

## Posudek oponenta diplomové práce

Jméno a příjmení autora posudku: Jaroslav Křivánek

Jméno a příjmení autora práce: Michal Šebesta

Název práce: Synthesis of digital landscape surface data

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Vlastní text (sem prosím napište text posudku, délka textu posudku není omezena):

The presented diploma thesis deals with example-based synthesis of landscape surface data. More specifically, the goal is to refine the resolution of landscape cover data from MODIS to a higher resolution than the one available. This is essentially a super-resolution problem, for which many approaches exist in the literature. However, the considered case is specific in that the landscape cover can be correlated with other surface features readily available from digital elevation models (DEMs). Since DEMs are usually available at a higher resolution than the MODIS data, the established correlation model could then be used to synthesize the desired high-resolution refined landscape cover maps.

The specific approach taken in the thesis establishes the probabilistic correlation model using a simple local linear regression between the presence/absence data for various landscape cover types (forests, water body, urban area, agricultural land etc.) and various features derived from a DEM. The idea is inspired by recent work on image denoising of unconverged Monte Carlo renderings used in computer graphics. This approach is somewhat arbitrary and is not inspired by any deeper insights into the nature of the expected correlation between the features and the presence/absence data, but this is fine as it is overtly admitted in the thesis.

The results obtained with this simple approach show some visual improvement over the coarse data and one can say that they 'look plausible'. In terms of a numerical comparison with reference high-resolution data, however, no improvement has been measured. Again, this is fine as it is openly discussed in the thesis.

Overall, I believe that Mr. Šebesta has taken a nice step at finding a practical solution of the present problem that does deliver some plausible results. However, I also do have some criticism.

First and foremost, the entire approach is based on the assumption that correlation exists between the features and the high-resolution presence/absence data. Without this correlation, the approach cannot deliver meaningful results. For this reason, I would expect validation of this assumption on reference data. This would also help choose the right features for the algorithm.

Second, while Mr. Šebesta has provided a reasonable survey of related work, one closely related area has not been mentioned at all, despite the fact the reviewer has hinted to the thesis supervisor to explore this area. Specifically, (by-example) texture synthesis algorithms such as Image Analogies (Hertzman et al. 2001), Image hybrids (Risser 2010) are all extremely closely related and could provide further insights into the problem.

Finally, Mr. Šebesta has chosen to write the thesis in English, while his command of the language is far from optimal for the task. There are few sentences in the thesis that would not suffer from stylistic or grammatical flaws, which makes reading of the thesis fairly difficult.

Nonetheless, I do believe that the Mr. Šebesta's diploma thesis is a solid piece of research work and sufficiently shows the qualities and skills of the candidate.

### Doporučení k obhajobě:

For the above reasons, I do recommend the thesis for defense.

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V Praze dne: 9.1.2016

Podpis: