

Computer Science Seminar Series

National Capital Region

Understanding Perceptual Dimensions of Object Material Properties

Speaker: Prof. Bei Xiao
American University
Friday, October 31, 2014
1:00PM- 2:00PM, NVC 207

Abstract

Humans are good at recognizing objects as well as the materials of which that they are made of. We can easily distinguish cheese from butter, silk from linen, and snow from ice just by looking. Material perception is crucial for action planning. For example, when we reach to pick up a glass of milk, we have already made predictions about the weight and rigidity of the glass, as well as the fluidity of the milk. Materials such as liquid, wood, fabrics or plastic, have distinctive physical properties. Physics-based rendering has developed sophisticated descriptions of material properties such as the *bidirectional reflectance distribution function* to describe surface reflectance. The parameter space of such physical models is very large but humans have a much more reduced representation of parameter space describing material appearances. Understanding perceptual representation is helpful in graphical simulation of novel materials, reducing computational cost, predicting contextual effects, and establishing computational models of material inference.

In this talk, I will discuss recent progress on perception of translucent materials (e.g. skin, wax, jade) and fabrics (e.g. jeans, silk, cotton): types of materials that are both prevalent and challenging to simulate. First, I will discuss how the scattering phase functions affect translucent appearance and how human establish a lower-dimensional perceptual embedding of the phase function space. In the second part, I will discuss machine and human estimation of mechanical properties of fabrics under external forces and perceptual dimensions of parameters that describe behavior of moving fabrics in virtual scenes.

Biography



Bei Xiao is an Assistant Professor in the Department of Computer Science and is affiliated with Center of Behavioral Neuroscience at American University. Her research area is in human perception, color vision, perception-driven graphics, and computer vision. Her recent work focuses on human and machine inference of material properties of deformable objects in dynamic scenes and multisensory perception combining vision, audition, and haptic. More information about her work can be found: <https://sites.google.com/site/beixiao/>