

Frozen 2 : Creating the Wind Spirit

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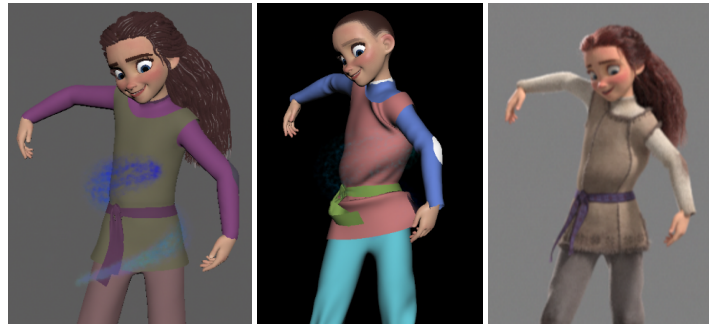


Figure 1: Gale is seen through interaction with cloth and hair: (left to right) Animation, Technical Animation, Render

ABSTRACT

In Walt Disney Animation Studios' "Frozen 2", the wind spirit Gale appears in multiple forms throughout the film. Gale can only be seen in its effects on other objects in the world. This includes interactions with leaves, debris and other environmental elements, as well as its effect on the cloth and hair of the characters: creating moments where the character is present, but not visible. Having to animate, simulate, and understand the character's emotional intent, all without true visual characteristics, posed many challenges. This talk addresses the solutions developed and the process we took to get there.

CCS CONCEPTS

• **Computing methodologies** → **Simulation by animation**; *Physical simulation*.

KEYWORDS

fx, effects, wind, character, simulation, animation

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1 CHARACTER DESIGN

This design process was not like most characters. Gale is a character that can not be seen at all times and is not defined by a static model. Early on we realized that showing this character as a mass of leaves

was not going to be practical or visually appealing for the film. Figure 1 illustrates how visually different the initial design pass on the left was from the final look on the right. One is massive and tends to overwhelm the screen space while the other is subtle and works itself into the environment. This also led to the understanding that this character could not have a voice. A defining characteristic of Gale was the concept of "lost and found." We often would lose sight of Gale in one part of the shot only for it to come back to life in another spot without causing a disconnect for the viewer. This was made possible by allowing the animators to give a performance to the simulation teams.



Figure 2: Concept art

2 RIGGING THE CHARACTER

Inspiration for the character rig came from the early storyboards which can be seen to the left in Figure 3. We knew from the beginning that we wanted to avoid having Gale be represented as a

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cluster of leaves and to make sure it was clear that this is a wind spirit. It is not made of the debris that fills the wind – only carries it. We loved the way the boards that used leaves to indicate the spirit's presence also used the broad strokes and very graphic lines to visualize the path. We thought this was a great tool in displaying not only the path and shape but also the intended emotional state of the character. A clean elegant line compared to a chaotically drawn jagged line was not only simple it was clear how the character was feeling.

The rig for Gale ended up being very atypical in that it was not just a character asset you could bring into the scene; it consisted of a set of tools developed to generate a path and intuitively modify timing. The tool set consisted of VR tools which allowed the animators to actually step into a scene and draw the path interactively while tracking its timing. From there they were able to attach the rig which gave them various ways of drawing strokes of different qualities along this path using familiar, intuitive, keyable controls. An in-house animation tool named Swoop was developed to modify existing paths and retime motion in a quick intuitive way that animation was incapable of doing in the past.

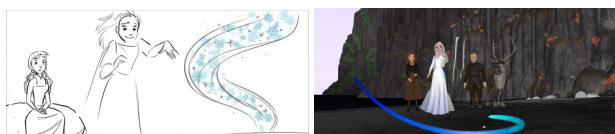


Figure 3: animation rig

3 TECHNICAL ANIMATION

With a character whose presence ranges from subtle interactions with other characters to a raging wind storm, technical animation is a hugely important aspect. The effects Gale produced on the character's cloth and hair needed to stay true to the animators' original intent. To achieve this, we leveraged our open source SeExpr expression language [WDAS 2013] to control the intensity and activity of Gale's presence. The expressions sampled the character rig live in the shot as input to then directly influence the simulations based on the performance from animation. This allowed technical animators to make changes to the performance to ensure the best simulation results. Due to the design of the rig and its ability to indicate wind intention, technical animation was able quickly iterate while staying true to the performance. The ability to see the character without a visual indicator aside from its effect on the environment was something we were now able to test.

4 EFFECTS

Gale presented a unique challenge for the effects department, as the character would only be visible by what moved around it. This presented the effects department the challenge and unique opportunity to add specific interaction to a variety of different environments. We focused primarily on vegetation from the deciduous forests in Norway. Given Gale could both take the form of something as small as a little breeze, to something as large as a tornado, the team had to ensure that articulation at any level from loose ground cover and smallest branches all the way up to full trees could be animated.

Great lengths were taken to ensure that all assets coming from the environments team were able to be quickly rigged and simulated. The assets were then passed onto lighting for the final renders. For the simulation work in effects, the team leaned heavily on input from animation by way of the Swoop curves authored in VR as shown in Figure 4. Velocity values were possible to extract from the Swoop curves and use inside of the newest cloth and hair solver from SideFX Houdini, Vellum, to drive motion into grass, leaves, branches, and any other plant life that Gale passed by. The speed of the solver as well as the pipeline established to hand Gale data back and forth between departments allowed for early collaboration and proved to be critical to the success of Gale's performance.



Figure 4: VR setup

5 WORKFLOW

For a typical character, the workflow proceeds from animation to technical animation and then to effects. For Gale we were able to start effects earlier. Since it was possible to bring the animation performance into Houdini, effects was able to start without having to wait for technical animation. This allowed for improved iteration and a collaborative relationship between the two departments. Part of the workflow that developed involved a back and forth between effects and animation. Once the animation was done this cross-departmental collaboration was similar with technical animation. The technical animators had some creative liberty with the character's performance, while at the same time, animation could add on modifications to improve the overall performance if large changes needed to be made.

6 CONCLUSION

When a character has so many unknowns, the exploration process is incredibly important. Many lessons were learned and a spirit of collaboration came about because of the complexities involved. It is not very often that animation gets to directly influence the technical animation workflow as well as effects. It was a significant learning experience for all of the departments and the experience has helped spark a change in the way we tackle complex characters and problems. The relationship between departments was strengthened and this overall positively affected the attitude of those working on the film.

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