



Embroidery Modeling and Rendering in Real Time

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Input: a line drawing.



Embroidery texture is rendered on a flat plane.

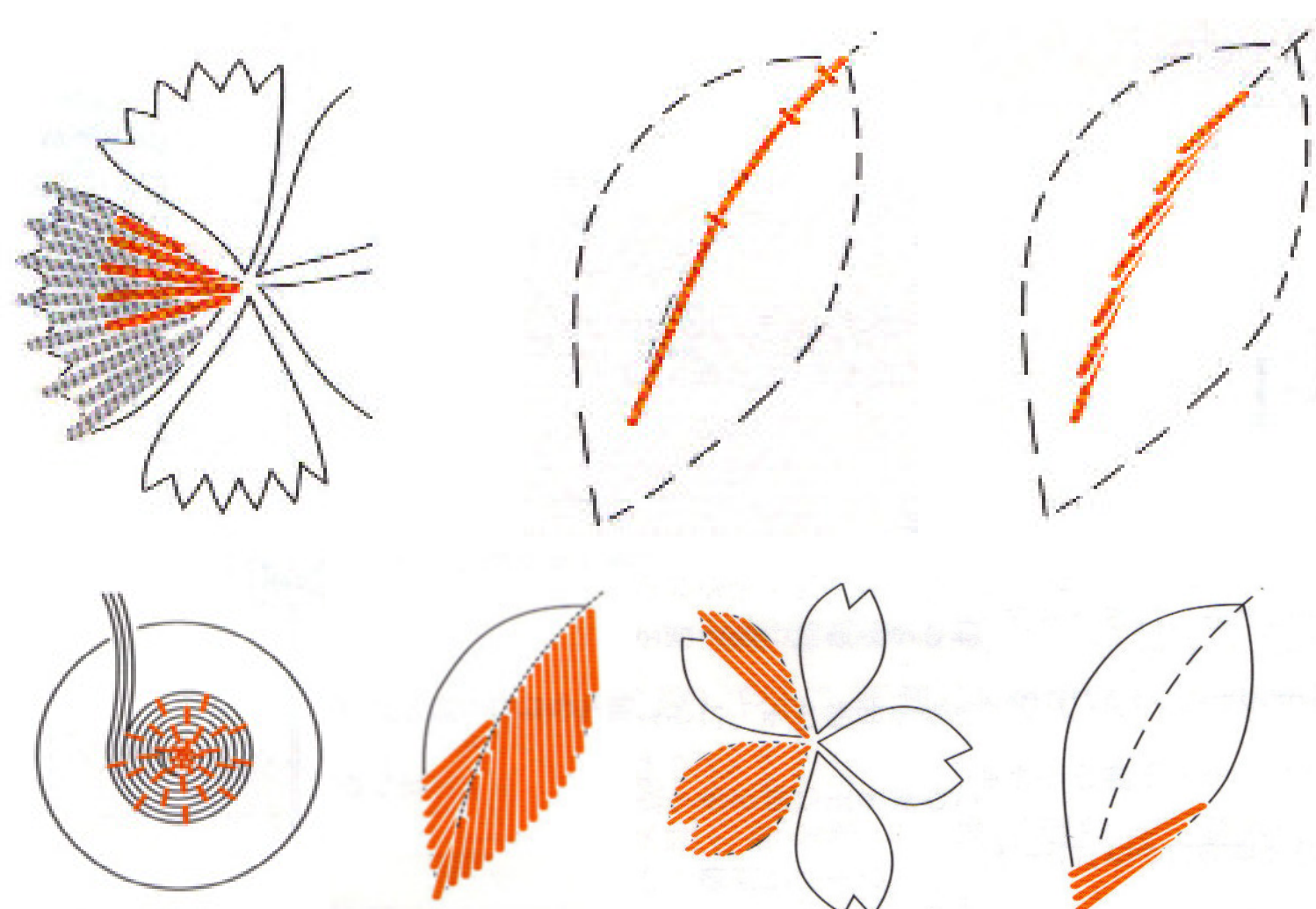


Embroidery texture is rendered on a 3D object.

