

# The Animation of Togo: Achieving hyper realism for 11 CG dogs

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Figure 1: A plate (left) and still (right) from the film 'Togo', ©2019 Disney Enterprises, Inc. All Rights Reserved.

## ABSTRACT

Disney+'s 'Togo' is a testament to the critical creative partnership between DNEG's Build, Rigging and Animation departments, in the pursuit of a realistic CG dog. This talk will explore the intricacies of creating photorealistic dogs from ideation to finish, demonstrating the process from an Animation standpoint, while addressing the collaborative nature of the project.

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## 1 INTRODUCTION

One of the main aspects of DNEG's work on Disney's Togo was the need to create realistic CG dogs that would look identical to the on-set dogs used in the film. There were many shots the real dogs were able to do but also a number of shots that required CG dogs due to the risk and danger it would pose to the real dogs. This meant the CG dogs needed to be completely indistinguishable from the on-set dogs due to regular intercuts in the edit between CG and real dogs. DNEG spent a great deal of time focusing on the asset development of the dog and making sure all departments in the pipeline were fundamentally involved in addressing key issues with believability before we started shot production.

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## 2 IMPROVING VIRTUAL CANINE PERFORMANCE

The project had two major challenges for animation. The first was how to get a CG dog to emote realistically in close up facial hero shots, side by side with live action shots of the same dog. To accurately recreate dogs' facial movements and expressions, DNEG developed a new facial system incorporating dogFACS for the dogs' facial performances.

### 2.1 RESEARCHING DOG FACS

With Arna Diego acting as the Animation Lead in charge of dog facial animation, the team gathered onset video reference footage of the canine actors to understand husky faces, behavioral patterns and individual personality traits. They also used YouTube and other online sources to gather dozens of home videos of dogs emoting, usually in aggressive ways as this would be the primary emotion for some of our close-up hero shots. To properly understand the team's reference material, Arna studied the research made on dogFACS learning about the different dog facial movements such as 'lip corner puller', 'upperlip raiser' and 'nose wrinkler' as well as the dogs' anatomical structure and muscle groups.

### 2.2 DEVELOPING NEW TOOLS

Following her research, DNEG Lead Animator Arna Diego and Build Lead Lucas Cuenca combined their knowledge on the dogs' facial anatomy and range of motion and developed new blendshapes based on dogFACS and other referenced material. With Animation, Build and Rigging working closely as departments, the team meticulously broke down each of the muscles in a dog's face and built comprehensive style guides illustrating how muscles interacted depending on the expression of the subject. After constant exchanges and feedback between the three departments, the Rigging department was able to develop and provide the Animators with a fast and



**Figure 2: A still from the film 'Togo', ©2019 Disney Enterprises, Inc. All Rights Reserved.**

intuitive facial rig with a great overlay control system to recreate the vast range of motion of the canine's face. After the animation was completed, the team collaborated with the Creature FX department to further enhance the performances of the dogs.

### 2.3 CG SNARLING

When possible, the live dogs would perform on screen, but there were certain behaviors where it was appropriate to replace even the dog's facial performance. One of those behaviors was snarling, which featured in some of the key hero shots. With a new and improved facial rig, the animation team was prepared to take on the challenge of mimicking the complex and nuanced micro movements found in a realistic snarling dog. It was a great challenge for the team to realistically portray a dog transitioning from angry to resigned and relaxed. The FACS shapes combined with added detail worked to accurately represent the mobility of a dog's muzzle when it snarls. The Animation team was successfully able to recreate detailed micro-movements that had been integrated into the facial rig; producing a CG dog's facial performance hard to distinguish from the live canine's.

## 3 DOGS ON ICE

The team's second major challenge consisted of completing a short section of full CG shots during the Norton Sound sequence. The sequence set on the treacherous Alaskan landscape sees 11 sled dogs, led through the blizzard by Willem Dafoe, galloping on the ice as it breaks and tilts with the weight of the sledteam.

### 3.1 BUILDING AN ANIMATION LIBRARY

A part of the animation team led by Leonardo Bonisolli focused their efforts on quadruped locomotion and started building a movement library consisting of online references, footage and original plates of different dog gaits, slips and falls on ice. After selecting the best material available, the team crafted most reference into animation clips that became the building blocks of the animation process. Throughout their research, the animators learned some of the main differences between race dogs and sled dogs, and, most importantly, the dynamics which lead a dog to slip or fall on ice. For instance, dogs responded in a very different manner depending on when the lack of balance started occurring. Throughout the movie, the CG dogs had to be mixed in with live plates, which meant the

animated huskies had to be completely indistinguishable from their live counterparts. The animated performance featured in the Norton Sound sequence was largely successful thanks to the time spent thoroughly analyzing the aforementioned reference and referring to our quadruped locomotion studies.

### 3.2 RETHINKING QUADRUPED RIGS

To support realistic performances to a higher standard, DNEG's Rigging department redeveloped its entire quadruped rig support. The new rig allowed Animators to create even more realistic CG dogs. With a new front leg module with 'limb lock' functionality, they were able to mimic the locking of the front legs most animals do when carrying their weight over the leg. The new rig included a reconstructed spine which added to the realism and functionality of the animation. The Rigging department worked in collaboration with the Animation department to then develop a rig specifically for the sled harness which would take into account the distance between each member of the sled-team and would prevent the animators from creating motions that would fall outside of the rule set by the harnesses.

### 3.3 THE PHYSICS OF DOG FALLS

In order to accurately represent dogs slipping and falling on ice, the Animation team needed to understand how 4 legged animals, running forward quickly along a slippery surface get affected by the ground suddenly tilting. Since Togo features sled dogs, the Animation team had the added challenge of working with dogs bound together by a rope harness system, with a heavy sled dragging the rear of the team as it loses control. The absence of any footage of dogs slipping and sliding at such steep angles, meant that a lot of the mechanics and physics used in the show had to be based on interpretation of how gravity affected each of the team members in such perilous conditions.

Leonardo Bonisolli and Aaron Gilman, Head of Animation at DNEG, retraced all the way from the storyboards how the ice incline would affect the sled team composition curvature forcing it to bend as it slowly loses forward momentum and is pulled down by gravity over time. Each dog performance had to therefore work in combination with the overall physics of the sled and the animation clips collected in the animation library provided the animators with enough flexibility to keep every dog running, slipping and falling in unique and non-repetitive ways. The rough blocking achieved with this method, served as a starting point to design the dog performances and selectively choose when a dog had to run and pull the sled forward or rather temporarily slip and struggle to regain its balance. Gravity played a fundamental part into crafting the dogs' animation as not only the sled had to consistently slide towards freezing waters, but even the dogs themselves had to try and fight the incline of the ice while also pulling their musher to safety. The challenge faced by animators to reach a higher level of quality, therefore consisted in applying to the original blocking pass all the concepts discussed above and polish the animation for each element of the scene, until all 11 dogs, musher and sled would really become believable.