DTU Compute
Department of applied mathematics
and computer science

BxDiff
JRP 18SIB03

Measuring the appearance of translucent 3D objects

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Measuring appearance of 3D objects is hard

What we see is influenced by **reflective properties** and **geometry**

Observations depend on the geometric curvature

- Strong curvature introduces transparency!

Need to account for geometry and appearance – a **complicated problem!**

Methods for translucent 3D objects

- **Simultaneously measure** appearance and geometry

- Wrap all the complexity into **Bidirectional Texture Functions** (BTFs)

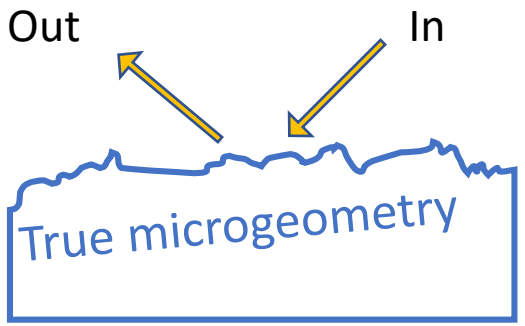
Bidirectional Texture Functions (BTFs)

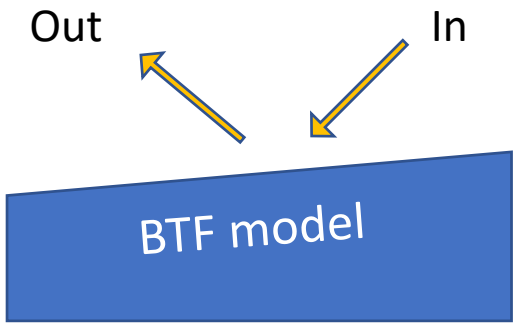
BTFs can include the effects from:

