Victo Ngai Inspired Stylization in Real-Time

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Figure 1: Our rendering system mimics the smooth gradients, highlighted edges, and bold colors used by artist Victo Ngai.

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1 INTRODUCTION

Non-photorealistic rendering (NPR) can transform 3D models into a stylized 2D output that is more evocative than a realistic rendering. In games and animation, this can provide visually interesting results while, potentially, lessening the burden on artists. Inspired by previous work in real-time stylized rendering approaches (e.g., emulating watercolor [Montesdeoca et al. 2017]), we decided to deconstruct and emulate the bold, gradient-filled work of modern artist Victo Ngai. Through a combination of color adjustment, texturing, and gradient fitting, our system can create a fast approximation (Figure 1) of the art of Victo Ngai at interactive rates.

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Figure 2: A compute shader is used to fit per-object screen-space gradients (right) to the original shaded scene (left).

2 OUR APPROACH

Victo Ngai artworks are reliant on line work and detailing; they contain very little realistic rendering, and lighting is used more for compositional impact than for creating volume and form. Thus, our stylization pipeline (Figure 3) seeks to simplify shading, adjust colors, and highlight detail.

In this system we stick to flat colors and gradients for shading. In order to flatten the shading of the scene, our pipeline begins by rendering a lit version of the scene, along with object IDs, into an offscreen buffer. A compute shader is then used to fit vertical

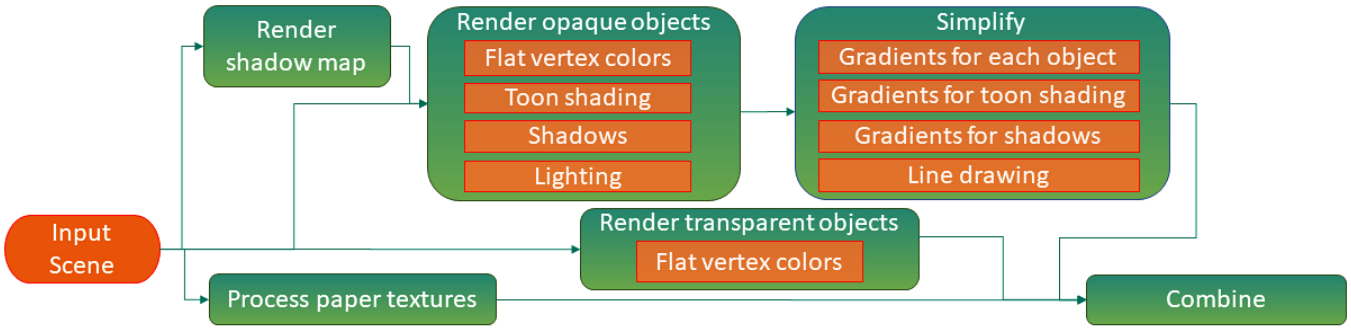

Figure 3: Our overall stylization pipeline.

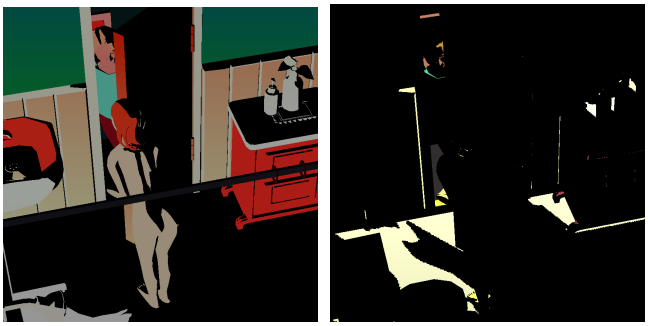

Figure 4: Stylized lighting is added back to the scene in the form of toon shading (left) and cast shadows (right).

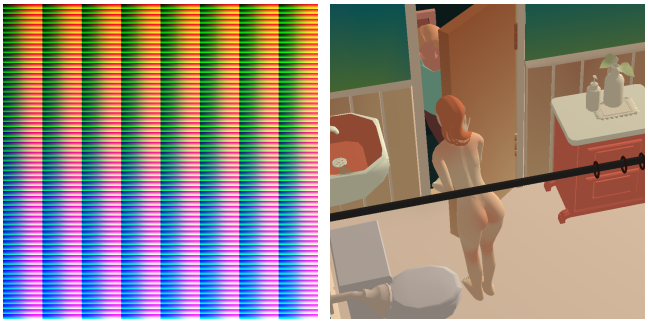

Figure 5: Lookup tables for base colors (left), shading, and lines are used to adjust the colors of the basic rendering (right).

screen-space gradients to each region, and these gradients are used instead of the realistic shading (Figure 2).

Our pipeline uses a toon shading pass along with a cast shadows pass – both of which can be modulated by art-directed gradients – to bring shape to the scene (Figure 4). Finally, line art is also drawn based on normals, depth, and object IDs. (Figure 6).

Victo Ngai artworks tend to have a very clear color palette, featuring two colors, generally one warm and one cool, that dominate much of the artwork. Hue and value (rather than saturation) are used for contrast. Our system mimics this look using hand-authored color lookup tables for the flat colors, the toon shading, the cast shadows, and the line drawing.(Figure 5)

As for texturing, this system uses a series of hand-drawn tile-able textures based on ones found in Victo Ngai's artworks that can be applied to parts of objects in the scene (Figure 6). Some Victo Ngai

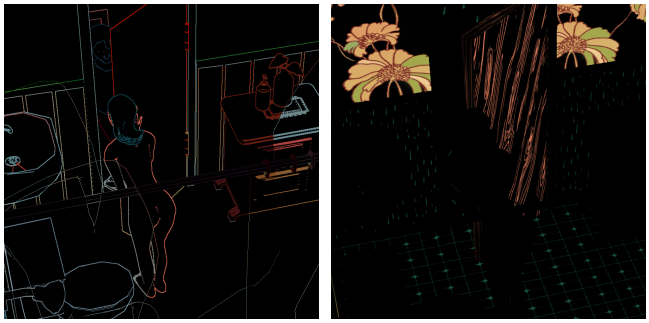

Figure 6: Detail is added with tiled textures (right) and line art rendered using depths, normals, and object IDs (left).

works also contain a large paper texture. Such a paper texture emulation (based on [Montesdeoca et al. 2017]) is also possible in this stylization and includes the pigment granulation and distortion that would happen with physical mediums. Additionally, gradients are sometimes done with screentone-like textures in Ngai's paintings; this system also allows for that in art direction of the gradients and creates the effect through tonal art maps as described in [Praun et al. 2001].

3 RESULTS AND DISCUSSION

In order to test our system, we built an example scene in the style of Victo Ngai's "Sweet Dreams" (Figure 1). We encourage readers to compare this scene to the Ngai original (accessible via the artist's web page at https://victo-ngai.com/nyer). We find that our system captures many of the features of the original well, but we have not completely captured the style. Particularly, our system lacks the sophistication of color use in a true Victo Ngai work, the subtle use of transparent and lighting elements, and details such as the small tremors in hand drawn lines. Additionally, a stylization program which is so heavily dependent on rules cannot hope to replace an artist's creativity in decisions about where to ignore conventions of color, lighting, and perspective.

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