Moana: Geometry Based Disco Ball Lighting for Tamatoa's Lair

Dong Joo Byun Shant Ergenian Gregory Culp
Walt Disney Animation Studios*

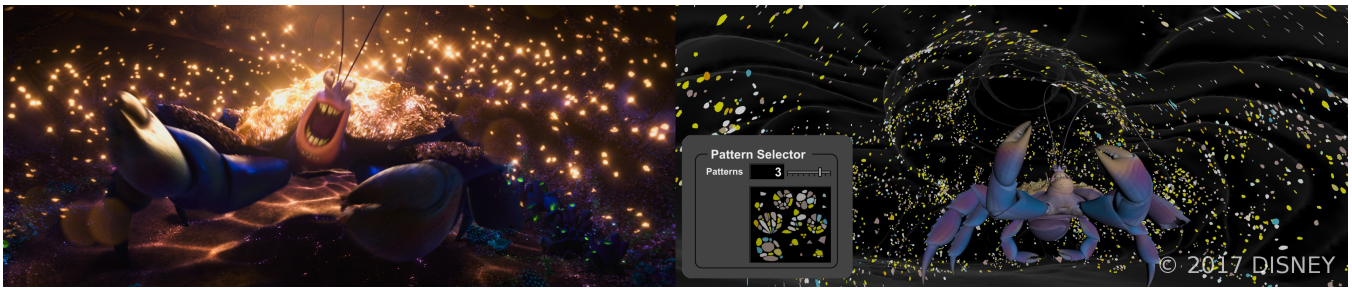

Figure 1: Tamatoa's Lair Disco Light Effects.

ABSTRACT

In the "Lair of Tamatoa" sequence of our latest movie ***Moana***, we had 56 disco ball lighting effects shots. Our effects and lighting departments collaborated closely to create the bizarre and ludicrous environment of the scene. We developed a geometry-based lighting pipeline which allowed us to interactively design the light effects..

CCS CONCEPTS

•Human-centered computing →Visualization design and evaluation methods; •Computing methodologies →Procedural animation;

KEYWORDS

Visualization, procedural Animation, geometry, art-direction

1 INTRODUCTION

In the lair scene, Tamatoa, the boastful big crab, sings and dances as he threatens Moana and Maui. The light source originates from the ceiling and Tamatoa's shell acts as a disco ball, reflecting complex patterns of light on the walls of the lair. Our challenge was to design the timing, composition, shape, size and motion of the disco light patterns more interactively. We had to decide how realistically the patterns should follow the characterfis motion and how much artistic touch we should add on.

Initially, we simulated the interaction of light with the shell geometry to produce most realistic reflection patterns. The accurate reflections provided us with a tightly bonded reaction with the character's animation, but did not offer any art-directed animation control and the motion of the patterns was too distracting.

We also explored an approach inspired by the use of cucalorus patterns in film lighting. A cucalorus is a stencil device used to generate patterns of shadow or light. We used an environment map to represent the patterns through alpha values, and this was illuminated by a point light source constrained to Tamatoa's shell. The animated cucalorus provided artistic shapes of patterns, but the motion was disconnected from the character's animation. In addition, generating the animating pattern with the actual light source was a relatively expensive process.

In order to achieve a good balance of art-direction and realism, we decided to pre-visualize the patterns using geometry instead of using the light source. The geometry was then converted to a usable light source for the final render.

2 PROCEDURAL GEOMETRY CONTROLS

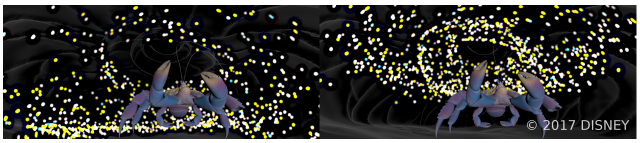

Figure 2: Height Controller

In our system, either manually or procedurally generated geometry could be used as reflection shapes through a pattern selector. Rays were shot from the light position on the shell geometry onto the lair's wall. The resulting points moved on the wall, and generated the specified pattern shapes. By changing the number of the points, we could control the density.

We used procedural animation rules to control the size, rotation, and speed of the individual patterns or of the clustered patches. We also could control the height distribution with the height controller.

In order to define how much interaction the patterns should have, we had a tilting weight and rotational weight. We tuned the

*email:Dong.Joo.Byun@disneyanimation.com.
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tilting value to make the patterns interact properly with Tamatoa's body shaking animation.

We also intentionally added rotation to the overall animated patterns to further simulate the look of a disco ball. The rotational weight allowed the patterns to move partially with Tamatoa's rotation and partially independently.

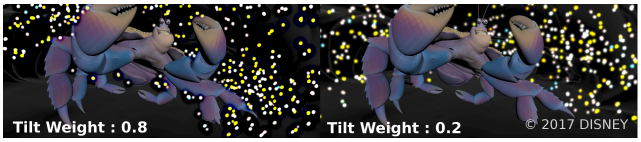

Figure 3: Tilt Controller

3 LIGHT SOURCE GENERATION

Once our pattern animation was approved, we mapped the patterns onto a sphere placed on the shell. We then un- wrapped and repositioned the patterns in uv space to gen- erate a 4K (4096 x 2048) animated pattern image sequence.

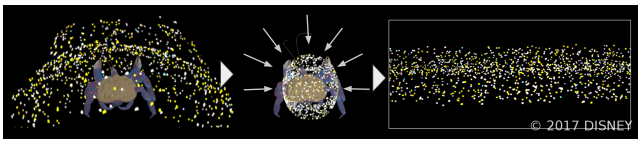

Figure 4: Light Source Generation

4 LIGHTING

After having spent a cycle calibrating the relationship between our lighting system and the pattern generation system, we were able to completely match the results in the renderer.

Once the pipeline had been established, lighting received generated maps that were further art directed or in some cases not, until the final desired motion was achieved. With the addition of some musically timed animation and bloom effects the disco ball effect was integrated into the appropriate shots.

5 CONCLUSION

We established a geometry based lighting system for the pre-visualization and the light source generation. It provided us with procedural and intuitive control of the animated lighted patterns. It was very beneficial that we could interactively design and modify them in viewports, which we would see as same results in final renders. The detailed and art-directable controls of this system facilitated otherwise very complex lighting process of this kind of tasks. This system allowed us not only to do great performances but also to accoplish our creative goals of Tamatoa's lair lighting effects.