- microgeometry and
- subsurface scattering

by replacing with a much simpler model

Great re-rendering, but **hides the details of the object**

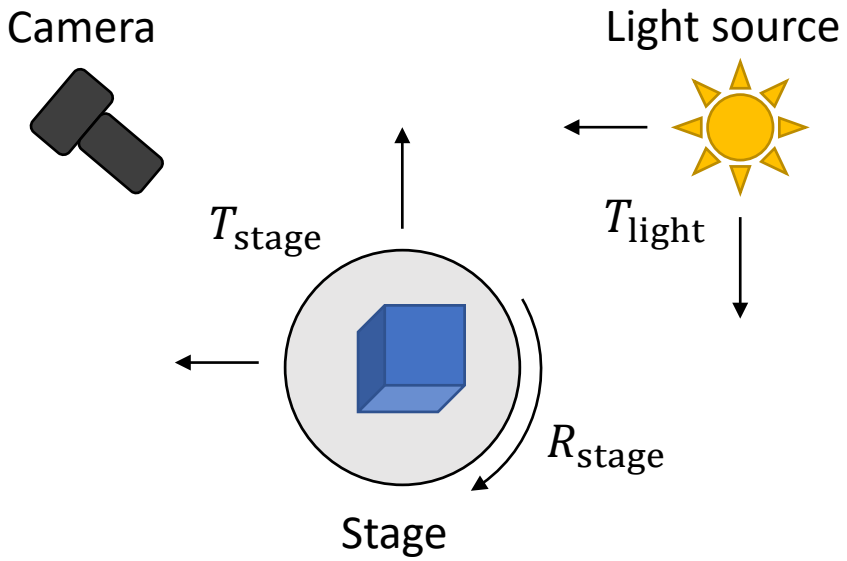


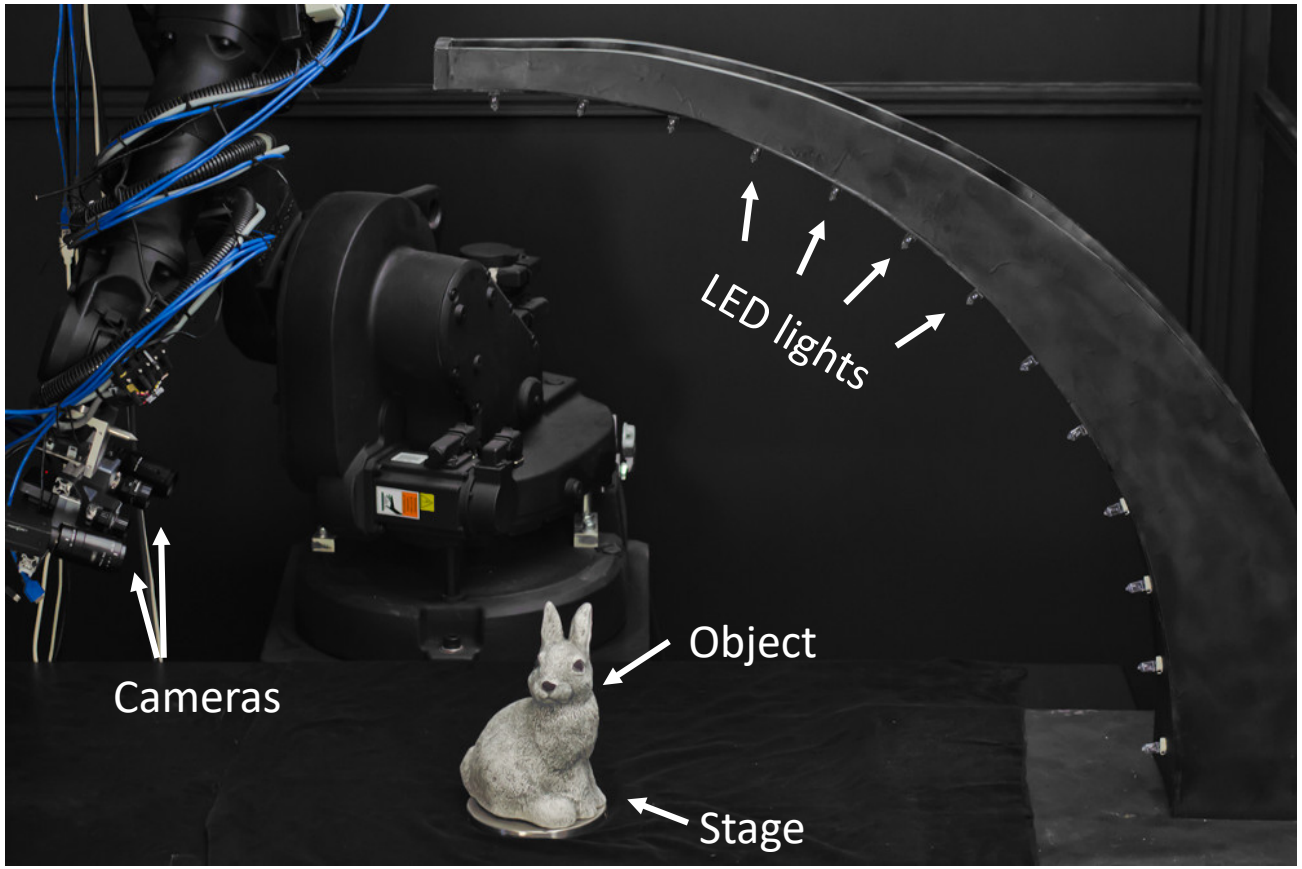


Appearance and geometry acquisition

Simultaneous acquisition set up:

- Usually camera based
- Moving stage (camera) and light i.e. a bidirectional set up



