

### **Bonus Creativity Points – Ambient lighting**

For this calculation we relayed on the slides from week 3 file named " shading13", and some information online.

The model will be as follow:

$$I = C_{avgL} * C_{avgMat}$$

Which:

$I$  - is the ambient lighting intensity of the scene, we assume it's the constant color effect for the whole scene.

$C_{avgL}$ - is the average color of all the lights in the scene.

$$C_{avgMat} = C_m * K_{mat}$$

$C_{avgMat}$ - is the ambient color the objects in the scene project, we calculate it by averaging over all the diffuse colors of the materials after multiplying them with  $K_{mat}$  which is a new parameter of the material that represent the surface's ambient reflectivity.

$$K_{mat} \in [0,1]$$

In our implementation we set the  $K_{mat}$  default value to zero, so in the original scene there will be no difference made.

The method `getAmbientLighting` is responsible for automatically estimating the ambient intensity through the room, its implementation does not affect the rendering process practically as we only want it to calculate without changing anything in the picture. How ever for it to affect the output picture we only need to add this factor to each pixel color in the picture.

### **Bonus for Soft Shadows Section**

The soft shadow method in the project calculates light intensity, a parameter that accounts some light parameters and the ratio between the rays shot from the light grid to the hit point we are calculating the pixel for.

To account transparent object what we did is change the variable of the number of the rays from the light that were shot to a floating-point number. In this way, we can count “partial” rays. A partial ray as we call it, is a ray that comes through a transparent object, and therefore, it becomes weaker than a direct hit from the light to the hit point, but still larger than zero.

We multiplied all the transparency values of the objects on the way from the light grid to the hitting point, and we go a number  $\in [0,1]$  that gives a more accurate ratio  $\frac{\text{num of rays shot}}{\text{num of rays hi}}$  by using the transparency values of the objects in the way and adding the option of partial rays hit to be accounted.