

Posudek diplomové práce

Matematicko-fyzikální fakulta Univerzity Karlovy

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Název práce Název práce
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Studijní program Informatika **Studijní obor** Počítačová grafika a vývoj počítačových her
Autor posudku Thomas Klaus Nindel, Ph.D. **Role** oponent
Pracoviště KSVI

Text posudku:

The work addresses the difficult engineering challenge of implementing the Vertex Connection and Merging (VCM) Path Sampling strategy into the ART rendering framework. A special challenge to this end is the fact that ART is a bispectral renderer, meaning it supports fluorescence. The author lays down a theoretical framework for VCM based on the relevant literature, explains different path sampling algorithms, describes the rendering system framework, gives pseudocode of the implementations, and evaluates the gained results using side-by-side comparisons of the different algorithms.

Overall, the work achieves only partial results: VCM is implemented successfully for non-fluorescent scenes. For fluorescent scenes, both Light tracing and photon mapping are implemented. However, the work fails to merge these into the full VCM algorithm. The exact reasons for that remains unclear (Pg. 36 mentions that it "would require more time to conduct research").

The evaluation section of the thesis uses side-by-side comparisons of different path-sampling strategies implemented by the author. While these are sufficient to qualitatively illustrate the differing variance of the estimators, they lack a quantitative comparison (i.e. variance values, mean and expected values shown using false-color difference images), and comparisons to some "ground truth", i.e. renderings obtained from a different rendering system. This makes it very difficult to evaluate whether the author was successful in *correctly* implementing the algorithms. The author claims that the "results seem to be consistent" (Pg. 39).

In the sections laying down the mathematical framework, some key details are missing, which impacts consistency: On page 11, the symbols $m_{i,j}$, λ_{in} and λ_{out} seem to be related, but this relationship is not explained. On Page 15, the connection between the given (Monte Carlo?) estimators in Eq. 2.3, and the path integral framework is unclear. Likewise, the symbols I_* are not explained.

In terms of the formal requirements and linguistic expression, the work lacks some finesse.

Some abbreviations are used without introduction ("SDS Paths", "LT", "PT"), there are sentence fragments (Page 13 first sentence, Page 17 sentence above 2.4 Heading). The orthography is mostly flawless. The bibliography is adequate and rather short.

Recommended Grade: 2

Práci doporučuji k obhajobě.

Práci nenavrhuji na zvláštní ocenění.

V Praze dne 4.9.2024

Podpis: