1 Errata

1.1 Chapter 3 - Theory

Page 15, paragraph 1 : *visible light* must be replaced with *visible electromagnetic radiation.* The last sentence ("Instead explicitly noted, [...]") can be removed.

Page 15, paragraph 1 : The wavelengths of infrared and ultraviolet are swapped. It should be "between the 380nm of the ultraviolet and the 750nm of the infrared".

Page 16, paragraph 1 : The terms in photometry are *luminous energy* and *luminous flux*, instead of *radiant energy* and *radiant flux.*

Page 17, caption 3.2 : It is the opposite in fact. By shrinking the area, we retain more or less the same irradiance, while the measured flux is different. So, the caption should read: *Irradiance versus power. For the two surfaces A and B, the received irradiance E is the same, while the two measured fluxes Φ_A and Φ_B are different, as the area of B is twice as the one of A.*

Page 20, table 3.2 : Some quantities in the table are not correct. The radiance quantities require both a different delta function in order to work. We must then distinguish between flux in a point and *total* flux emitted by the source. In the directional case, the flux is zero (as they have no source) and the total flux is infinite (as a directional light is infinitely large). In the point case, we have a total flux of four times π the intensity, that is all concentrated in the origin.

Quantity	Directional light	Point light
Cosine term	$\cos\theta = \vec{n} \cdot \vec{\omega}_l$	$\cos\theta = \frac{(\mathbf{x}-\mathbf{x}_l)\cdot\vec{n}}{\lvert\mathbf{x}-\mathbf{x}_l\rvert}$
$\Phi(\mathbf{x})$ Flux	0	$4\pi I\ \delta(\mathbf{x}_l - \mathbf{x})$
Φ Total Flux	∞	$4\pi I$
$E(\mathbf{x})$ Irradiance	$L\cos\theta$	$I\frac{\cos\theta}{\lvert\mathbf{x}_l-\mathbf{x}\rvert^2}$
$I(\mathbf{x},\vec{\omega})$ Intensity	0	$I\ \delta(\mathbf{x}_l - \mathbf{x})$
$L(\mathbf{x},\vec{\omega})$ Radiance	$L\ \delta(\vec{\omega} - \vec{\omega}_l)$	$\frac{I}{\lvert\mathbf{x}_l-\mathbf{x}\rvert^2}\ \delta(\vec{\omega} - \frac{(\mathbf{x}-\mathbf{x}_l)}{\lvert\mathbf{x}-\mathbf{x}_l\rvert})$

Table 1: Different radiometric values for simple light sources.

Page 20, 21 and 27 : The L_o and $\vec{\omega}_o$ terms should be replaced by L_r and $\vec{\omega}_r$ (reflected radiance), as the former two are reserved for the rendering equation formulation.

Page 20, paragraph 2 : *The BRDF states that the incoming [...]* shold be replaced with *The BRDF states that the incoming irradiance and the outgoing radiance are proportional.*

Page 20, paragraph 1 : The properties listed are generally attributed to *physically based* BRDF functions.

Page 23, bottom : the $\vec{h}$ vector should be defined with the reflection vector:

$$\vec{h} = \frac{\vec{\omega}_r + \vec{\omega}_i}{\|\vec{\omega}_r + \vec{\omega}_i\|}$$

Page 25, paragraph 2 : The equation misses a subscript in the emissing term. Moreover, the visibility term is already included into the incoming radiance L_i. So the right equation is:

$$L_o(\mathbf{x}, \vec{\omega}_o) = L_e(\mathbf{x}, \vec{\omega}_o) + \int_{2\pi} f(\mathbf{x}, \vec{\omega}_i, \vec{\omega}_o) L_i(\mathbf{x}, \vec{\omega}_i)(\vec{n} \cdot \vec{\omega}_i) d\vec{\omega}_i$$

And the same correction must be done in the renderign equation at page 28:

$$L_o(\mathbf{x}_o, \vec{\omega}_o) = L_e(\mathbf{x}_o, \vec{\omega}_o) + \int_A \int_{2\pi} S(\mathbf{x}_i, \vec{\omega}_i, \mathbf{x}_o, \vec{\omega}_o) L_i(\mathbf{x}_i, \vec{\omega}_i)(\vec{n} \cdot \vec{\omega}_i) d\vec{\omega}_i dA_i$$

Page 28, paragraph 5 : the directional derivative equation is not spectral, and should be changed as

$$(\vec{\nabla} \cdot \vec{\omega}) L(\mathbf{x}, \vec{\omega}) = \frac{\partial L}{\partial x}\vec{\omega}_x + \frac{\partial L}{\partial y}\vec{\omega}_y + \frac{\partial L}{\partial z}\vec{\omega}_z$$

Page 32, paragraph 1 : $1/\sigma_t$ is the *mean free path*, while the converse of the reduced extinction coefficient, $1/\sigma_t'$, is called the *transport mean free path*.

