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CREATIVE STORY DESIGN METHOD IN ANIMATION PRODUCTION PIPELINE

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Abstract: This research focuses on a new method in the development of animation story content which could shorten the creation process and arouse new ideas. By implementing digital storyboarding for direct story creation, a reversed model of animation process, this research examines the feasibility of this method and discusses its pros and cons in story development, story structure and implications for animation education. The results showed that storyboard driven method in creating animation content is workable and time saving. This method is helpful for novices in visualizing and revising their creative ideas. We found that a good story structure could still be created with storyboard driven method. Compared with the traditional production pipeline, the contributions of this method in story structure were more on the story climax, resolution, and plot. From the evaluation results although experts confirmed feasibility of this method, they still preferred traditional story design process.

Keywords: *storyboard, story design, story structure, production pipeline*

1. Research Background

In animation production, story design is an important stage that determines the success of the movie. Since a good story is the first step and all other works have to follow the storyline in order to create visual images, directors or investors are cautious about selecting a good story(Mou & Tu, 2013). However, story design is not an effortless work, which requires years of training, keen observation, and last but not least, talent. The average time length of story development is 1 to 2 years for feature film, and 1 to 6 months for short movie. Therefore, how to reduce story development time in animation pipeline has been an important issue. This research will examine a new method of story creation which could save time and arouse new story ideas.

Here we can see in Figure 1 the traditional process of story creation. Story design has to go through a writing transformation to formal script and a concept transformation to image. Transformations between story/script and between script/storyboard could become a barrier to production, since there is a gap which requires years of effort, experience, and even talent to accomplish the work. That is why this process takes time, and this is a main issue in animation production.

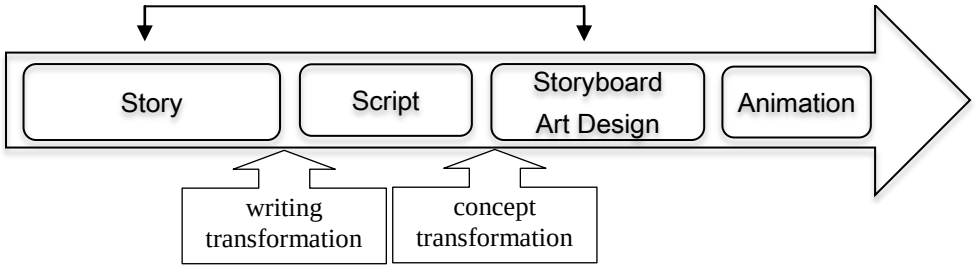

Figure 1. Traditional production pipeline is transformation from words to images

2. Story Design

2.1. Story Structure

Every story has a structure whether it has a good or bad one. In this research, we focus on the linear narrative structure to study the story development. A linear story progresses from A to B to C in sequential time(Arnold & Eddy, 2007; Beiman, 2012). Events in the story are presented chronologically. Most animation and film work in linear format.

To further analyze linear narrative storytelling, there is a structure that remains unshakable for thousands of years. Aristotle (384 BC~322 BC), a famous Greek philosopher, scientist and poet, could be the first person to bring up the idea of plot structure. As he said: "A plot must have, a *beginning*, a *middle*, and an *end*, and the events of the plot must causally relate to one another as being either necessary or probable." Freytag, a contemporary German novelist and playwright, considered plot as a narrative structure that divided a story into five parts, which is known as Freytag's pyramid(Figure 2).

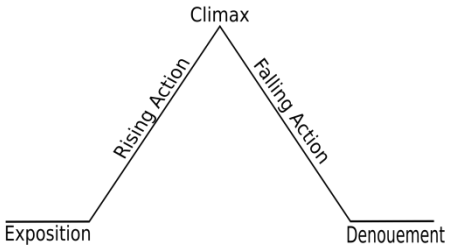

Figure 2. Freytag's pyramid

In scriptwriting for animation, film, TV and drama, a commonly referred structure is called "three-act structure", which is very practical and effective to attract the audiences' attention(Arnold & Eddy, 2007; Beiman, 2012; O'Neil, 2001; Sheppard, 2009; Tumminello, 2004). Storyboard as a visual expression of the story played as the key role in displaying story images. Its visual tension has to corrospond to the story tension. To better present the story structure visually, a curve diagram can illustrate the tension of the 3-acts accurately(Block, 2007) as shown in Figure 3.

