

# An efficient production pipeline used to create 52 full 3DCGI anime episodes.

Ken Suzuki\*1   Yoshishige Matsuno\*2   Shigeru Horiguchi\*3   Hiroshi Arima\*4  
Yahara Studio SUNRISE, Inc.



Figure1 Toon Shaded characters for a 3DCGI series

## 1. Introduction

The autumn of 2003, Cartoon Network began the airing of a full 3DCGI 52 episode TV anime program called “SD GUNDAMFORCE”, which presents detailed child-sized mechanical characters in full action. This sketch will discuss the development of our various custom shaders which utilizes CPU & GPU and the production workflow that incorporated these shaders, to complete all 52 episodes (30 minutes per episode) of “SD GUNDAMFORCE”.

## 2. Background

With the given timeframe and a restricted budget, it was impossible to produce a program of high detailed characters in motion, using the methods of traditional 2D anime production, hence the project commenced with the direction of full 3DCGI. With the conditions of using cel shaded models, we prepared our first production pipeline incorporating using only CPU rendering. But from experience from our prior 3D shorts, the rendering time per frame for a full 3D scene would be no less than 40minutes. Having to complete all 52 3D CGI episodes (approx. 26 hours) within the given time frame and budget, we had to develop new tools which lead to constructing a fresh new production pipeline to save both time and cost.

## 3. The development of Original Tools and the accelerated Turnaround period.

The following listed below are several problems that may occur when constructing a new production pipeline; the adaptation from 2D to 3D for directors, artists, and all other staffs who are accustomed to traditional 2D production, the unpredictable time frame needed for trouble shooting when producing a 3DCGI production, the construction of a series workflow where both story and CG work are produced simultaneously. These were some problems that were raised and had to be corresponded to, during our CG R&D period for creating an in-house original production. To increase turnaround time, we not only solved all the enumerate

lists of issues, but also introduced Motion Capture as our new character animation system, and we started development of “GPU Assisted Pre Final system” which utilizes the GPU. With this system, the CPU and GPU powered shaders (Table1) can produce a close to final quality image in real time; the Directors are able to give instant feedback to animators without waiting for images to be rendered, and the animators also were able to work, test, and troubleshoot their work in close to final render image in real time. By adapting this new system to our workflow, we not only solved all our challenges, but greatly increased production time (render time has increased to roughly 30-40times). For hardware, other than the graphics board, all machines have the same specs. Our Prototype system used 3DLabs Wildcat series, and in-production, the additional systems used NVIDIA QuadroFX series.

No	Name	Description
1	SD_Cartoon Shader	A shader that enables to view Celshaded view in Realtime
2	SD_OutLine Shader	A shader that enables to view outline edges in Realtime
3	SD_Particle Shader	A shader that enables to view emitted Particles in Realtime
4	SD_Fur Shader	A shader that enable to view fur on Polygon in Realtime

Table1 In-House custom 3D Plug-ins for Commercialized 3D software

## 4. Results and Conclusion

By incorporating the GPU Assisted Pre Final system to our production, we were able to complete 26 hours of final output footage in a very tight span of 18 months. With the construction of this fresh pipeline, we had evolved into a completely different style anime studio than originally planned. However, with our new system, we are currently producing a full three-dimensional 3DCGI ride simulation, and we have several other projects in progress.

e-mail: \*1:ken-suzuki@red-comet.net  
\*2:yatsuno@acm.org  
\*3:horiguchi@zakrello.net  
\*4:arima@artify.com