Page 32, and throughout the thesis : what we call *transmission coefficient* is commonly referred as *effective transport coefficient* in literature.

Page 37, equation 3.15 : it should be corrected as

$$C_{\mathbf{E}}(\eta) = \frac{3}{4\pi}\left(\frac{2\pi}{3} - \int_{2\pi} R(\eta, \vec{\omega})(\vec{n}_o \cdot \vec{\omega})^2 d\vec{\omega}\right) = \frac{1}{2}(1 - 3C_2)$$

with a changed cosine squared term in the integral.

1.2 Chapter 5 - Implementation

Page 80 : The code for the LCG noise is wrong. It should be replaced with the following.

```
highp float noise_lcg(vec2 co, int size)
{
  uint k = co.x + size * co.y;
  uint b = 3125;
  uint c = 49;
  uint result = 1; /* have to start somewhere */

  for (;k > 0;k>>=1)
  {
    if ((k & 1) == 1) result = result * b + c;
    c += b * c;
    b *= b;
  }
  return float(result) / 4294967296.0f;
}
```

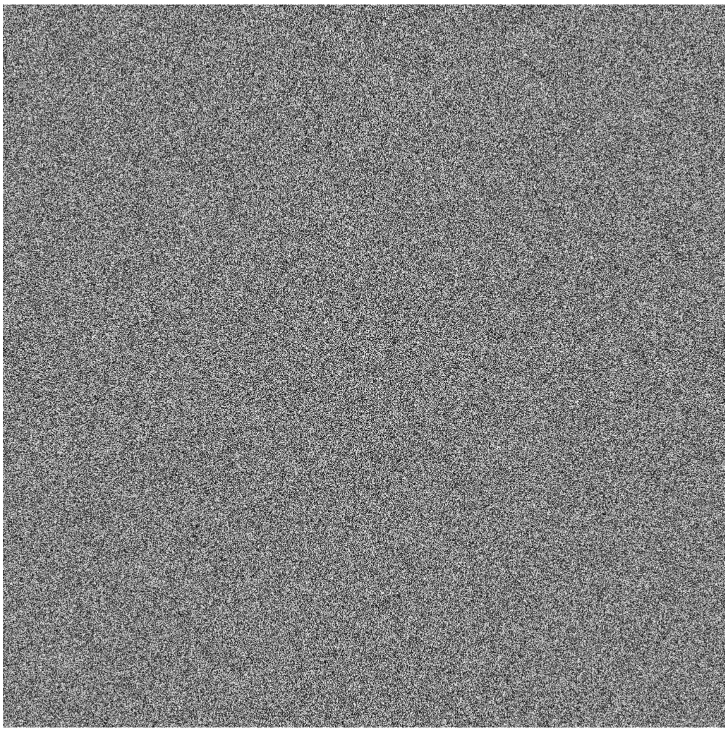

Figure 1: Corrected LCG noise.

Despite giving a comparable result now (see Figure 1), it is still a less viable solution that the LSR noise, as we need to generate only one random number per pixel.

Page 88 : the distance $\|\mathbf{x}_l - \mathbf{x}_i\|$ must be squared in order to get the right radiance term in point lights. While listing 5.13 is correct, two equations in this page are not:

$$R^{t,k}(\mathbf{x}_o) = I_l \sum_{i=1}^{N} \frac{S(\mathbf{x}_i^{t,k}, \frac{\mathbf{x}_l - \mathbf{x}_i}{\|\mathbf{x}_l - \mathbf{x}_i\|}, \mathbf{x}_o, \vec{\omega}_o)}{\|\mathbf{x}_l - \mathbf{x}_i\|^2} \exp\left(\sigma_{tr} r_i^{t,k}\right), \quad t \in [0, T], \quad k \in [0, K-1]$$

$$L(\mathbf{x}_i, \vec{\omega}_l(\mathbf{x}_i)) = \begin{cases} L_l & \text{if l is directional with } \vec{\omega}_l,\ L_l \\ \frac{I_l}{\|\mathbf{x}_l - \mathbf{x}_i\|^2} & \text{if } l \text{ is point with } \mathbf{x}_l,\ I_l \end{cases}$$

1.3 References

[Torrance and Sparrow 1992] is [Torrance and Sparrow 1967], as the original submission was in JOSA (DOI: `http://dx.doi.org/10.1364/JOSA.57.001105`).

[Born and Emil 1999] is [Born and Wolf 1999].