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## AUTOMATIC SHADER TOOL FOR 3D ANIMATION PRODUCTION IN THAI INDUSTRIES

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**ABSTRACT.** The 3D animation has become a big business in Thailand. We conduct the focus group with key authorities in the Thai animation industry in order to understand the real issues in Thai animations business. We found that Thai animators trend to manually set the attributes for the effects. This causes human errors and time delay in the development process. The aim of this research is to develop an automatic shader tool to help reduce human errors and time delay. But at the same time, the tool should give the animators control over the necessary attributes setting. Moreover, it should act as a learning tool for the new animators in Thai animation industry as well. This is because Thai animation industries require their animators to have basic understanding about the effect setting. Our tool is then tested with the animators in their real environment. The experts find our tool works efficiently and help them getting their job done quickly. Moreover, the new animators find the tool easy to use and reduce errors as well.

**Keywords:** 3D animations, lighting and shading effect, shader editor tool, Thai animation industry

### INTRODUCTION

In the last decade, the three dimensional (3D) animation has become a significant part in the entertainment industry. The animators define all the important detail of the animation in order to get the result that meet the director needs. There are many factors to achieve realistic 3D animation. Lighting is a very important part in the animation. Perfect lighting and shading effects generate the flawless performance that provides the right mood and tone for the audiences.

Producing realistic lighting and shading requires expertise. The experts require a lot of time to manually adjust the lighting and shading effects during the development of the animation. The setting of the effects is a tedious process as there are many values to be adjusted manually by the experts. Moreover, the rendering process of the result from the adjustment is a time consuming process. Especially, nowadays, the visual effects are composed of a very high resolution. The higher resolution means a longer rendering time during the animation development. As the lighting and shading effects are adjusted by an expert manually in the shader editor tool, therefore it is prone to human errors. Apart from human errors, in the Thai animation industries, there could be other factors that cause the errors such as the result not

turning out as the expert expected, or the director could not decide between few options in his mind. These errors in adjusting the lighting and shading effects can cost the project a lot of time as the result of the adjusting does not appear in real-time in the shader editor tool. The cost in rendering the result is quite high. Thus, for every adjustment that does not meet the requirement, it could increase a production time, to double the time of the original plan or more.

As mentioned, the process of adjusting the values for lighting and shading effects are complicated and tedious. Moreover, the errors in adjusting the lighting and shading effects for the animation increase the rendering time. As a result, it costs the delay to the original plan of the animation development. This could cost a lot of money in the film business. Therefore, in this paper, we introduce an automatic shader editor tool that aims to ease the adjustment process. This should reduce time in the adjustment process and also reduce the human errors for the animators. The tool is developed based on Mel Script technology. It should accelerate the time and reduce the burden of dealing with setting many various values in creating the lighting and shading effects. However, experts in Thailand have never used this type of automatic technology before. We also study the effect of adopting the tool in the real industry setting in Thailand.

The paper is divided in to 4 parts. The first part introduces the animation and its development process. The second part discusses the analysis of our interview with the industry in Thailand about the issues in the adjusting process of lighting and shading effects. The third part demonstrates our design of the automatic shader editor tool. Finally, the result and conclusion of the application of the tool in the real industry setting are discussed.

## ANIMATION

Kiti Pakdewattanakonn (Pakdewattanakonn, 1998) defined animation as the graphics that have movement that represents phenomena that occurs constantly such as the motion of the atoms in the molecule or the motion of a piston engine. In order to motivate a creative imagination for the audiences, an animation production will need to have particular characteristics which may cause the problem on the size of the files. The process of the animation development is described in the next section.

### Animation Production Process

The main process of the animation production is divided into 3 steps.

*Pre-Production.* This step is all about the preparation tasks such as thinking of concept, writing the story, combining the original script from the author. This includes drawing a storyboard and making a digital story reel. To make the digital story reel, modelling and texturing are regarded as the very important tasks in this step. This is because it will dominate the direction of the project. If the pre-production is completely well planned at this stage, the whole production process will be done easily.

*Production.* This is the step of doing the production such as drawing, creating the environment background and generating the animation based on the storyboard that was done during the pre-production stage.

*Post-Production.* The last step is the procedure to tidy up the loose ends of the product such as combining the animation clips together, putting the sound and adjusting the color. The aim of this step is to recheck and edit what is needed to be readjusted by the product to the completion and ready to be illustrated to the audiences.

From the animation production process, the lighting and shading effects play an important role. The animators adjust the lighting effects freely based on the story and the mood that he wants to portray in the animation scenes. The lighting effects can be described as follows.

*Key Light.* It is the main light that gives brightness to the whole scene. The height of the source of light is depending on the mood you want to convey. Usually it is placed above the scene at an angle around 30-45 degrees.

