A Process to Create Dynamic Landscape Paintings Using Barycentric Shading with Control Paintings

Matthew Justice
Department of Visualization, Texas A&M University
College Station, Texas 77831
mattscottjustice@tamu.edu

Ergun Akleman
Departments of Visualization & Computer Science and Engineering, Texas A&M University
College Station, Texas 77831
ergun.akleman@gmail.com

Figure 1: *An example of artistically controlled shadows and highlights rendered as different times of the day.*

ABSTRACT

In this work, we present a process that use Barycentric shading method to create dynamic landscape paintings that change based on time of the day. Our process can allow creating dynamic paintings for any time of the day using simply a limited number of control paintings. To create a proof of concept, we have used landscape paintings of Edgar Payne, one of the leading landscape painters of the American West. His specific style of painting that blends Impressionism with the style of other painters of the American West is particularly appropriate for the demonstration of the power of our Barycentric shading method.

CCS CONCEPTS

• **Computing methodologies → Non-Photorealistic Rendering**;

KEYWORDS

Rendering, Non-Photorealistic Rendering, Western Painting

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1 INTRODUCTION AND MOTIVATION

The current modeling and rendering processes require too much knowledge to create hand-painted looking dynamic paintings for novice users such as traditional painters. Therefore, there is a need for the development of processes to obtain desired dynamic paintings with intuitive and artistic control. In this work, we present a simple process to create dynamic paintings that can change based on existing lighting conditions. Our process provides intuitive and artistic control to obtain the desired look. To demonstrate the effectiveness of our process we created dynamic paintings starting from Edgar Payne's western landscape paintings.

In this particular example, we use a simple Barycentric shader (See [Akleman et al. 2016] for formal description) with two variables s and t, where s represent what percentage of sunlight can reach a given point and t is the time of the day normalized as a number from 0 to 1. Let $P(s,t)$ denote a dynamic painting for a given set of s and t values. Also let u and v in $[0,1]$ represent pixel positions and $P(s,t,u,v)$ is the color of pixel u and v in time t. Note that s is the function of u, v, and t.

Now assume that we know how we want our dynamic painting look like for a limited number of sample points, we, then, can use these sample paintings as control points and compute $P(u,v)$ as a weighted average of these control "paintings". In this particular case, without loss of generality we provide four control paintings as texture maps as $P(0,0) = T_{00}$, $P(1,0) = T_{10}$, $P(0,1) = T_{01}$, and $P(1,1) = T_{11}$ as shown in Figures 2a, 2b, 2c, and 2d respectively. Final dynamic paintings are obtained by using Bilinear interpolation for the given time t and computed s for each pixel u and v (See Equation 1). The advantage of this model, the effect of sky illumination coming from scattered sunlight can be embedded in texture maps using the time term t as shown in Figure 2. We only need