BRDF Measuring System using an Ellipsoidal Mirror and a Projector

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Background

Background: measurement of reflection property for many applications such as computer graphics and inspection of painted surfaces

Purpose: *fast* and *dense* measurement of BRDF complex reflection

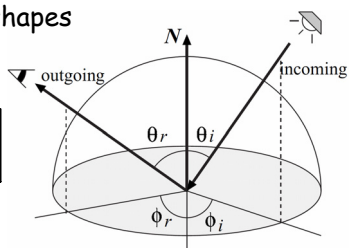
velvet satin brushed metal

What is BRDF ?

BRDF (Bidirectional Reflectance Distribution Function)

- The ratio of outgoing radiance to incident irradiance
- depends on microscopic shapes

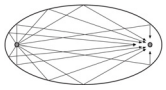
BRDF: $f(\theta_i, \phi_i, \theta_r, \phi_r)$



BRDF Measuring System

Ellipsoidal Mirror

All rays from one focal point reflect on the mirror and pass the other focal point.



Principle of the System

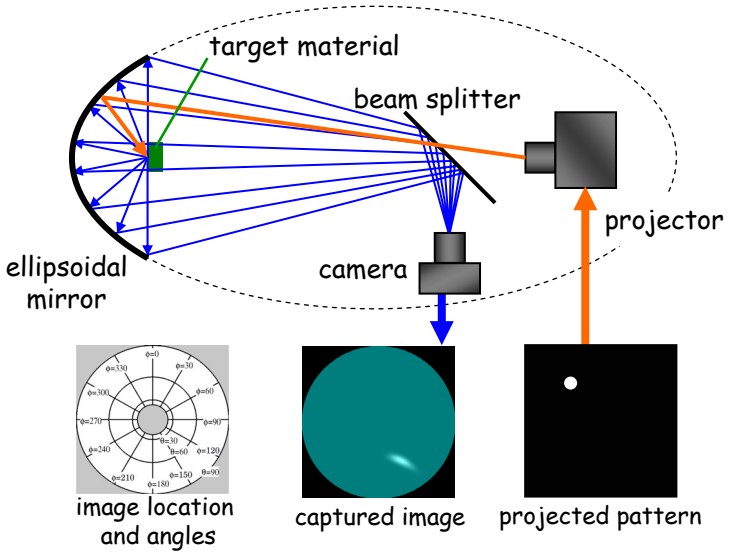
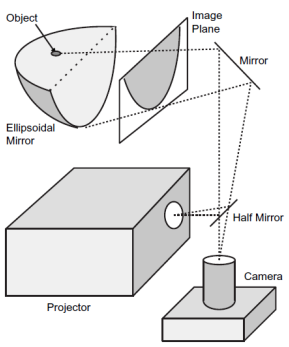


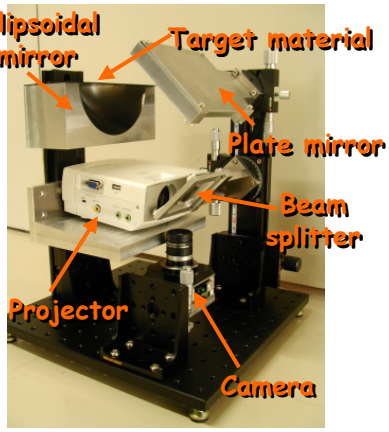
image location and angles

captured image

projected pattern

Developed System





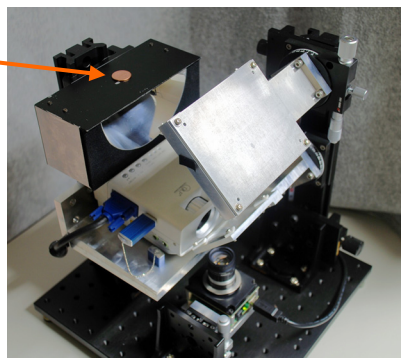
Ellipsoidal Mirror
➡ omni-directional observation

Projector
➡ exclusion of mechanical drive

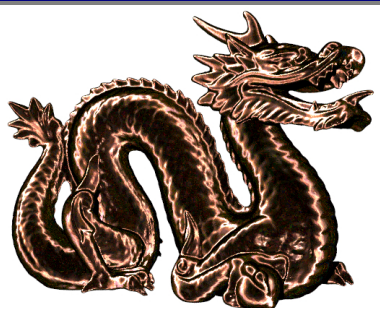
Experimental Results

BRDF Measurement of Real Object

- Isotropic reflection (3-parameter BRDF)
- 90(θ) x 2(ϕ=0,180) = 180 images
- 2minutes x 10times (for averaging) = 20minutes



Glossy Penny 2007



Old Penny 1975