

Abstract

Capturing the shape and texture of large structures such as monuments and statues at very high resolution is extremely expensive, both in terms of time as well as storage space. In many cases the inner details are generated by surface properties of the material, and the appearance is statistically uniform. In this paper, we present an approach to add surface details to a coarse **3D** model of an object based on two additional information: a set of images of the object and a high resolution model of the material that the object is made of. The material model that we employ is the Polynomial Texture Map (**PTM**), which captures the appearance of a surface under various illumination conditions. We use the observed images of the object as constraints to synthesize texture samples for each triangle of the object under any given illumination.

The primary challenge is to synthesize a polynomial model of the texture, where the constraints arise in the image domain. We use the knowledge of object illumination to map the texture models into image space and compute the optimal patch. The texture transfer then happens as a complete **3D** texture model. We also consider the problems of pose, scale, reflectance and smoothness of surface while carrying out the texture transfer. We synthesize the texture of an object at a per-triangle basis while carrying out operations such as normalization and blending to take care of discontinuities at the edges.