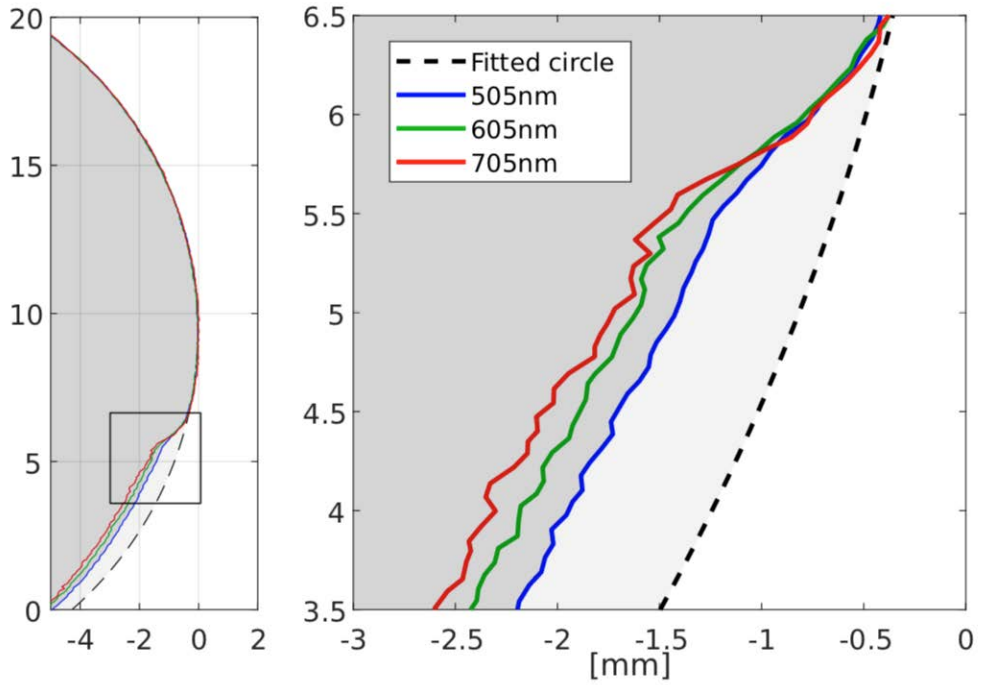


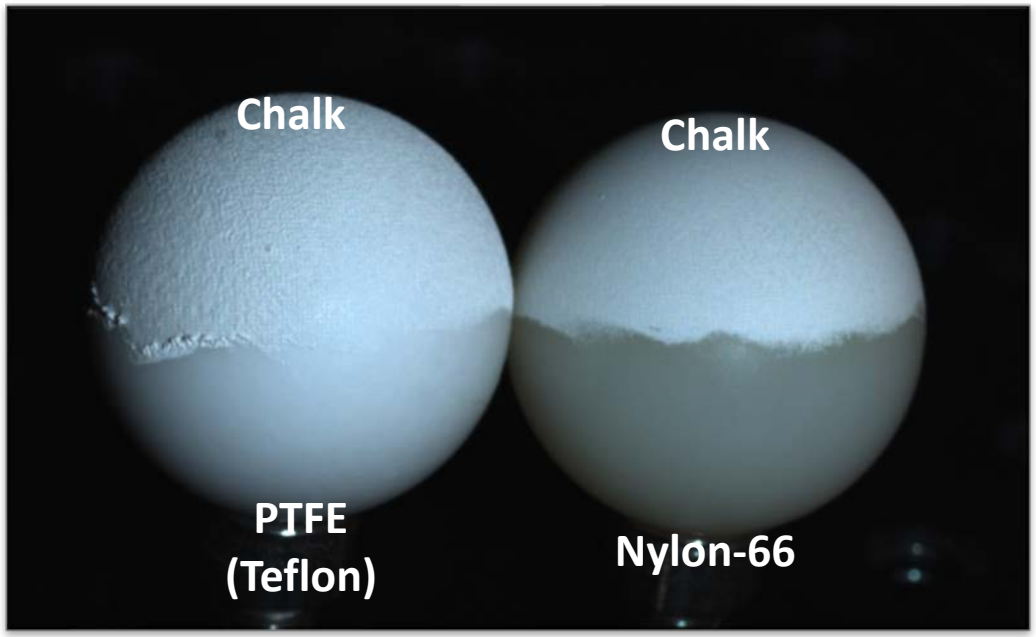
Separating appearance and geometry

Geometry is estimated from different views, but appearance varies.

In effect, the geometry is usually estimated with errors!

We think we are seeing something else entirely!





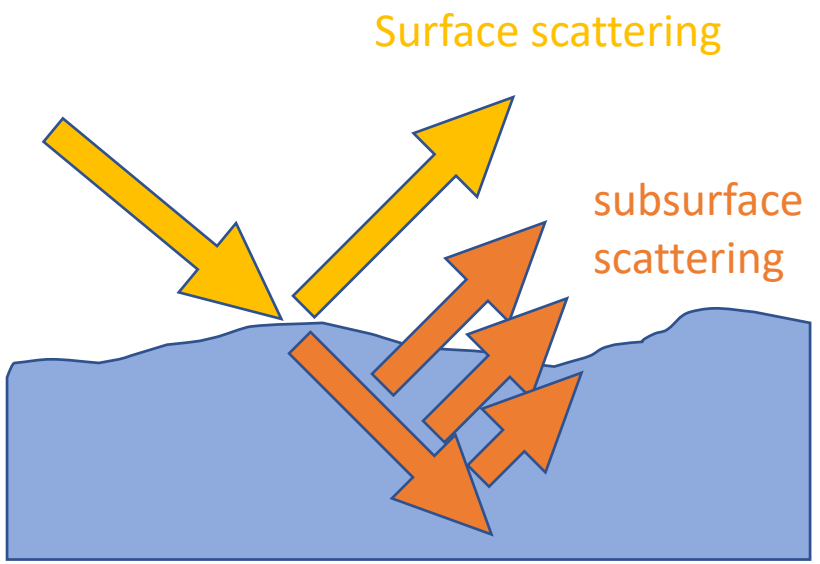
Surface and subsurface separation

Accurate geometry from separating the surface and subsurface scattering

Different methods have been studied:

- Polarization filtering
- Modulated or high frequency phase-shifting
- Light transport analysis

None of these are perfect!



Getting the appearance right is hard

No perfect method exists for scanning translucent 3D objects.

- The estimated geometry has errors
- Errors in the geometry affects the estimated appearance.

We can approach accurate 3D object scanning.

- Separate surface and subsurface scattering e.g. polarization filtering

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Thank you

Eco3D The Cyber-Physical 3D Ecosystem
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