*Fill Light.* It is the light that requires to smooth out the contrast from the result of the reflection from the key light on the characters. The fill light is used to add the balance to the scenes and make the scene more realistic. Normally, the fill light is set at 90 degrees of the key light.

*Back Light.* It is also called the Rim Light. This light will break objects or characters from the background. The position of back light is usually placed at the opposite from the position of the camera.

*Shadow.* It demonstrates the dimensions of the scene. Typically, the shadow is caused by the key light of a scene, however, the shadow may come from more than one light source.

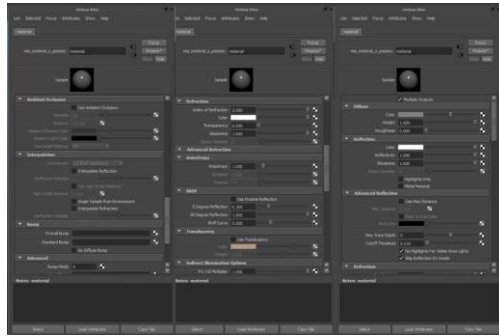
There are many settings to create the lighting effects in 3D animation. The next section discusses about our first study about the issues in Thai 3D animation industries.

## **INTERVIEW WITH THE INDUSTRIES**

In order to understand the key issues in the Thai industries, we set up the focus groups with the marketing directors, VFX creative directors and founders of the top companies in Thailand including Big Brain Pictures, DigiForest, Kantana Post Production and Anilephant studio respectively. These companies in Thailand are the leading companies that produce many 3D animations. From our in-depth interview with the experts that work in the animation industries in Thailand, we found that they all find the setting of lighting and shading effects is a long and tedious process, as there are many attributes to be set. Moreover, it is time consuming because it does not have a real-time result display part on the tool as seen in Figure 1. The new editor member normally finds it hard to understand and takes time adjusting the attributes expertly.

Auchara Kijkanjanas (Kijkanjanas, 2016) said that in the SLR section in the Thai animation industry, human errors occur hugely. Moreover, the repetition of the lighting and shading setting is required in many shots in the animation. For example, adjusting the appearance of the surface for lighting arrangement in each shot in the animation can happen repeatedly so many times in one animation. If the error occurs, it wastes a lot of time to redo every shot. As a result, it causes a problem in production.

Hideo Mori (Mori, 2016) states that apart from human error, another main problem in the animation production process is the inconsistency of the way the animators name their files. The animators named the files inconsistently for different adjustments of the surface effects. This causes problems during the team collaboration and recovery of the previous adjustment files. This comes from the result of an unnecessary time consuming process of searching for the wanted file.



**Figure 1. Current Non-Automatic Shader Editor Tool (Autodesk , 2016).**

Pitha Tripetchsomkhun (Tripetchsomkhun, 2016) said that jobs of the SLR section in the animation production requires a lot of manual tasks. For example, the animator has to adjust many attributes in the shader tool to get a suitable appearance of the surface. Moreover, the new animator has to learn about these many attributes when some of them do not even get to be used in the real situation. These processes take quite a long time. This may cause a delay in the operation of the production.

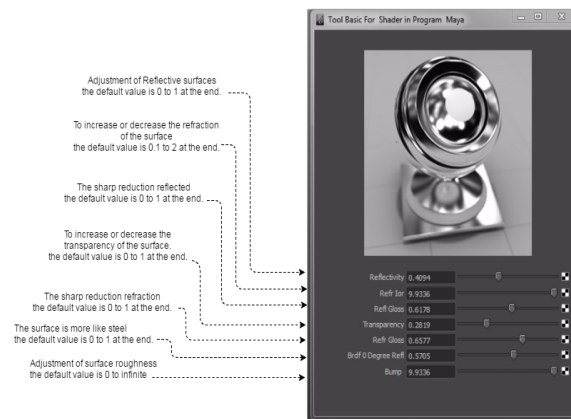
Kompin Kemgumnird (Kemgumnird, 2016) mentioned that the SLR sections in the animation productions abroad have adopted automation tool to help in offloading the work. This is the main advantage of the abroad industries. They have Mel script or an automated system to reduce workload in adjusting the setting for the effects. Therefore, they have more time to consider and take the crucial decisions about the outcome of the product.

From the focus groups, we conclude that Thai industries requires an automatic tool to help with setting up the lighting and shading effects. But unlike industries abroad, Thai industries still require animators to have a basic concept of adjusting the setting and control over the setting. Therefore, the tool should not be fully automated. It should just reduce the work load and human errors from repeated burden and unnecessary tasks. Our design of the tool is discussed in the next section.

