COMP3421 Week 3

Lighting and blueprint classes

Controlling a player

- We can move objects in the editor...with a bit of practice, we could probably get them to move in some interesting ways...
- However, how do we create a character?
- For example, we can create a box that moves around and jumps, but the camera doesn't follow it...
- We also don't have a way to receive input from different sources (e.g. controllers, VR headsets, etc.)
- Has anyone looked at one of the sample character blueprints? They use something a bit different to what we've used so far...
    - That's right, they use the concept of an InputAxis!

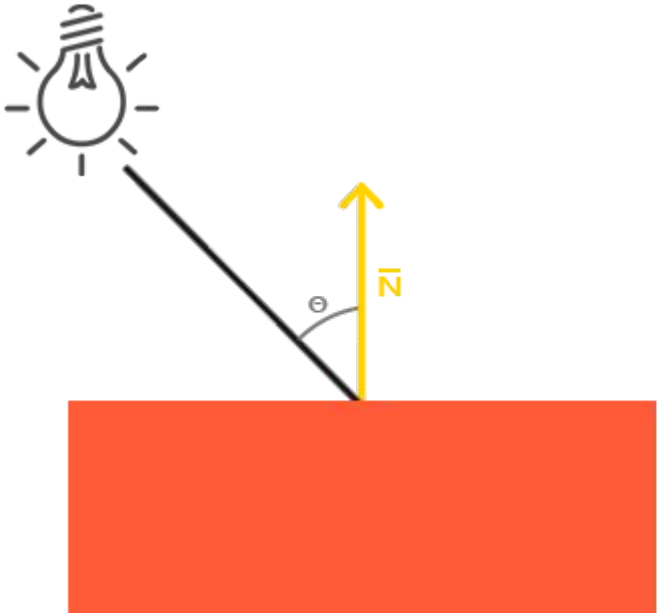
Lighting

- Phong shading model was an early method of simulating lighting without incurring huge computational costs
- Consists of ambient, diffuse, and specular light.
- Ambient light is basically a “baseline” that applies to all objects. It will generally be some very small value.
- Diffuse lighting provides most of our lighting.
- Specular lighting produces those highlights I’ve talked about for the past two weeks...

Diffuse light calculation

```
float diff = max(dot(norm, lightDir), 0.0);

vec3 diffuse = diff * lightColor;
```

