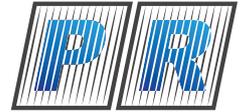


USER STUDY OF VIEWING AND ILLUMINATION DEPENDENT MATERIAL APPEARANCE



Jiří Filip Michal Haindl

Institute of Information Theory and Automation of the AS CR, Prague, Czech Republic
filipj@utia.cas.cz



Our research focuses on a way how people view real materials with respect to their orientation as well as illumination direction. We performed user study with fifteen naive subjects using novel interactive stimuli where subjects could arbitrarily change orientations of planar surface and directional illumination.

Abstract

Seven real materials were represented by means of illumination and view dependent textures. The study comprised two experiments, free-view and task-oriented, and user behavior across different samples together with their answers to a questionnaire were recorded and analyzed.

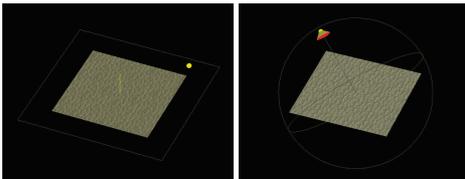
Motivation

Material visual properties defined by its **view and illumination dependent appearance**.

- Demanding and costly appearance measurement,
- **Goal:** develop perceptual filtering rules → apply them already for adaptive data measurement.

Stimuli design

Controlled interactive stimuli:



- sample orientation and illumination direction controlled by a mouse,
- 7 materials as view & illumination dependent textures (Bidirectional Texture Function),
- flat sample → known actual view & illumination directions.

A Psychophysical Experiment

- 15 naive subjects,
- trained to use the interactive system,

Experiment 1

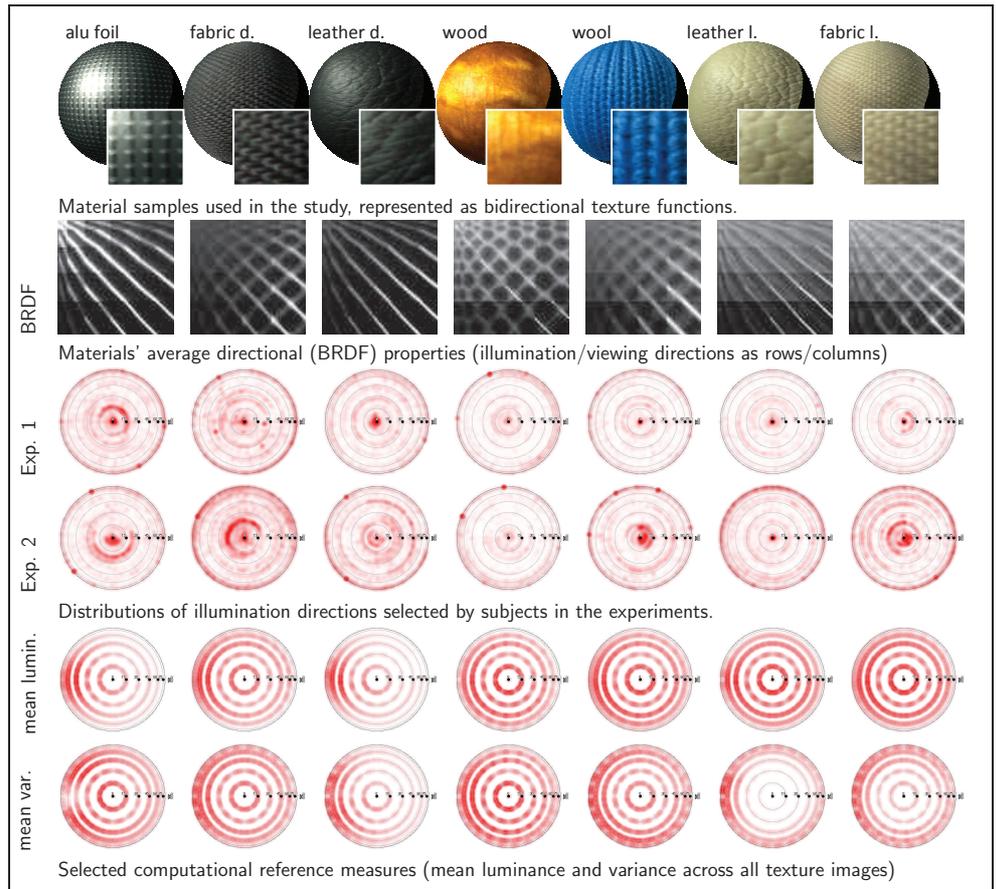
- free viewing of all samples, non-restricted time,
- each sample evaluated for *identifiability*, *roughness*, *specularity*, *anisotropy* on scale 1-9,
- extreme pictorial examples of each property were shown to subjects,

Experiment 2

- the same as experiment 1 → defined task:
- find orientations of the sample and light producing interesting/attractive material's appearance.

Collected data

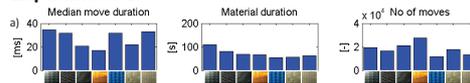
- Mouse move duration & number of moves,
- Distribution of illumination directions.



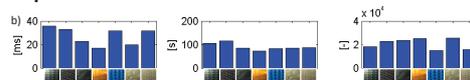
Results

Statistics of subjects behavior: median durations of light/sample move, material viewing time, number of moves.

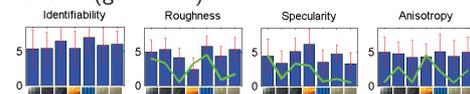
Experiment 1



Experiment 2



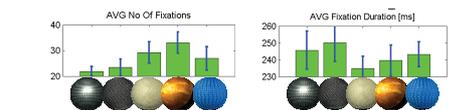
Average subject evaluation of material properties (Experiment 1), compared with computational features (green line):



Conclusions

Subjects' moves statistics

- Material dependent viewing strategy → correlation with gaze analysis: [Filip et al. 2012]



- Consistent judgment of material's roughness and specularity, less consistent judgment of material's anisotropy.

Subjects' data directional analysis

- Subjects preferred close-to-orthogonal view, light directions providing higher contrast.

[Filip et al. 2012] - Filip J., Vácha P., Haindl M., *Analysis of Human Gaze Interactions with Texture and Shape*, Springer LNCS 7252, April 2012