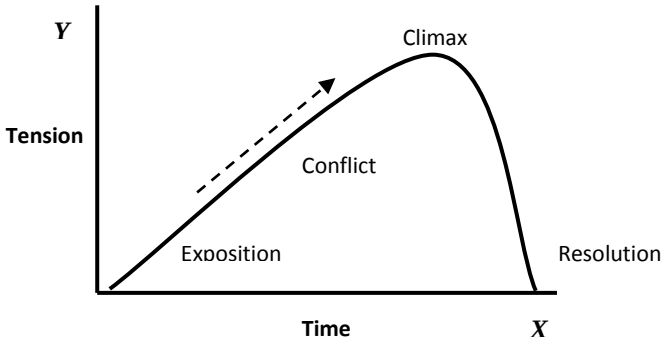

Figure 3. Visual story structure

Act 1 is the beginning of the story. In this exposition stage, the storyteller sets up the characters, location and conflict (situation) of the story. Act 2 is the middle of the story which contains many twists and turns, and keeps rising the stakes to make the story interesting and tension building. Act 3 is the end of the story. In this resolution stage, the climax is reached and the problem is resolved. The main characters attain their goal as well.

2.2. Storyboarding

Storyboards are illustrations displayed in sequence for the purpose of visualizing a story. Alfred Hitchcock (1899~1980), a famous director of suspense and psychological thriller film, also considered his films as storyboards come to life(Begleiter, 2010; Tumminello, 2004). In animation history, Disney Studio first conceived of storyboards with the rise of animated short in the early 1930s(Block, 2007). One of the earliest and most well-known uses of modern storyboard was for the animated feature film *Snow White and the Seven Dwarfs*(Eisner, 2008).

Not only in animation field, but also in other research domain, storyboard is utilized in many studies as a tool for assisting the design and development of game. Moreno-Ger in their development of graphical adventure video games, used storyboard as the key development element(Moreno-Ger, Sierra, Martínez-Ortiz, & Fernández-Manjón, 2007). Jhala developed a "Longboard" game engine system to present visually the *content* of the story with designed characters and environment(Jhala, Rawls, Munilla, & Young, 2008). Their utilization of storyboard in game development was innovative and successful.

2.3. New model of story design

The effectiveness of storyboard in converying ideas and stories is supported in previous studies. Therefore, here we propose a new model. We reverse the process by starting from storyboard design to create a story. Figure 4 shows the new model of story creation.

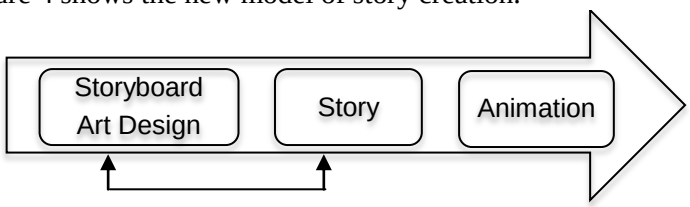

Figure 4. New model of story design

The model starts from storyboard creation to develop a story. In this way, designers could directly use images/storyboards to express their creative ideas of story. In the process of storyboard creation and storyline development, designers could smoothly modify their ideas to check the story plot arrangement with storyboards. This way we could save time in transforming ideas to written scripts, and conceptual words to images. This creation process actually match the creative cognition theory called Geneplore model (Finke, Ward, & Smith, 1992) which will be discussed in the next session. Therefore, with our proposed new model of story design, here we will examine how this method can be more efficient in production process. Whether this storyboard driven method for animation content development is applicable, it needs to be investigated in our study.

3. Creative Cognition

The solving of design problems requires thinking. Design thinking is an approach for practical, creative resolution of problems that looks for an improved result. Thus it is a form of solution-based, or solution-focused thinking that has a clear goal or what is meant to be achieved(Armstrong, Jr., & Gordon, 1975). Previous studies on problem decomposition have found out that with large base of relevant knowledge, designers could approach solutions with explicit decomposition strategy(Ho, 2001). Liikkanen et. al (Liikkanen & Perttula, 2009) proposed a dual-mode perspective which implicit and explicit problem decomposition are applied in idea generation.

Story design in this study is an idea generation problem that needs new means to resolve its development difficulty.

Creatively solvable problems vary in complexity, knowledge needs, and amount of divergent and convergent thought needed(Brophy, 1998). Although Wallas is the first researcher to propose a four-phase creative process model(G. Wallas, 1926), designers' invisible mental operations are not revealed. Guilford claimed that creativity was generation of ideas that were novel and appropriate to the field(Guilford, 1967). His assessment of creativity has positive impacts on other researchers, such as Wallas and Kogan(M. Wallas & Kogan, 1965) and Torrance(Torrance, 1984). Torrance, who was regarded as "father of creativity research", claimed that people's creativity can be revealed in their innovative *ideas* and *images*. Empirical work on creative imagery has in the development of a new approach to the study of creativity, which is called *creative cognition*(Finke et al., 1992). The creative cognition approach, applies the general methods of cognitive science to the study of creative thinking. It also provides a theoretical framework for developing related studies on creativity and imagination.