ABSTRACT

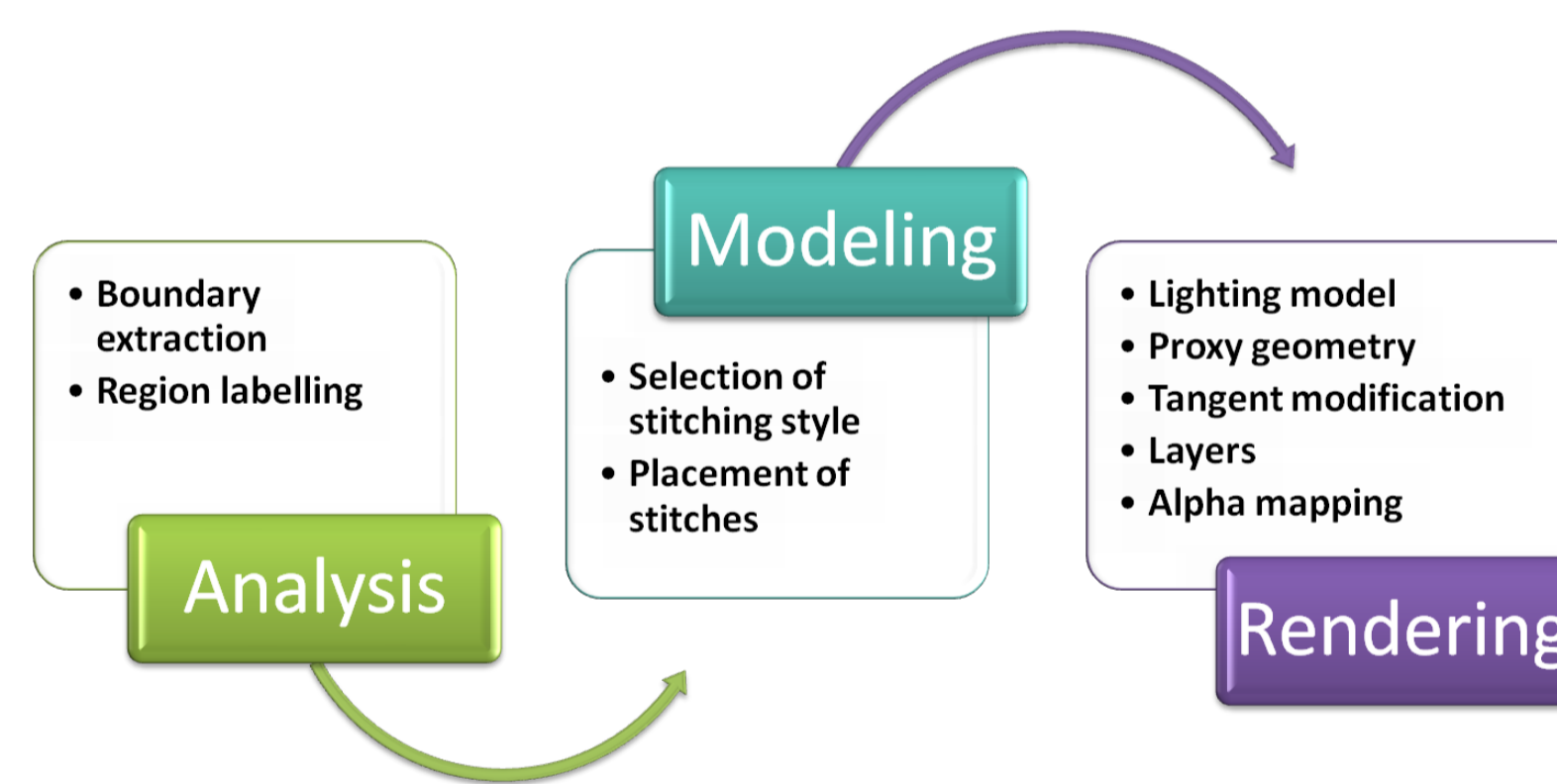
Embroidery is a traditional non-photorealistic art form in which threads of different colours stitched into a base material are used to create an image. We explore techniques for automatically producing embroidery layouts from line drawings and for rendering those layouts in real time on potentially deformable 3D objects with hardware acceleration. Layout of stitches is based on automatic extraction of contours from line drawings followed by a set of stitch-placement procedures based on traditional embroidery techniques. Rendering first captures the lighting environment on the surface of the target object and renders it as an image in texture space. Stitches are rendered in this space using a lighting model suitable for threads at a resolution that avoids geometric and highlight aliasing. The result is a realistic embroidered image that properly responds to lighting.

