Interactive Graphics Systems

Pictures: two details of HCI from movie T*he Dark Knight (credits BLIND, Ltd.)*

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Managing lights

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Requirements

- WebGCF already contains a class to support light management: CGFlight

CGFlight by example: creation and setters

```
// example of instancing a new CGF light object. Assuming this is an object of class CGFscene.
var l = new CGFlight(this)


// HOWEVER  in the webCGF the lights have already been created. You have the array this.lights[] with 8 CGFlight instances. You only need to assign values to them and keep disabled the ones that you do not use.


// set position: last coordinate is an homogeneous coordinate and defaults to 1
l.setPosition(0,0,10, 1);


// set ambient light. Also available are setDiffuse setSpecular.
l.setAmbient(0.1, 0.1, 0.1, 1)
```

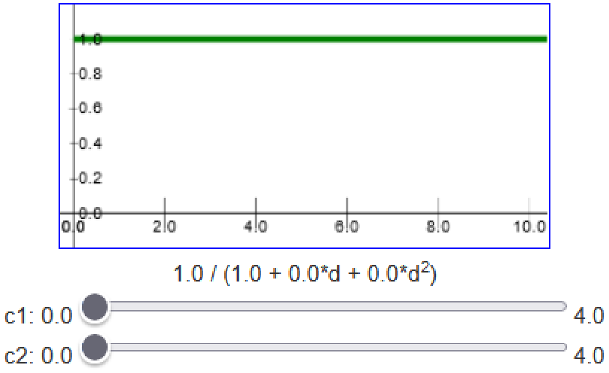
CGFlight by example: attenuation

```
to_light = u_Light_position - v_Vertex;
d = length( to_light );
attenuation = 1.0/(1.0 + c1 * d + c2 * d * d)
...
color = attenuation * (ambient_color + diffuse_color + specular_color);
```

```
// set constant attenuation
l.setConstantAttenuation(1)
```

```
//  set linear attenuation
l. setLinearAttenuation(0.0);
```

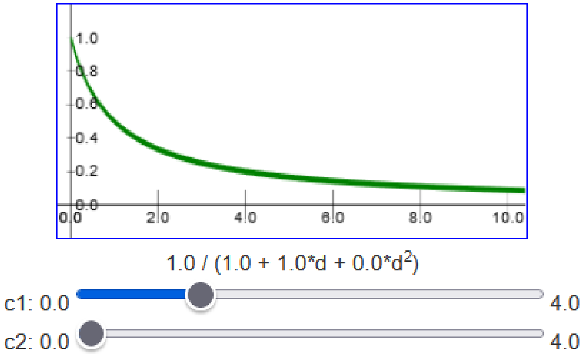
```
// set quadratic attenuation
l. setQuadraticAttenuation(0.0)
```



1.0 / (1.0 + 0.0*d + 0.0*d^2)

c1: 0.0 4.0

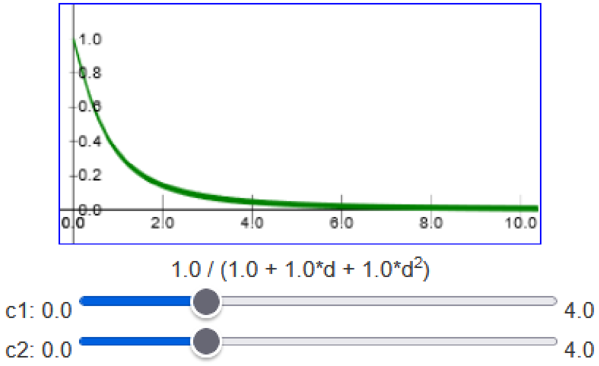
c2: 0.0 4.0



1.0 / (1.0 + 1.0*d + 0.0*d^2)

c1: 0.0 4.0

c2: 0.0 4.0



1.0 / (1.0 + 1.0*d + 1.0*d^2)

c1: 0.0 4.0

c2: 0.0 4.0

CGFlight by example: spotlight

```
// set spotlight cutoff angle (in degrees)
l.setSpotCutOff(45)

// set spotlight direction
l.setSpotDirection(0.1, 0.1, -0.1)
```

Shader defaults (multiple_light-vertex.gl)

```
vec3 spot_direction;            // Default: (0, 0, -1)
float spot_exponent;            // Default: 0 (possible values [0, 128]
float spot_cutoff;              // Default: 180 (possible values [0, 90] or 180)
float constant_attenuation;     // Default: 1 (value must be >= 0)
float linear_attenuation;       // Default: 0 (value must be >= 0)
float quadratic_attenuation;    // Default: 0 (value must be >= 0)
bool enabled;                   // Deafult: false
```

```
att = 1.0 / (uLight[i].constant_attenuation + uLight[i].linear_attenuation * dist +
                  uLight[i].quadratic_attenuation * dist * dist);
```

CGFlight by exemple: enabling and visibility

```
//  enabling the light
l.enable();

//  disabling the light
l.disable();

// turn the light visisble by showing an object at its location
l.setVisible(true)
```

CGFlight by exemple: make changes effective

// updating the light after changes in any light properties, enable/disable or visibility

// WARNING: the update method is called inside the display() of class extending CGFscene

```
this.lights[i].update() for 0 <= i < 8
```