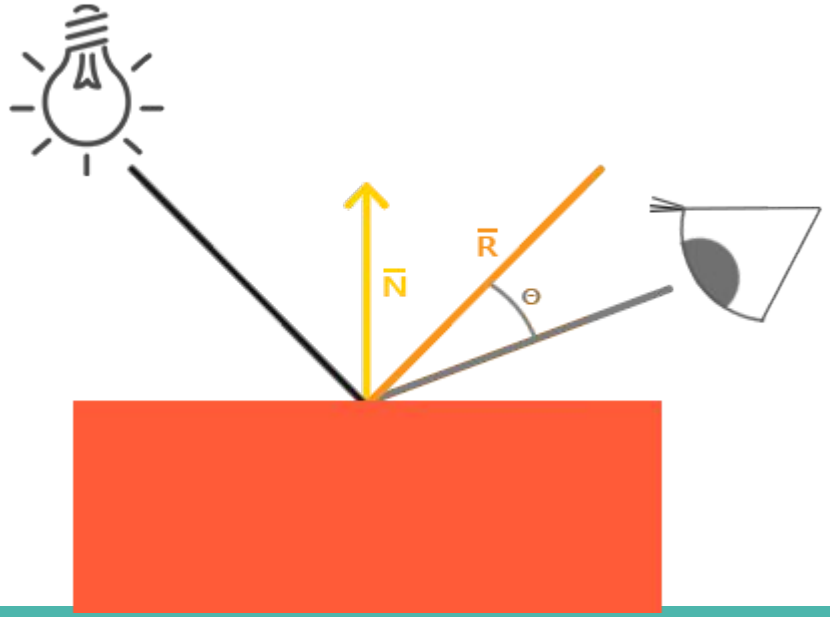


Source: https://learnopengl.com/Lighting/Basic-Lighting

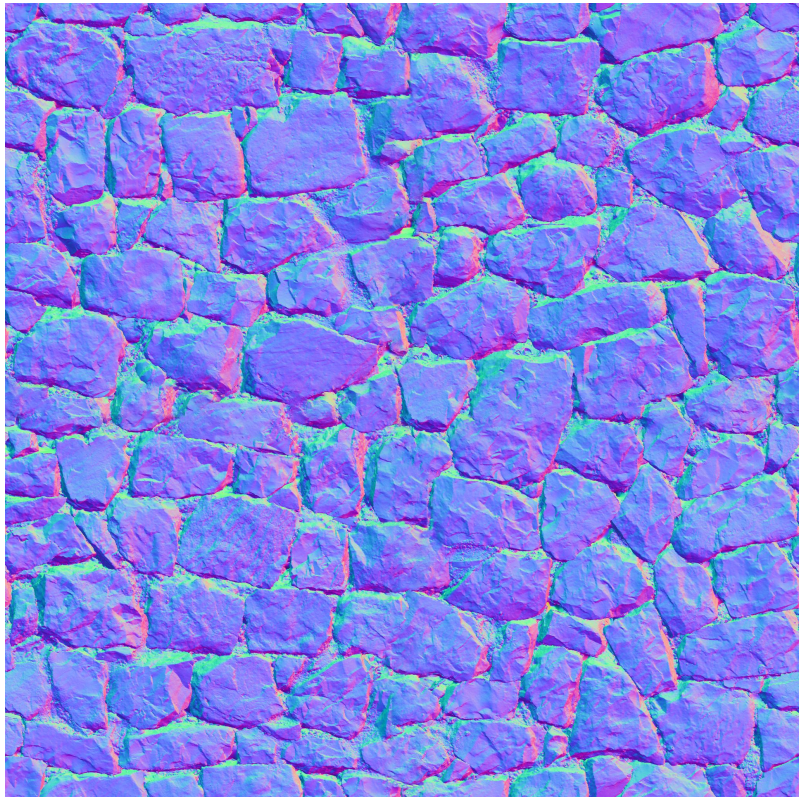
Specular light calculation

float spec = pow(max(dot(viewDir, reflectDir), 0.0), 32);

vec3 specular = specularStrength * spec * lightColor;



Now we see how those normal maps might work!



Types of lights in Unreal - Point Lights

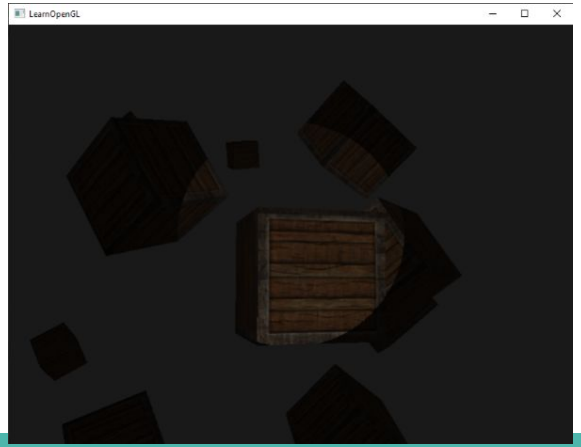
- Like a light bulb, or a torch
- Light emanates out from its location in all directions
- Light slowly fades away over distance

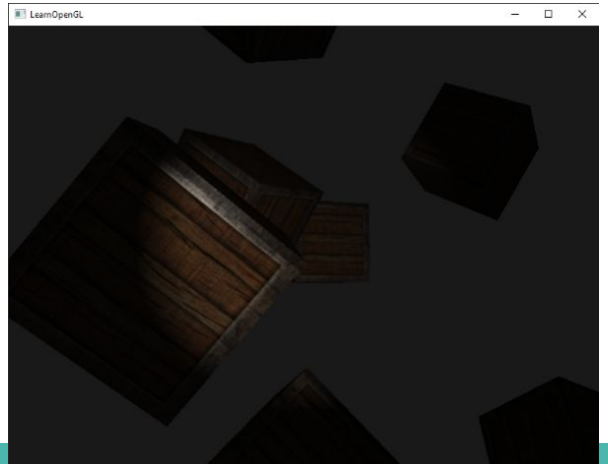
Types of lights in Unreal - Directional Lights

- Generally supposed to represent the sun, or to uniformly light a space
- Light travels in a single direction
- Light does not fade over distance

Types of lights in Unreal - Spotlights

- Similar to point lights, but with an important restriction
- Light is confined by two cones that we define
- We use two cones because if we only used one there might be a hard “edge” to the light that seems unnatural.
    - See https://learnopengl.com/Lighting/Light-casters for low-level implementation details.





Types of lights in Unreal - Rectangular Lights

- Similar concept to a point/cone light, but instead the light emanates from a rectangle.

Types of lights in Unreal - Sky Lights

- A rather unique form of light.
- Captures the scene in the distance, and applies it as light to the scene.
- The goal is to ensure that reflections of things like clouds work properly.
- Can be difficult to understand/use...

Light Mobility

- Static
  - Lighting is precomputed and cannot change at runtime
  - Basically no performance impact
- Stationary
  - Some pre-computed and some dynamic lighting
  - Indirect lighting is pre-computed, but direct lighting is dynamic, and its colour can be changed
  - Static shadowing on static actors
  - Can cast dynamic shadows onto moveable actors.
  - Stay in one position
- Moveable
  - Completely dynamic light