Lecture 13: Illumination
SageMath Examples
CS 410

October 5, 2017
Scene Specification

cam = {'eye': vector(RR, 3, (25, 25, 60)),
       'look': vector(RR, 3, (25, 25, 10)),
       'up': vector(RR, 3, (0, 1, 0)),
       'bnds': {'l': -1, 'r': 1, 'b': -1, 't': 1},
       'nefa': {'near': -10, 'far': -60},
       'resl': {'width': 64, 'height': 64}}
globe = {'c': vector(RR, 3, (25, 25, 10)), 'r': 4.0}  
matl = {'ka': vector(RR, 3, (0.2, 0.2, 0.2)),
        'kd': vector(RR, 3, (0.7, 0.7, 0.7)),
        'ks': vector(RR, 3, (0.5, 0.5, 0.5))}  
ambient = vector(RR, 3, (0.2, 0.2, 0.2))  
lights = [{'p': vector(RR, 3, (5, 32, 30)),
            'e': vector(RR, 3, (0.5, 1.0, 0.5))},
           {'p': vector(RR, 3, (45, 32, 30)),
            'e': vector(RR, 3, (1.0, 0.5, 0.5))}]
Visualize Scene Geometry

Object/Sphere

Green Light

Red Light

Camera
Two Lights Grey Sphere
Phong 16 vs 200
Dial Back to Boring - Ambient

# White sphere and only ambient light

```python
mat1['ka'] = vector(RR, 3, (0.5, 0.5, 0.5))
mat1['kd'] = vector(RR, 3, (0.0, 0.0, 0.0))
mat1['ks'] = vector(RR, 3, (0.0, 0.0, 0.0))
ambient = vector(RR, 3, (1.0, 1.0, 1.0))
lights = []
```
Diffuse Illumination Only

# White sphere with one light directly above

```python
mat1['ka'] = vector(RR, 3, (0.5, 0.5, 0.5))
mat1['kd'] = vector(RR, 3, (1.0, 1.0, 1.0))
mat1['ks'] = vector(RR, 3, (0.0, 0.0, 0.0))
ambient = vector(RR, 3, (0.0, 0.0, 0.0))
lights = [{'p': vector(RR, 3, (25, 60, 10)),
            'e': vector(RR, 3, (1.0, 1.0, 1.0))}]
```

Dark side of the moon
# White sphere with one light directly above and also
# ambient 'background' illumination

mat1['ka'] = vector(RR, 3, (0.5, 0.5, 0.5))
mat1['kd'] = vector(RR, 3, (1.0, 1.0, 1.0))
mat1['ks'] = vector(RR, 3, (0.0, 0.0, 0.0))
ambient = vector(RR, 3, (0.5, 0.5, 0.5))
lights = [{'p': vector(RR, 3, (25, 60, 10))},
          {'e': vector(RR, 3, (0.75, 0.75, 0.75))}]
Diffuse Plus Ambient Case 2

# White sphere with one light directly above and also
# ambient 'background' illumination

mat1[ 'ka' ] = vector( RR, 3, (0.5, 0.5, 0.5) )
mat1[ 'kd' ] = vector( RR, 3, (1.0, 1.0, 1.0) )
mat1[ 'ks' ] = vector( RR, 3, (0.0, 0.0, 0.0) )
ambient = vector( RR, 3, (0.5, 0.5, 0.5) )
lights = [ { 'p' : vector( RR, 3, (25, 60000, 10)),
              'e' : vector( RR, 3, (0.75, 0.75, 0.75)) } ]
# White sphere with one green light off to the right

```
matl['ka'] = vector(RR, 3, (0.5, 0.5, 0.5))
matl['kd'] = vector(RR, 3, (1.0, 1.0, 1.0))
matl['ks'] = vector(RR, 3, (0.0, 0.0, 0.0))
ambient = vector(RR, 3, (0.25, 0.25, 0.25))
lights = [{'p' : vector(RR, 3, (45, 32, 30)),
            'e' : vector(RR, 3, (0.5, 1.0, 0.5))}]
```
Colored Light With Highlight: Case 7

# White sphere with one green light off to the right
# and with specular reflection

mat1['ka'] = vector(RR, 3, (0.5, 0.5, 0.5))
mat1['kd'] = vector(RR, 3, (1.0, 1.0, 1.0))
mat1['ks'] = vector(RR, 3, (0.5, 0.5, 0.5))
ambient = vector(RR, 3, (0.25, 0.25, 0.25))
lights = [{'p': vector(RR, 3, (45, 32, 30)), 'e': vector(RR, 3, (0.5, 1.0, 0.5))}]

![Image of white sphere with green light and highlighting]
White Light with Green Sphere: Case 8

```python
# Green sphere with one white light off to the right
# and with specular reflection
matl['ka'] = vector(RR, 3, (0.5, 0.5, 0.5))
matl['kd'] = vector(RR, 3, (0.5, 1.0, 0.5))
matl['ks'] = vector(RR, 3, (0.5, 0.5, 0.5))
ambient = vector(RR, 3, (0.25, 0.25, 0.25))
lights = [{'p': vector(RR, 3, (45, 32, 30)),
          'e': vector(RR, 3, (1.0, 1.0, 1.0))}]
```
Highlights Zoomed: Case 7 & 8

Highlight takes on the color of the light source.