

The Recognition of Material Properties for Vision and Video Communication

MIT200-02

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Most significant progress:

The material recognition project began this year. We have developed a machine vision algorithm for recognizing the reflective qualities of simple known surfaces such as spheres. We have also developed an analysis-by-synthesis technique that allows us to estimate both the shape and surface properties of simple smooth objects. In addition, we are beginning to test the psychophysical capabilities of humans in making discriminations between surfaces made of different materials. Two papers have appeared in the proceedings of the SPIE based on this year's work.

Proposal for work in year July 1, 2001 to June 30, 2002:

We plan to continue studies on the perception of materials by humans and machines. We are concentrating on the perception of the reflective qualities of smooth surfaces, such as those defined by the Phong model in computer graphics. The main parameters correspond to the amount of diffuse reflectance, the amount of specular reflectance, and the sharpness of the specular reflection. In the domain of spheres, we have found that statistical methods derived from the texture recognition literature can be useful if applied in the correct way. We would like to extend this approach to surfaces with more complex known geometries, as well as surfaces with unknown geometries.

In parallel, we will pursue psychophysical studies on human observers. We will do experiments to determine the cues that are utilized by humans in assessing surface qualities. We can then incorporate these cues into machine vision systems. These experiments will also provide useful information for computer graphics. For instance, if we can understand the image properties that convey the sense of shininess or translucency to a human observer, then we may be able to give digital artists greater control over the surface appearances that they generate.

Collaboration

Visits to NTT: none.

Visits from NTT: Dr. Shin'ya Nishida spent the day with us on 10/17/00. He presented a seminar on his research, at MIT, on 10/20/00.

Papers published with NTT

None

Press mentions

None