

Delicious Looking Ice Cream Effects with Non-Simulation Approaches

Dong Joo Byun* James Mansfield Cesar Velazquez
Walt Disney Animation Studios



Figure 1: Left: Ice Cream Scooping. Right: 2D Drawover, Key Frame Animation with Deformers, and Rendering

Abstract

Simulations provide us with physically correct motions and believable features for effects elements. However, when creating more stylized and unique effects animation, we frequently need more art-directible and manageable tool sets. This session presents a detailed overview of specific non-simulation based approaches we developed for the ice cream effects in Disney’s *Zootopia*. And we will discuss their benefits and productivity.

Keywords: 2D drawovers, deformer, non-simulation, ice cream

Concepts: •Computing methodologies → Procedural animation;

1 Introduction

Animating ice cream in *Zootopia* provided us with unique challenges. We needed to capture a high level of detail with in the effects, since the ice cream was the hero effects element in the shot. We designed the shape and motion of the ice cream effects through 2D drawovers. Many different approaches were tried including fluid simulations and key frame animation, and the deformer-based key frame animation could give us the correct blend of quick performance and art-directibility. The procedural and painted textures made the ice cream look more delicious.

2 Ice Cream Scooping

2.1 Effects Design - 2D Drawovers

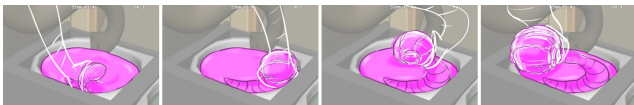


Figure 2: Ice Cream Scooping Drawovers

* e-mail: dong.joo.byun@disneyanimation.com

All images ©Disney Enterprises, Inc.

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s). © 2016 Copyright held by the owner/author(s). SIGGRAPH '16, July 24-28, 2016, Anaheim, CA, ISBN: 978-1-4503-4282-7/16/07 DOI: http://dx.doi.org/10.1145/2897839.2927445

With 2D drawovers, we proposed that the ice cream would be scooped, by rolling the ice cream mesh.

2.2 Deformer and Key Frame Animation

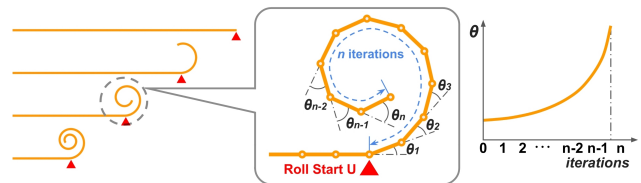


Figure 3: Geometry-Roll Deformer

We developed a geometry-roll deformer to make the rolled ice cream mesh. All of the points in the geometry had a “rollU” attribute and the tool had a “roll start u” parameter. With the difference of these two values, points could have different bending angle values. The code runs multiple iterations of a bending process on the given geometry. Every iteration, an increasing bending angle is applied to each section, and it generates the rolled geometry as illustrated in Figure 3.



Figure 4: Rolled Geometry, Geometry-Roll Deformer Interface

In order to make the area where ice cream would be scooped out, first we sculpted the geometry and then blend-shaped it with the original geometry. Scooped out shape was gradually revealed along the guide curve.



Figure 5: Scooped Out

2.3 Textures and Shaders

Another challenge we had was generating the ice cream textures. We animated the revealing and hiding of procedural and painted textures, in order to apply different surface properties on the ice cream.

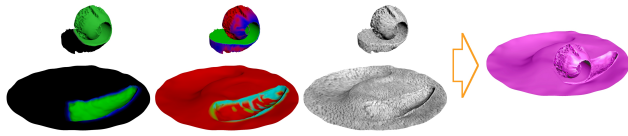


Figure 6: *Ice Cream Textures*

3 Ice Cream Dropping

3.1 Effects Design - 2D Drawovers

For a different shot, the 2D drawover was used to design the shape and motion of the falling ice cream. We designed the ice cream mesh to be stretched when it was released from the elephant's trunk.

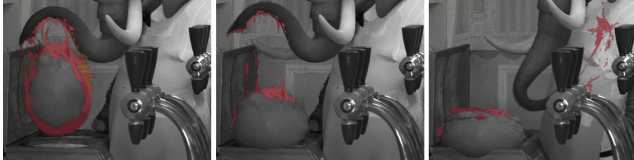


Figure 7: *Ice Cream Dropping Drawovers*

3.2 Deformer for Pinched Shape

In order to deform the falling ice cream, we used a curve-based deformer. The deformer stretches the geometry along the guide curve and based on the proximity to the curve.

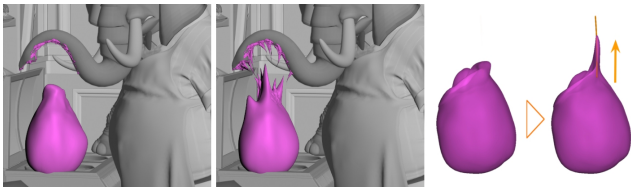


Figure 8: *Pinched Shape by A Curve Based Deformer*

3.3 Other Non Simulation Approaches

For the small bits of ice cream which dripped from the elephant's trunk, we implemented a non simulation based approach called "interactive script-based dynamics" [Byun et al. 2015]. It was used to design the dynamics of single geometry piece interactively with the pre-defined kinematic rules. To animate the ice cream smearing on the elephant's apron, we first painted the finished texture and we used an animated matte to reveal it.

4 Conclusions

2D drawovers provided us with a solid vision of the effects we needed to create. It also helped us in designing and optimizing our tool sets, and it was a great communication tool between the artist and the director. With our customized deformers and key frame animation, we were able to have our 3D animated ice cream match the 2D drawovers. By animating painted and procedural textures, we could create the delicious ice cream look. In conclusion, these non-simulation approaches allowed us not only to do great performances but also to accomplish our creative goals of *Zootopia*'s ice cream effects.

References

BYUN, D. J., WADIA, Z., AND KASCHALK, M. 2015. Interactive script based dynamics in Big Hero 6. In *ACM SIGGRAPH Talks*