this work, the relative average error is around 1%, and clearly falls below this value when one additional eigenspectra are used (around 0.5%).

5. Conclusions

The PCA method has been applied to the BRDF that was experimentally measured on a sample glossy green ceramic colour standard. The analysis leads to the conclusion that only 4 principal components are responsible for most of the variance of the BRDF. The relative weight of each one of these components is linked to the specific geometry of the reflection. Thus, component 1 is more significant (i.e., plays a more significant role) when specular geometry is considered, whereas 2, 3 and 4 are more significant in those geometries where there is diffuse reflection. What makes these components 2, 3 and 4 different is the relative weight that they have in the calculation of the variance of the spectral distribution observed in the specular direction. Consequently, there is a relationship between the principal components and the physical phenomena that govern reflection in this sample. In this context, a model having a physical meaning can be set out based on these principal components.

It has been demonstrated that this principal-component-based model can explain very well the BRDF spectra even when only 4 components are included. With PCA it is possible to represent in a simple way and simultaneously both the spectral and the angular nature of the BRDF. As a result, PCA becomes a powerful tool to undertake the complex task of interpreting this kind of data. Moreover, PCA facilitates the task of interpolating the various BRDF measurements corresponding to a particular sample. The reason lies in its underlying physical model: in PCA, each of the resulting principal components corresponds to a particular component of the BRDF of different nature; also, each principal component can be fitted independently from the rest.

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