Head, Shoulders, Knees and Toes: Interpreting Schulz in 3D

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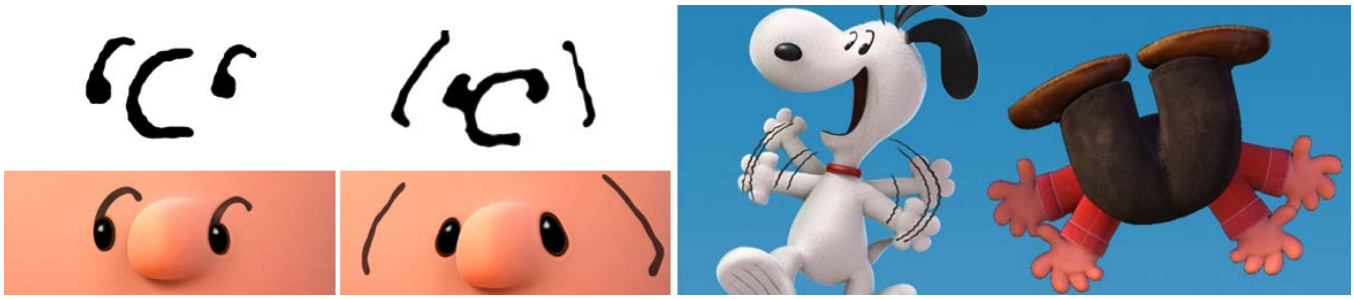

Figure 1: *3D interpretation of original 2D artwork (left). Stylized motion blur via multi-limb geometry (right).*

Abstract

The original Peanuts material, defined by Charles Schulz' unique 2D language, presented a huge challenge to the development of *The Peanuts Movie (2015)*. It required Blue Sky Studios to go beyond a mere conversion from 2D to 3D by embracing the 2D artwork and finding a unique look and fresh animation style in the spirit of the original comic strip. Three of the most recognizable and unique aspects of Schulz' work are his use of silhouette and ink line work for the drawings of the eyes, the extreme character poses implied by the comic strip, and the highly stylized indication of motion blur. To achieve a respectful 3D equivalent we found a language for the surrounding, prominent ink or expression lines by implementing sliding eyes and 'poseable' textures for animation. Additionally, we developed a unique multi-part character setup, and an approach to 3D motion blur that was inspired by the original 2D techniques of "multiples" and "smears". These techniques gave us the flexibility we needed to keep the Peanuts look while still being renderable in our photorealistic pipeline.

1 3D Expression lines as 'poseable' textures

Early in the pre-production phase we realized that traditional eye rig setups would not allow us to achieve the desired functionality and look, particularly of the ink lines in the 2D artwork. After exploring multiple approaches, we settled on a sliding eye setup. The eye geometry was attached to a sliding surface. The sliding surface itself was deformed by the shrinkWrap deformer (developed in partnership with Autodesk and now available in Maya) which stuck to the face mesh and allowed us to slide the eye to any position the animator desired. To emulate the eyebrows and surrounding expression lines, which we named 'sixes', 'nines', and 'periwinkles' (a name which originated from 'a-pair-of-wrinkles'), we added similarly attached sliding surfaces. Since the design for the Peanuts kids required the expression lines to integrate with the skin, rendering the expression geometry directly was not a viable option. Thus, rigging and materials were tasked to develop 'poseable' textures. After the rig was posed, the Materials Department would then extrapolate the pertinent information from the rig, and use them as a signal that would drive surface properties which allowed us to support the 2D animation aspect of this film.

2 Multi-part Character Setup

The design of the Peanuts characters allowed their parts to freely reorient, much like a golf ball on a tee. However, depending on the character's pose there may not be a consistent pivot point, for example the connection between the head and the neck. To solve this problem each character was constructed of multiple meshes. But separating the body into various pieces cancels a major benefit of a subdivision surface-based animation pipeline – that of consistently smooth surfaces under deformation. To make the additional degrees of freedom usable, a hybrid rig was combined with a tool called "Suction Cup" that maintained smooth connection between multiple subdivision surfaces. This both supports the unusual rotate-in-place capability and also allows us to share a single body rig across different characters. Finally, our in-house renderer *CGIStudio* uses fill surfaces to combine these pieces using CSG so that subsurface scattering behaves in a way that is consistent with a single, solid piece of geometry.

3 Motion Blur via Multiples

It became clear that physically-based camera motion blur would unacceptably alter the intended look. An analog to the traditional 2D animation techniques of "multiples" and "smears" was developed. Instead of emulating Peanuts' stylized 2D motion directly by supporting sub-parts of hundreds of characters separately, we developed a method to selectively utilize parts of a fully rigged character. This so-called "Ghost Limbs" method achieves interactive display of the relevant parts of the full character rig for animators and propagates this visibility information on to the renderer. Similar to Suction Cup, the renderer uses fill surfaces to construct solids from the individual limbs, allowing materials with scattering to behave properly.

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