There's More Than One Way to Skin a Wolf: Wolf Transformations in "Van Helsing"

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Numerous characters in "Van Helsing" transform from a human state to a monster or vice versa. Among the most challenging were transitions between werewolf and human, in which the initial character tears off his skin to reveal the final character underneath. These effects employed extensive cloth and hair simulation and a host of rendering and compositing processes.

Simulating Tearing Skin

Our tearing skin effects were created with cloth simulations. To achieve the complex dynamics of tearing skin subject to detailed directorial control, we completely reimplemented our cloth simulation system. The artist can now determine the timing and placement of tears *at simulation time*, instead of when the creature is initially modelled. Tears can happen along any edge of the simulation polymesh. This enables the simulation artist to change the placement easily.

Tear placement and timing are determined by a *tension limit* for each edge of the polymesh. We look at the tension created by forces attempting to separate the two polygons which share that edge. If the current tension exceeds the tension limit, we split the mesh along that edge. For additional realism, the system offers plastic deformation, modelling the permanent stretch which the mesh undergoes just before reaching its tension limit.

While reimplementing our cloth simulation system, we merged it with our hair simulation system, which was also used heavily in our transformations (for both human hair and wolf fur). The new cloth and hair systems share an integration engine and many controls and forces, making it possible to run one simulation including both cloth and hair, each affecting the other.

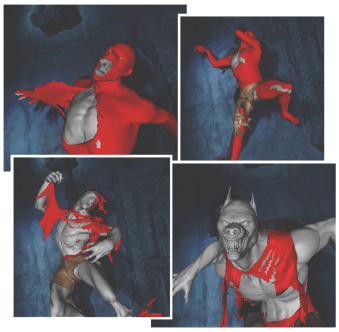

Figure 1: Human-to-wolf transformation.

Controllable Tearing

Our tearing controls offer a range of tradeoffs between physical realism and directorial control. The simplest, most dynamics-driven method uses a global tension limit, applied uniformly to all mesh edges. Tears occur wherever and whenever this limit is exceeded. The cloth responds to animation and shape changes of the underlying body without additional artist input. For example, when the spine bulges suddenly, the skin along the spine is automatically subjected to greater tension and splits accordingly.

To control the placement and timing of tears, the artist can selectively weaken or strengthen regions of the cloth, and animate both the global tension-limit value and the localized modifications.

At the far end of the dynamics/directability spectrum, we offer simple keyframing. The artist can force an edge to tear at a specified frame, or mark it as "untearable", in order to match the exact timing of a slashing claw which tears the skin, or to prevent sections from tearing until the frame range in which they are seen close-up.

Rendering and Compositing

The character's skin was modeled as a network of b-spline patches. In the past we mapped our simulation results back to those patches. However, the changing topology of the tearing cloth required a new approach: a simulation polymesh was derived directly from the merged patches and a subdivision surface was fit to the simulation results for rendering. Throughout this process, texture coordinates were automatically managed to match the original model while accounting for topological changes.

When transforming from wolf to human, the skin being torn off is the wolf's furry pelt. The simulated fur, therefore, is anchored to the cloth mesh as it changes topology. We developed new software to place the guide hairs on the tearing cloth and respect the changing topology when interpolating additional hairs for rendering. To represent thick skin, with fur on one side and gory "goo" on the other, we used double-sided shading, and displaced the two sides slightly.

Human-to-wolf transformations required the skin to cling closely to the character's body until ripped away, so that details of transforming musculature were not lost; but those shapes could not be sculpted into the mesh itself, because they must vanish once the skin was pulled away. We added springs to the simulation mesh to hold the skin to the desired shape, then deactivated those springs as the skin was pulled taut.

Figure 2: Final rendering of wolf.

Thanks to the rest of the Software R+D sim team and the Van Helsing crew who worked on these transformations: Aron Bonar, David Bullock, Brice Criswell, Craig Hammack, Daniel Jeannette, Zoran Kacic-Alesic, Tori Livingstone, Tim McLaughlin, Keiji Yamaguchi, and many more.

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