



One of the visual effects I'm most interested in is the cel-shading in Borderlands 2. I like it The effect not only meshes well with the game's design and writing, but also plays a big part in defining the identity of the game as a whole. The technique is called cel-shading (after similar techniques used in comics, graphic novels, and manga) and consists of several parts when you look at it closely.

It appears to be simple in concept, mostly a highly advanced version of the Toon shading concept we saw in class. It primarily works by affecting the colors or textured models, which most likely is done in the fragment shader, however, there is an element that changes with the camera (and with the position of the model in-game: the outline. As the character model rotates on the title screen (shown above) the outline will always outline the edge of the model as it appears to the camera. It also outlines internal edges such as the edge between the character's chin and neck.

From my research it seems like the cel/toon shading and the outline are actually separate effects. They are probably not entirely separate shaders but are most likely separate passes on the same shader. For the outside outline I would use an edge detection algorithm, possibly with use of depth to calculate the internal edges. For the basic shading, I would iterate on the toon shading concept until I got something I was happy with.