Rigging with Constraints on *How to Train Your Dragon: The Hidden World*

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Figure 1: The Lightfury Rig in Action

ABSTRACT

For *How to Train Your Dragon: The Hidden World*, DreamWorks Animation made the decision to reuse the existing character assets from the preceding production, *How to Train Your Dragon 2*. Many resources were put into rigging the large quantity of characters , and the rigs went through intense scrutiny. This created an interesting suite of challenges for the rigging team, involving everything from adding secondary add-on deformation systems to legacy characters, creating characters that mixed and matched new faces with old bodies, and the development of a new 'simple dragon' rig to help populate the world.

CCS CONCEPTS

• **Computing methodologies** → **Animation**;

KEYWORDS

rigging, animation, modular rigging, premo

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1 INTRODUCTION

During the production of *How to Train Your Dragon 2*, DreamWorks Animation introduced the award winning *Premo* animaton software to its pipeline. This major development effort required a complete redesign of the rigging systems at the studio. As a result, an extensive amount of resources went into rigging the characters on that production. To capitalize on that work, the rigs were ported to the new film. This allowed more time to be put toward new characters. There were over 30 returning character assets, many of which had multiple head and body variations. There was not sufficient rigging schedule time to rebuild them. Another advantage of porting was the ability for the animation department to reuse most of their 'pose libraries.'

Despite the benefits, porting created an interesting set of challenges for the rigging team. Animation tools and technology improves and adapts. Assets can become outdated in the span of only a couple productions. Although robust for their use on the previous movie, the ported rigs were outdated from the latest techniques developed on other shows. With a constrained rigging team, clever, economical solutions had to be developed to address this problem, along with solving new issues that arose as a result of porting characters.

Figure 2: Some secondary deformation systems added to legacy characters. Left to Right: 1. Legacy Rig. 2. Bendy Limbs. 3. Contour Cage. 4. Muscle Groups

2 OLD MEETS NEW

Although the old characters couldn't be rebuilt to get new functionality, we could find other ways to enhance them. Our procedural character graphs allow for multiple stacked deformers, making it possible to add layers opposed to editing existing systems. We added a bendy-limb system to allow for curvature-tuning controls in the arms, legs and torsos. This system is a layered deformation system, where curves follow segments of the original skeleton, and apply a secondary deformation offset on top of the basic skeletal deformations. Some dragon characters went further and incorporated a silhouette-sculpting tool we call the *contour cage*. This system consists of a low resolution cage model that affects the final skin, where each vertex and certain declared edges of the cage are exposed as controls for animators. This allows for more fine tuned silhouettes, solving issues where a shape needs to be adjusted based on a particular camera angle. We also added a system that allowed animators to shape and simulate broad, generalized 'muscle groups.' This was another secondary deformation system that allowed animators to shape various clusters weighted to mimic muscle groups. It also included settings for animators to run simulation, and get some secondary jiggle for free.

3 MIX AND MATCH

For Animators, the old *Dragon 2* rigs behaved similar to the new-style rigs of subsequent shows, but the new rigs had been completely reworked underneath. New characters created on *How to Train Your Dragon: The Hidden World* could be rigged in this new rigging paradigm, but had to appear consistent with the old rigs when an animator interfaced with them in *Premo*.

A complication arose when having to create the Lightfury character. Since she was a new character, it was decided to give her the updated face system. The body was a more complicated situation. The dragons on the second film had a number of specialized systems for the bodies that weren't updated from the template-include structured rig components of the second film to the build-script based components of the modern productions. With little development time to rebuild these package components, it was decided to use the old systems for all dragon bodies. This required some restructuring of the character graph to get the old body systems to work with the new face system. The way the rig passes data from one component to the next was reorganized and simplified between the two productions for legibility. This meant that we had to replace and rewire a number of the 'connective-tissue' data objects in the graph so the new style face would have access to the expected data from the body. The basic character directory structure of the old characters was also out of date, and had to be altered in order for the animation software to understand how to properly compile hybrid characters. The result was a hybrid character graph, where the old style body output data would plug into an intermediary output object, so it could hook right into a new-style face rig.

After this was implemented, it opened the door for mix-and-match opportunities. It allowed riggers to tweak the Valka character's face design and redo it from the ground up (the only 'legacy' character to get this treatment). It also allowed production to add three warlord villains as secondary characters later in production. They all inherited a ported, already completed body, and only the faces and wardrobe had to be set up from scratch.

Figure 3: The hobgobbler was rigged with the 'simple-face'

4 HIDDEN WORLD OF DRAGONS

This mix-and-match of technologies also allowed a greater variety of dragons in the universe. The production wanted to include cameos of some of the dragon characters from the television show and short films of the franchise without putting too many resources into rigging them. While the old-style dragon bodies were still difficult to set up, we identified what features from the hero dragon rigs we could get away with losing for these cameos - mostly by not taking the time to set up individual controls over the hundreds of custom spikes and fins unique to every dragon species. Most of the savings of these cheaper dragon characters came from the face. We developed a completely new 'simple-face' system out of the build-package components available with newer body rigs. We created a simplified, generalized reptile head, which could adapt to any new dragon that was added. This system allowed a simple dragon face set up in around two days, compared to the six to eight weeks it would take to rig a regular fully-featured dragon face. It was flexible enough to add new functionality for certain creatures that ended up getting more screen time, like the hobgobblers.

5 CONCLUSIONS

While *How to Train Your Dragon: The Hidden World* reused the character assets from *How to Train Your Dragon 2*, it did not mean a lack of rigging problem solving. The decision saved the production time and effort in multiple departments, and created novel rigging challenges not normally faced at DreamWorks Animation. The rigging platform is robust enough to adapt to these challenges, and allowed the rigging team to blend new and existing tools and techniques to complete the film with a constrained team.