The Evaluation of the Color Blending Function for the Texture Generation from Photographs

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Abstract. Mass-casualty triage simulation requires the realistic depiction of wounds and other signs of external injury on victims. Texture maps permit images of actual wounds to be rendered over computer models. Several images may be required to depict extensive injuries. Seamlessly combining these images requires an appropriate blending function. This paper compares two functions for their ability to create visually appealing integrations.

1 Introduction

Triage at a mass-casualty site includes a visual assessment of the patient's injuries. Traditionally, triage training required the use of healthy volunteers with moulage (i.e. special makeup). Computer simulations of mass-casualty situations have greater flexibility, require less planning and coordination, and can be performed more frequently. For realism, detailed images of actual wounds and other injuries can be acquired as texture maps, then applied over a generic human models. Texture maps of extensive injuries must be generated from two or more images. Blending these images seamlessly is necessary for realism. This paper evaluates two functions for this ability.

2 Method

The test object is a mannequin head. Images are taken of the head; one head-on (camera 1), the other from the mannequin's left side (camera 2) and perpendicular to the former. A 3D polygonal representation is also acquired. Let $\vec{c_1}$, $\vec{c_2}$ be the unit vector of the camera view directions, E_1, E_2 be camera center of projections, and I_1, I_2 be the camera image planes. Let p be a point on the head and $\vec{n_p}$ be the unit normal vector at p. Then $I_{k,p}$ is the point on image plane I_k intersected by line E_kp, where $k = 1, 2$. In addition, let $\alpha_{i,p}$ be the angle between $\vec{n_p}$ and $\vec{c_i}$ where $i = 1, 2$. A texture map of the head's front and left sides is generated using T_1, and T_2, where

$$T_1(p) = \left(\sum_{i=1,2} (\vec{c}_i \cdot p)^2 I_{i,p}\right) \Big/ \left(\sum_{i=1,2} (\vec{c}_i \cdot p)^2\right) \text{, and} \tag{1}$$

$$T_2(p) = (\cos\alpha_{1,p} I_{1,p})^2 + (\sin\alpha_{1,p} I_{2,p})^2 \text{ .} \tag{2}$$

3 Results

Fig. 1 (left) is the head model with texture map generated by T_1. Fig. 1 (right) is the same model but with its texture map generated by T_2.

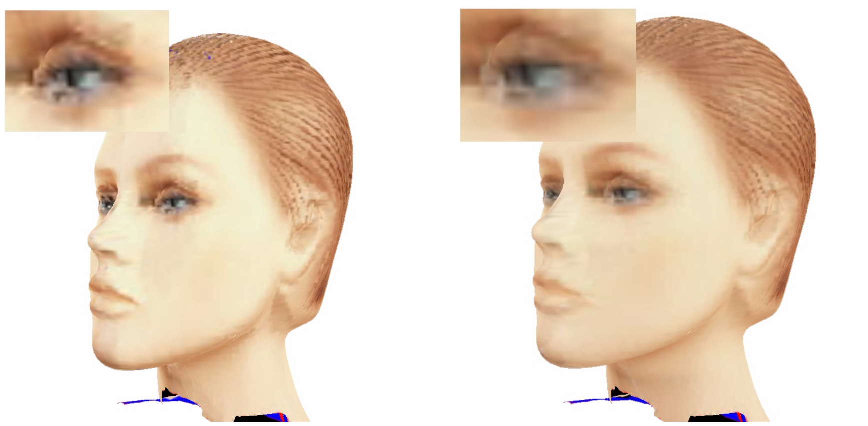

Fig. 1. (left) model of head using texture map generated by T_1. (right) same model but using texture map generated by T_2.

4 Conclusion and Discussion

T_1 produces noticeable artifacts, particularly around the eyes and in vertical bands across the left side of the face. T_1 uses an average of dot products, and is more sensitive to local variations of the surface normal. Regions where this changes rapidly (e.g., around the eye) are the most affected. T_2 produces smoother results with less objectionable artifacts around the eyes. T_2. This blending function produces more visually appealing results even across regions where the surface normal changes rapidly.

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