TRADITIONAL STITCHES



Long-short satin stitches, two methods for embroidering lines and borders, and four other surface styles.

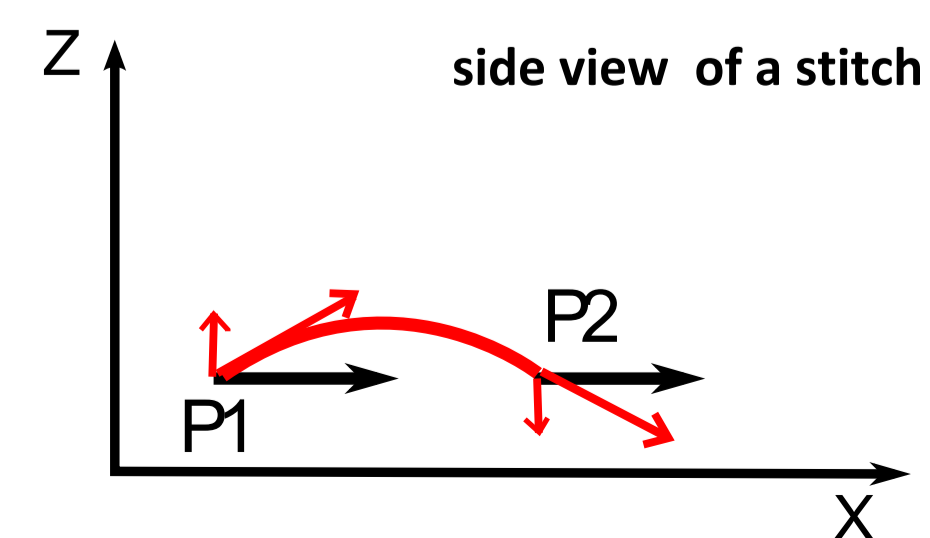
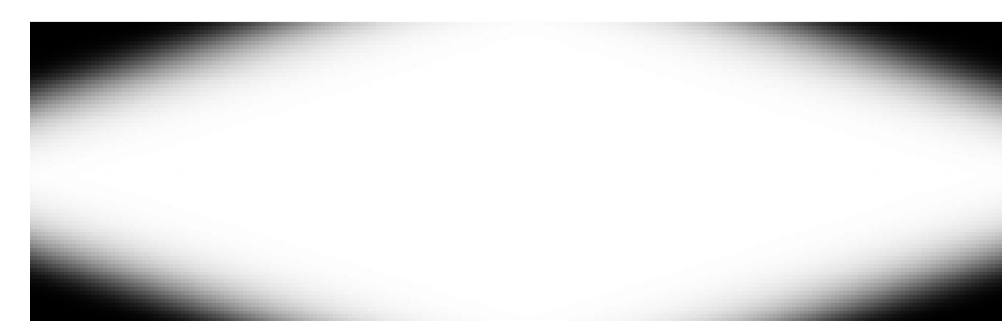
GENERATING EMBROIDERY



