumpStart* line, touted as the "#1 educational software," (Simone, 2002) had cumulative sales of over $330 million by 2001, and was translated and sold in many different countries around the world.

This then capped a kind of "Golden Age" for children's software that had been on-going through the 1990s. Retail sales were booming for the major publishers and this allowed for generous production budgets. The budget for a *JumpStart* game was typically just under a million dollars, and for one of Humongous Entertainment's bigger titles it could go as high as several million. At its peak in 2000, Humongous employed 80 animation artists and had sold 16 million titles of its games (Kubin, 2000).

Also by the new millennium, the software *Flash* was growing very popular as a tool for animators, especially owing to its vector capabilities that allowed Flash cartoons to flourish on the internet. Software companies began using Flash primarily to make promotional content for children or parents browsing on the web. Because the Flash Player was embedded in Microsoft's Internet Explorer, no special installations were required to begin viewing animated sites.

The animation staff at Knowledge Adventure changed its production methods to embrace the benefits of Flash, and all animators made the transition to drawing directly on tablets leading up to the merger with the staff of Davidson & Associates at new company headquarters in Los Angeles in June 2001. Flash was a welcome change of software for the Davidson animators, who had been using SpriteMaker since 1994. Although SpriteMaker had been innovative and allowed

for the efficient implementation of layers of character art within games, its interface had frustrated many artists.i By contrast, Flash was a newer and more versatile application. It provided a digital work environment that felt more intuitive to most animators.

Knowledge Adventure embarked on a complete re-introduction of its grade-based JumpStart line. This was an ambitious task because previous titles were produced consecutively, whereas this new line would release to market simultaneously. Working with technical staff, a new process was created to convert the vector art of Flash into pixel sprites in a manner that would not overtax the production pipeline. The shared libraries of vector graphics created numerous advantages for repurposing art and building up from a foundation of existing animation. The JumpStart Advanced titles were released in 2002 and performed very well in the retail market.

Edutainment accounted for up to 20% of PC software sales in 2001-02[1]. (NPD Group, 2002) However, the industry became something of a victim of its own success. The strong sales and popular brands of the major children's software developers had led to acquisitions by outside companies, in part because of the enduring shelf-life of these brands. Children did not easily distinguish older titles from newer ones, and so they would just as eagerly play old CD-ROM games. While sales from other game genres might diminish quickly after an initial release, children's software could remain evergreen and continue to notch persistent sales for several years.

The toy company Mattel was so optimistic about projected growth in edutainment that it purchased The Learning Company for the unprecedented sum of $3.8 billion. This represented such an overvaluation of the acquired company's worth that profit expectations simply could not be met, and the huge resulting shortfalls led to the resignation of Mattel's CEO in February 2000. (Hays, 2000) This quickly changed the landscape of the children's software business. The acquisitions made by the company Riverdeep then crystallized this perception of an industry in retreat when The Learning Company, Broderbund, and Edmark were all bought out and became subsidiaries. Riverdeep laid off the development staff at each studio so expenditures would not be a draw on profits, and it focused on re-publishing from its acquired CD-ROM catalogues, using bargain pricing and bundled software to stimulate sales.

Infogrames bought Humongous in 1999, at least having the good intention of continuing to develop new games. However, the debt of the acquisition coupled with downward trending for sales across most of its brands led to a sharp reversal in its plans. In June 2001 it laid off more than 40% of its development staff. Sadly, this hastened an end to its classic adventure games and with it the studio's emphasis on traditional character animation. In 2005, Humongous was closed altogether.

Knowledge Adventure was heading toward a similar fate under the ownership of Vivendi-Universal Games, which very nearly dismantled it entirely, but the president of Knowledge Adventure, Leslie House, was steadfast in attracting a sale of the division. Her efforts won out, and in 2004 it was sold to an investment group with an interest in the possibilities for extending the JumpStart brand. However, by that point, under pressure from Vivendi-Universal to enact significant cost reductions, the entire staff of 2D animators had already been laid off, in November 2003. From that point on, primary character animation would be done using Maya, popular 3D software. At Humongous Entertainment, following its big layoffs, there had also been a transition to 3D production.

[1] For the period 2001–2002, the genres of Children (13%) and Family Entertainment (7%) accounted for 20% of overall sales.

The CD-ROM era of big-budget children's games with traditional animation had drawn to a close. The paradigm of edutainment was changing, yet the achievements of this period linger on. Many elementary schools continue to run old JumpStart and Reader Rabbit software on classroom computers. The games of Humongous Entertainment still enthrall young players. Yet, the games are becoming obsolete. Some companies have invested in upgrading old software for compatibility with recent PC operating systems, but the release of Microsoft's Vista (2007) perhaps changes the equation. Leslie House mentioned that "when porting to Vista, just changing the Director install makes the art look worse; it's actually obsoleting the old product." (House, 2007) As endearing as they are, characters like Putt-Putt will likely fade from popular memory. Nonetheless, the initial promise of what could be done in the realms of children's software was largely realized, and the very best CD-ROM games from this period will attest to that. The challenge to achieve what remains unfulfilled is the province of current and future developers.

Conclusion

The porting of old software is ending. More and more, edutainment is not only played via CD-ROM, but also on *LeapFrog* handhelds, portable game systems, and on the internet. Subscription models are becoming more prevalent, and kids are joining online or virtual worlds. Knowledge Adventure has even launched it own, *JumpStart World* (May 2007), a realtime 3D environment where children explore, play and learn.

JumpStart World, among others, is an example of a game that has pushed the production of children's software more closely into the realm of videogames. This might have once raised parental concerns, but over time this is changing. 3D has simply become associated with having a more contemporary or modern appeal than the flatter graphics of traditional animation. The charm of Pixar films and the widespread use of 3D imagery in children's television have served to soften its earlier association with violent videogames for adolescents and adults.

Whatever the future holds for children's software, and on whatever platform it is played, the same things will continue to determine the success of a game animator: an ability to recognize and work within the limitations of technology, an ability to communicate with technical staff to ensure that his or her work conforms to the needs of the game design, and an ability to animate characters in a way that makes them engaging and appealing.

The great divide that used to exist between animating for children's games or for cartoons has diminished. In many respects, the production methods of television animation now resemble that of software companies from the 1990s. Today, so much of the film and television industry is digital-driven. Professional animators are expected to have proficiency with computers, and traditional animation is produced with software like Toon Boom Studio and Flash. The tools of the digital workplace have become so ubiquitous that a more common ground of production methods now exists between various animated media.

Tom Klein is an Assistant Professor at Loyola Marymount University. He teaches Animation at LMU's School of Film and Television, in Los Angeles, California. Contact: Loyola Marymount University, 1 LMU Drive, MS 8230, Los Angeles, CA 90045-2659. This paper was initially presented at the Society for Animation Studies Conference in Portland, Oregon in July 2007.

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