17th IAPR International Conference on Discrete Geometry for Computer Imagery

ConfTool

Overview John Chaussard Logout

Information on the contribution

161 *Title:* **A 3d curvilinear skeletonization algorithm with application to path tracing** (Paper submission)
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Evaluation of the contribution

Content (10%)	*Significance* (10%)	*Originality* (10%)	*Relevance* (10%)	*Presentation* (10%)	*Recommendation* (50%)	*Total points (out of 100)*
8	**8**	**6**	**8**	**6**	**7**	**71**

Reviewer's comments on the contribution

Contribution of the submission:
This paper has three clearly separated parts.

In the first part a parallel thinning algorithm for binary 3D images is presented. The main idea is to loop over the 6 orthogonal directions given by the axis and their negatives, for each direction dir we loop over the possible dimension of the faces, and for each dimension d we find free pairs with free d-faces that collapse "in the direction dir". Such collapses can be performed in parallel. This is the basic version of the algorithm.

In the second part the parallel thinning algorithm is extended in several directions. First it is defined the lifespan of a face, which is basically the number of iterations between becoming a boundary pixel (or face) and being collapsed. The the descenterness map is defined, which is a way to measure how much "inside" the image is each pixel. This parameters can be used to tune the basic version of the algorithm and obtain better skeletons. At the end, computing the skeleton requiers to run the thining algorithm twice: in the first round is used to measure relevance, this relevance is used to set "unremovable" pixels, and then the thinning is run again.

In the third part it is discussed how the skeleton of voids in an image can be used to assist computing the illumination of scenes. The idea is to adapt a standard ray-tracing algorithm in such a way that the skeleton is used to select the probability distribution in the Monte Carlo integration.

Comments for the authors:
In general I like the idea of using the skeleton of voids to assist ray-tracing algorithms. I would like to see more experiments to support the validity of the method, but I understand that this paper treats mainly theoretical aspects.

I like the idea of lifespan of a face. It reminds me of persistence homology, although I see not connection.

The discussion in Sction 5.2 assumes some things. For example, if there are different sources of light and the image is quite symmetric, it may easily happen that imp_n=n. In this case the discussion does not go through. Also, I get the feeling that the presentation is tailored to ONE light source. It would be better to make clear in the discussion that the method works for several light-sources.

In the experiments, there is a significant speed up in most cases, but in Sponza 2. Is there any explanation for this difference in the behavior of the speed up?

Do not use d in definition 7 because d is already used in the Algorithm. (It is confusing.)

Why do not define d(x,y) as the L_1-distance instead of using a graph-based distance?

Why do you call the skeleton curvilinear? What is curvilinear about it?

The path-tracing algorithm is quite standard and I assume that it appears in textbooks of Comp Graphics. I would suggest referring to one such book (perhaps instead of [8], but both references would also be ok.).

The English of the paper is not very polished. Here there is a partial list:
- page 3, line 8: ")" is missing.
- Def 3: "Let Y..., the complex X collapses....". These are two different sentences and there should be a period between them, not a comma.
- I do not understand the 3rd paragraph of Section 4.
- "its finds"

- "elements [whose ...] is interesting"
- "preprocessing achieved on it"