Geneplore model (Finke et al., 1992) provided a basic structure for the cognitive process. This model explained the phenomena of creative imagery by using two processing components: generative and exploratory process. Figure 5 shows the concept of the model. In the *generative* phase, mental representations called preinventive structures are first created. Generative processes such as retrieval, association, mental synthesis, mental transformation, and analogical transfer give rise to preinventive structures(Horng & Hu, 2009). In the *exploratory* phase, one then explores various interpretations of these structures. The preinventive structures can then be modified or replaced and the cycle can be repeated. Constraints on the final product can be imposed during either the generative or exploratory phase. The cycle of generative and exploratory processes can be reiterated until the final form of the pre-inventive structures is achieved(Palmiero, Cardi, & Belardinelli, 2011).

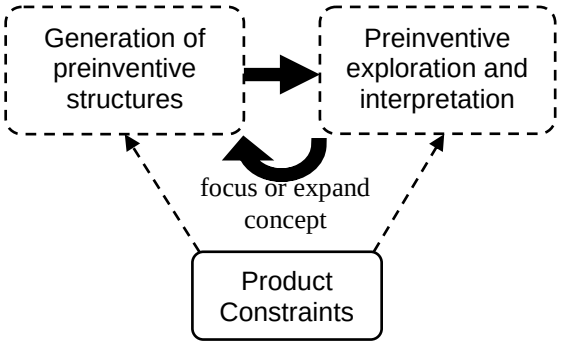

Figure 5. Geneplore model

We supposed that the two-phase Geneplore model could also explain the creative process of story concept development and the storyboarding visualization. In the generative phase, mental representations of the story ideas, flash of images and past experiences raise in designers' mind and in quick succession go to the exploratory phase. These ideas and mental images are interpretated, evaluated, and refined to meet the constraints of the product or task, that is, story genre. In the exploratory phase, the refined mental images can reveal in the form of storyboard. By going through the cycle of generative and exploratory phases, conceptual ideas thus can be presented in the form of visual storyboard. The application of Geneplore model to animation story design can thus be presented as Figure 6.

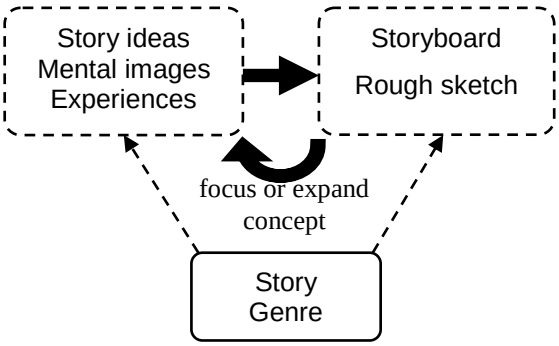

Figure 6. Story concept development with Geneplore model

4. Research Method

The goal of this study is to verify whether a reversed model of animation process, that is, a storyboard-driven method is practicable in story content development. 64 college students (32 male, 32 female) from multimedia, animation and motion pictures production joined in this experiment. 3 experts from animation industry were invited to evaluate novices' story design. A five point Likert scale (1=strongly disagree, 5=strongly agree) was used to examine story design elements to check whether this method could achieve good story structure. T-test analysis was conducted to examined the differences of experts' assessment and novices' self-assessment. Interviews were also conducted with experts and novices afterwards. This research can further contribute to the education and incubation of their training of story creation.

4.1. Design Task

The design problem that we raise to the participants is story design with storyboarding method. Without a specific animation script for storyboard design, participants had to create a new story by directly design with the digital storyboard system called *CrazyTalk Animator*. Participants were provided with basic story design visual elements and requirements as following lists.

- Story genre: comedy
- Characters: a cartoon boy and girl character, a puppy
- Background: an outdoor scenery with meadow, fence and small river
- Storyboard: 10-15 panels of storyboard for a complete story

Participants were required to finish the design task within 30 minutes. This task was conducted individually and followed by an interview and evaluation (self-assessment and expert assessment) when they finished the experiment.

4.2. Storyboarding System

The storyboarding system, *CrazyTalk Animator*, is developed by Reallusion company. It is a user-friendly system and easy to manipulate. Figure 6 shows the basic interface and menu of the system. Participants were trained on how to use it to achieve their desired boards before the task.

Figure 6. CrazyTalk Animator interface

5. Results and Discussions

5.1. Design cognition on storyboard driven method

After the storyboard task, an evaluation on the difficulty of the new model practice was conducted. Although experts did not practice the method, they were asked to answer same questionnaire based on their personal experience and thinking. The mean of novices' and experts' evaluation of design difficulty was 28.55 and 32.38 respectively. Novice designers regarded this reversed model of story creation as easier than experts' notion. The pair *t-test* showed $t = -6.026$ and $p = 0<0.05$. The result showed that there was significant difference between novices' and experts' evaluation. This infers that novice designers when required to design story with storyboard, they tended to think this new method easier than experts.

In the interview afterwards, 44 participants had positive attitudes towards this new method. Their responses are synthesized into following points.

- It was helpful to construct images directly and frame the appropriate shot.
- It was easier to think about the storyline and to examine the storyboard for the whole story structure. This can save time in our story development.
- It was a supportive method to concretize our mental images and to know the difference between imagination and realization.
- It was a good way to express creativity and imagination.

Experts, on the other hand, thought the storyboard driven method as difficult. They mentioned that with years of experiences on transforming texts to images, creating story from storyboard was a new challenge for them. Storyboarding from scriptwriting information had become an integrated ability for them. A well planned story was important for experts to start the production. Analyzing from the novices' side, since they were less experienced in storyboard or story design, plus from the data analysis we also found out they were more satisfied with their works than experts' judgement ($p = 0.007<0.05$), it is interpretable that novice designers considered the new method as easier than experts.

Story design via storyboard is a representation of our creative design thinking. Although the task required the participants to create a story from storyboard, the design process still starts from our thinking. The two stages of design interplay and mutually reinforce each other at the pace so fast that we could regard them as operating simultaneously. This design process indeed corresponds to the *Geneplore* model(Finke et al., 1992). Designers' mental images and story ideas generate firstly and move on to storyboard visualization of their conceptual ideas. Therefore, we can confirm the positive effect of this new design model. Compared with the traditional method, the storyboard driven method is not only time saving in animation process, but also more productive in creating story and storyboard simultaneously.

5.2. Story structure and evaluation analysis

To see whether the storyboard driven method of content design can construct a good structured story, we checked the evaluations from experts regarding the story elements. Participants' self-assessment results were also compared to see their cognitive differences on story design. The top 3 evaluations from experts are *resolution* (3.41), *climax* (3.30), and *story plot* (3.25). As for novices, the top 3 are *resolution* (3.66), *climax* (3.55), and *entertainment* (3.50) respectively. It is worthy to know that the top 3 scored elements from experts are *story structure* related. This implies that the new method of story design can actually work and is affirmed by experts. Also, novices had the same two elements as experts. This is a good phenomenon which implies that although with new method of design, novices were able to see the whole and judge what a structured story should contain.

In animation and film story design, "three-act structure" (Arnold & Eddy, 2007; Sheppard, 2009; Tumminello, 2004) is the standard format for most productions. With the reversed model of story content development, we also follow the same story structure rule for judgment. The results show that

from both experts' and novices' point of view, the storyboard driven method can still achieve some good structure story design. With this method, novices were able to create a structured story with visual images, which reduced the writing transformation process and time. Figure 7 shows the scope that the new method's positive support in story design.

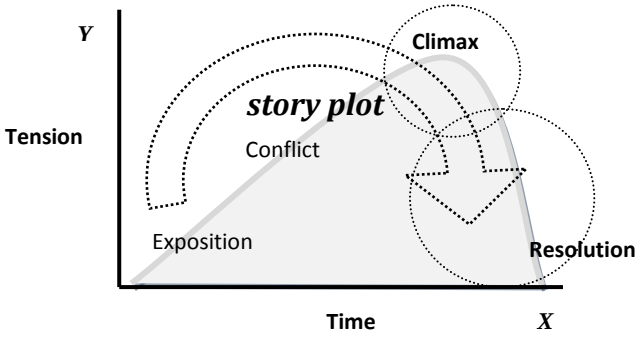

Figure 7. Positive support of storyboard driven method

6. Conclusions

The results show that from both experts' and novices' point of view, the storyboard driven method of content development can achieve some good structure story design. From the experiment, we find that the new method can help in the design of climax and resolution and the overall story plot. Regarding the exposition and conflict, there seems to be less contribution of this reversed method to story development. Nevertheless, from novices' point of view, this new model could effectively helps them to generate story ideas and modify them simultanously to fit the design criteria, which is time consuming in traditional production pipeline. Although traditional method may take long time to develop a good story, its solid foundation can help in building a good exposition and conflicts of story structure. The storyboard driven method is more effective in creating new ideas, visualizing and modifying story, constructing the overall story plot, and designing climax and resolution.

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