

論文 / 著書情報
Article / Book Information

題目(和文)	美的意図と時間一貫性を考慮した三次元形状から抽出される特徴線の様式化
Title(English)	Artistically Intended and Temporally Coherent Stylization of Feature Lines Extracted from 3D Models
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Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

(博士課程)
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論文要旨

THESIS SUMMARY

専攻：	計算工学	専攻
Department of		
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申請学位 (専攻分野)：	博士	(工学)
Academic Degree Requested	Doctor of	
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Academic Advisor(main)		
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要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

This thesis presents the first methods to add artistic intention to view-dependent lines extracted from 3D models. The proposed stylization systems combine new algorithms with user interfaces that enable the user to emphasize or omit details of line drawings generated from polygonal surfaces. The results obtained with the methods proposed in this thesis produce visually appealing and temporally coherent animations of line drawings that convey meaningful information such as material properties and feature sharpness. Chapter 1 introduces the background and purpose of this thesis by describing an ideal stylization system for animated line drawings using 3D models. Chapter 2 presents related work such as 3D mesh segmentation, smoothing of polygonal meshes, line extraction algorithms, line visibility, temporal coherence for line drawings and stylization methods. Chapter 3 discusses the difficulty of defining the artistic intention with a low number of user operations and formalizes the problem by defining ideal stylization objectives in artistically intended and temporal coherent line drawing animations generated from 3D models. This thesis introduces two different approaches that allow the user to add artistic intention with low number of user annotations (Chapters 4 and 5). Chapter 4 proposes a new stylization method that is based on surface segmentation and allows per-region stylization. This method divides the 3D model into enclosed regions referred to as Gaussian curvature areas and uses line tracking of object-space lines to further subdivide the Gaussian curvature areas. A segmentation simplification method is also proposed to remove over-segmented areas produced by bumpy surfaces regions in moderately complex models. The surface segmentation approach proposed in this chapter allows per-region stylization with low computational cost. Chapter 5 proposes a new stylization method that combines object and image space techniques to match strokes annotated on the surface to current frame feature lines. This method, while more computationally expensive than Chapter 4 method, allows per-stroke stylization to produce visually appealing and uncluttered line drawings. This chapter also introduces a new attraction field that allows occlusion-robust line matching based on the active contour model and defines a limited region on the surface, referred to as confidence area, to further discard mismatches to unrelated feature lines. Chapter 6 introduces a new interpolation method that maintains artistic intention of the user and prevents sudden changes of stylization by guaranteeing spatio-temporal continuity. This method is based on a weighted energy minimization that makes a trade-off between competing constraints. This chapter also proposes a weighting scheme to guaranty motion coherence between the feature line stylization and the apparent motion of the underlying surface. Chapter 7 describes properties such as predictability and the locality of stylization that justify the proposed approach and evaluates the temporal behavior, usability and computational cost of the stylization system. The results of the temporal behavior evaluation show that most viewers perceive an improvement in the temporal behavior of the line drawing animations generated by the proposed method. Furthermore, the stylization system achieves more meaningful line drawings than previous systems limited to a single style and only requires a low number of user operations and annotation time. While more computationally expensive than simpler methods, interactive rates are achieved for moderately complex models. Chapter 8 summarize the contents of this thesis and proposes short to long term remaining problems for future work such as Level of Detail (LOD), automatic style transferring and mesh understanding.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note：Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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