## **OUR DESIGN**

From the issues suggested by the directors and founders in the previous section, we propose an automatic shader tool. It is developed based on the Mel script that works with Maya to introduce the best practices for setting the appearance of the surface in 3D animation with minimum effort. However, in Thailand, the industries still require animators to understand the basic concept of adjusting the effects. Moreover, Thai animators have never used the automatic tools before. Therefore, in our design, the complex and tedious effect setting attributes in Maya are reduced to a selected set of simple and necessary attributes. The minimalist interface targets to reduce the human errors. But at the same time the animators still have the control over the necessary setting of the effects. They do not feel that they lost control over the tool as it is an automatic tool. The interface of our design is shown in Figure 2. The selected attributes in our design are based on the analysis of our in-depth interview with the experts. As we adopted participatory design concept, the animators became part of our design team. They provide feedback during our design and development process of the tool. The unnecessary attributes that are not commonly used are omitted in our tool. With these attributes, this tool can be used as a learning tool for the new animators in the industries as well. Moreover, as the number of attributes is minimized, it should reduce the learning time for new animators in the industries too. To reduce time in waiting for the result after submitting the setting to Maya, our tool also provides a panel that shows the real-time result of the setting in our setting interface as well. The tool also provides an automatic mechanism for naming the file in the consistent manner. This should reduce the time of finding the existing files. As the Thai

animators have never used such an automatic tool before, we have to study the user experience of this new tool in their work routine. The next section discusses the application of the new tool with real users in Thai animation industries.



**Figure 2. Interface of Our Tool.**

## IMPLEMENTATION

From our in-depth interview with authorities in the industries including Veera Sainimnour (Sainimnour, 2016), Patchanu Nori (Nori, 2016) and Supaluck Rungreng (Rungreng, 2016), we found that there is a big difference between novice animators and experienced animators. Therefore, the experiment is divided into 2 parts. The first part is with 8 experienced animators in order to evaluate the performance of the tool for the best practice of setting up the appearance of the surface in 3D animation production. The second experiment is tested with 20 employees in the SLR section in the renowned 3D animation companies in Thailand including Big Brain Pictures, DigiForest and Kantana animation studios. This is done to evaluate the satisfaction of new animators who have less training in setting up the lighting and shading effects and have to deal with the tedious setting every day. Then the questionnaire is used to evaluate qualitatively of the result on top of the observation. The questionnaire is divided into 3 parts. First part gathers the personal information about sex, age, job description and work experience. The second part is about the feedback on the efficiency of the tool in setting up the appearance of the surface in 3D animation. The last part contains questions about the satisfaction of the tool.

The performance assessment by the experienced animators showed that user interface design answers the user's requirement of showing current status of the system and it has a simplify form filling interface for the setting up of attributes for the appearance of the surface. The satisfaction of the interface is very high with the average value of 5 out of 5. The appropriateness and correctness of the data representation of the tool got a high satisfaction with an average of 4.50 out of 5. The users have high satisfaction with the accuracy and the error reduction in filling forms with an average of 4.00 out of 5. For the automatic file naming function, the users give a high satisfaction with an average value of 4.00.

The second part measures the satisfaction of the animators, who have to deal with the tasks every day. The animators gave a high satisfaction with the tool for setting up the appearance of the surface in 3D animation with an overall average at 4.36 out of 5. The animators give a high satisfaction with an overall average at 4.26 for the convenience of information and file searching within the tool. For the accuracy of the tool, the animators give a very high satisfaction with an overall average at 4.66. Finally, the satisfaction of the beneficial of the tool got a high satisfaction with an overall average at 4.30.

## CONCLUSION

The focus groups with the directors and founders of the animation industries in Thailand suggest that Thai animators should be introduced with the automatic tools. The tool should deal with firstly, the complexity and the repetition of setting many attributes for the appearance of the surface in 3D animation. Secondly it should help with the untidiness of the filing system of the animator team.

The tool is developed accordingly and tested with two groups of users (experienced and new animators). The result of our questionnaires state that the experts are very satisfied with the tool's interface. This includes the satisfaction with the selected attributes that the developers pick to be presented in the tool for the animators to use in setting the appearance of the surface in 3D animation. With regard to the direct users, the new animators find the tool easy to learn and easy to use. It encourages the convenience of the process of animation development immensely. With the consistent file naming system, the animators find it very useful during the file searching process.

The study demonstrates the benefits of our tool that deduct the learning time for new animators for attributes setting of the appearance of the surface in 3D animation. Our automatic shader tool provides the solution to the huge obstacle for Thai animation industries as stated in (Pooksuk, 2015). To conclude, the automatic shader tool benefits the animators massively.

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