Título: FAST PHOTOREALISTIC TECHNIQUES TO SIMULATE GLOBAL ILLUMINATION IN VIDEOGAMES AND VIRTUAL ENVIRONMENTS

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Resumen: To compute global illumination solutions for rendering virtual scenes, physically accurate methods based on radiosity or ray-tracing are usually employed. These methods, though powerful and capable of generating images with high realism, are very costly. In this thesis, some techniques to simulate and/or accelerate the computation of global illumination are studied. The obscurances technique is based on the supposition that the more occluded is a point in the scene, the darker it will appear. It is computed by analyzing the geometric environment of the point and gives a value for the indirect illumination for the point that is, though not physically accurate, visually realistic. This technique is enhanced and improved in real-time environments as videogames. It is also applied to ray-tracing frameworks to generate realistic images. In this last context, sequences of frames for animation of lights and cameras are dramatically accelerated by reusing information between frames.

The obscurances are computed to simulate the indirect illumination of a scene. The direct lighting is computed apart and in an independent way. The decoupling of direct and indirect lighting is a big advantage, and we will take profit from this. We can easily add color bleeding effects without adding computation time. Another advantage is that to compute the obscurances we only need to analyze a limited environment around the point.

For diffuse virtual scenes, the radiosity can be precomputed and we can navigate the scene with a realistic appearance. But when a small object moves in a dynamic real-time virtual environment, as a videogame, the recomputation of the global illumination of the scene is prohibitive. Thanks to the limited reach of the obscurance computation, we can recompute the obscurances only for the limited environment of the moving object for every frame and still have real-time frame rates.

Obscurances can also be used to compute high quality images, or sequences