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Supervisor's assessment of the thesis „Advanced Monte Carlo methods in Image Synthesis”, submitted by Petr Vevoda at MFF UK

The thesis has 156 pages, and apart from the introduction and conclusion, is divided in to three main sections that correspond to the three subtopics of Monte Carlo rendering that the author has significantly contributed to.

In the first and second area, there is one SIGGRAPH paper each which is being presented. The author has shared first authorship of both, and the exact contribution which he made to each is outlined in the publication list on page 156. Both papers made significant contributions to the state of the art in core Monte Carlo image synthesis, and the first has seen extensive industrial usage since it was published. The second one is currently more of a theoretical nature, as the obtained results do not yet make for easy integration into production systems. However, the findings are still an extremely significant, as this was the first advance on this particular sub-problem in over twenty years: most others had assumed that the extant solution was as good as it gets, and never investigated further. The author is to be particularly commended for questioning some core assumptions in this area, and making improvements where most believed none would be possible.

In the third area, the author is presenting the content of two papers, one for which he has shared first authorship, and one where he is the sole first author. Especially the second one about the infrared sky model is groundbreaking insofar as it is the first model of its kind: no pre-computed model of even remotely similar quality existed before, even outside graphics proper. The clear sky model in the first paper in this section is the result of a very long research effort, to which the author made significant contributions: without his work on the compression scheme that was used, the entire model would have been impossible. The same technology was re-used for the infrared model, which however required several modifications to be scientifically sound outside the visible range for which the original model had been developed. The visual range model has now been integrated into several production systems, and is widely acknowledged as the most sophisticated model of this kind.

As he has 2.5 first authorships of journal papers, the contributions made by the applicant fulfil the formal criteria for defending a Ph.D. thesis at Matfyz: and the thesis itself is a sound compilation of the excellent scientific work that was undertaken by the author over the course of several years. In my opinion, he has demonstrated beyond any doubt that he is capable of conducting cutting edge research by himself, and to lead complex and demanding research projects. So I wholeheartedly recommend this thesis for acceptance.

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