# T1000 Effects Driven Character Performance - Terminator: Genisys

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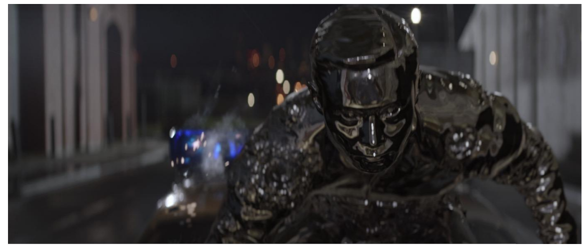
Double Negative*

*T1000 liquid character from Terminator Genisys © 2015 Paramount*

## Abstract

In Terminator Genisys, we streamline the conventional character pipeline in order to create the most dramatic sequences possible with a previously explored character; The T1000. With a large part of the animation driven by effects, we introduce a procedural pipeline that enables the artist to deliver a more story driven, monstrous, character performance.

## 1 Introduction

Terminator 2 introduced the T1000, an entirely liquid character with a chrome-like appearance. Terminator Genisys revisits this character, pushing the visual boundary of the original in order to add more dynamic sequences.

Early on in the initial recreation of the T1000, we knew that modelling would need to be integrated into the effects pipeline. Due to the organic movement of liquid metal, we required a fast, flexible pipeline that would not require us to return to the modelling department with each iteration of effects passes.

A tightly integrated shading system was also required due to the alloy state changes throughout key points in the story.

## 2 Initial Setup

A procedural system was developed in Houdini. This enabled fast, artistic prototyping of modelling techniques whilst giving an update framework for shot set-ups. Briefly, it involved:

- Pre-processing animation to provide regions of effect.
- Augmenting each region through the use of masks.
- Removal of animation data so that procedural modelling could take place.

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## 3 VDB Procedural Modelling

To begin modelling, the geometry was converted to an SDF (Signed Distance Field) which enabled the use of a variety of different techniques to alter the character. Two of the key processes were dimpling and gouging.

Dimpling is the process of creating light surface detail which was achieved by copying spherical-like meshes to regions of splash damage. These meshes were scaled along one axis based on the angle between an up vector and the surface normal. Once a VDB boolean operation had completed, this gave the appearance of splash dimples on the surface.

Gouging is the process of carving surface detail into the model which was achieved by combining the initial effects interaction's velocity with noise and advecting the SDF. This created detailed flow paths on the surface mesh as well as deep gouges.

The inverse of dimpling and gouging were computed at each stage, combined and used as the initial state for a FLIP simulation.

## 4 Simulation

A detailed simulation of liquid chrome was achieved using a modified FLIP solver. In a climactic sequence, the character conveys visual horror to the audience with wild and erratic motion. An extra advection stage was added to the solver. This ensured that a realistic drip or gloup motion was maintained for even the most erratic animation.

## 5 Shading

The VDB SDF played an integral part of the shading pipeline. This gave us accurate depth data of where the model had been processed by effects. The SDF data along with attributes generated from the FLIP simulation was combined and used to develop a shader. The result was a material that could transition from liquid chrome into a stone-like pumice material.

## 6 Conclusion

The effects pipeline is often complex and because of this, can be decoupled artistically from the rest of the conventional pipeline. We have introduced a way of tightly integrating effects with a high level of artistic control. This also maintains a procedural work-flow throughout some of the film's most pivotal and climactic scenes.