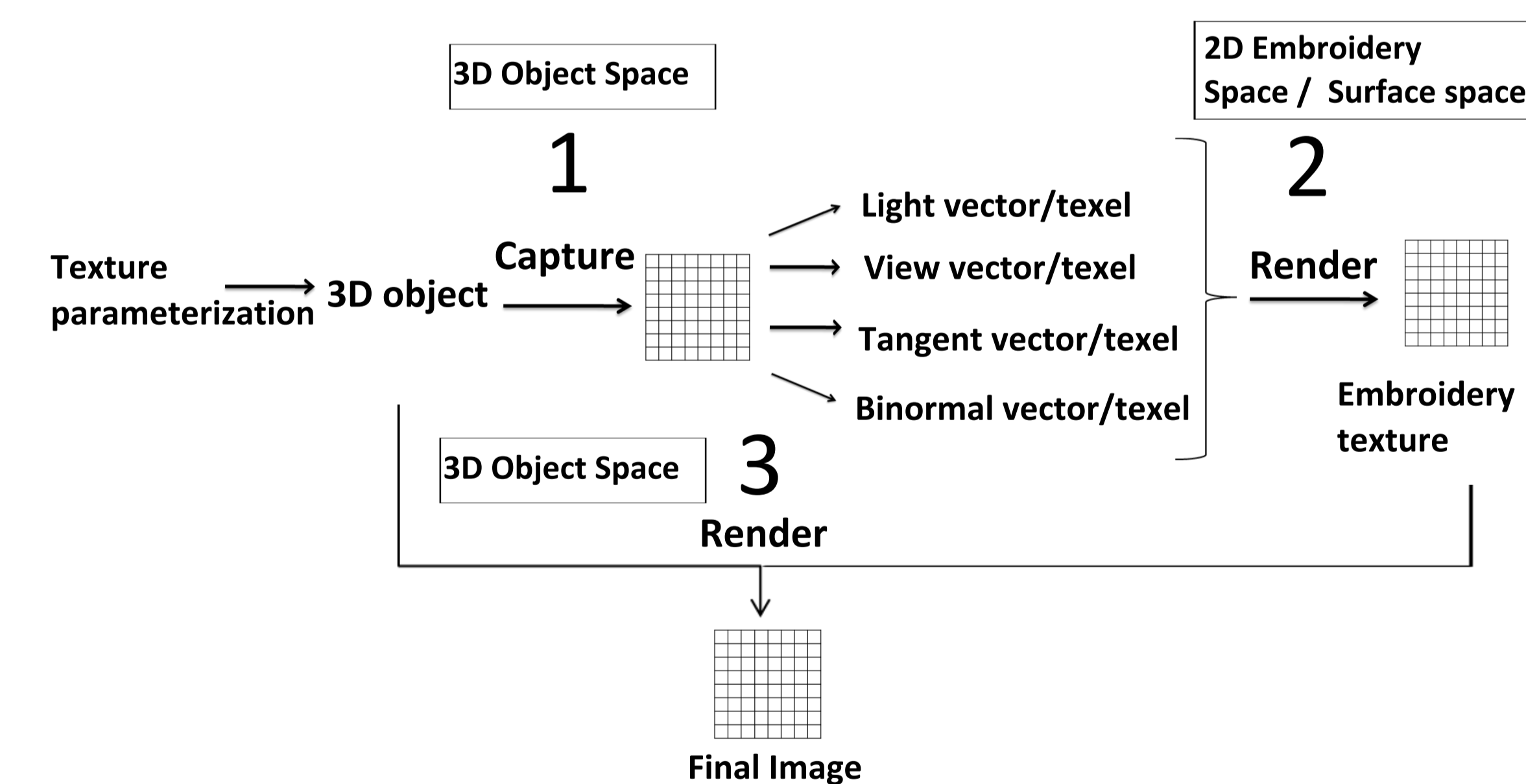
Analysis: regions, boundaries, and details are extracted.
Modelling: stitch styles, colors, and parameters are selected and stitches are placed in surface space.
Rendering: stitches are dynamically lit in real time in surface space.

STITCH RENDERING

Lighting Model: based on averaged Phong/Blinn lighting over the surface of an infinitesimally thin cylinder on proxy quadrilaterals.
Alpha Mapping: to give stitch curved, antialiased silhouette
Tangent Modification: to produce an illusion that the stitch is curved



SURFACE SPACE EMBROIDERY RENDERING



This pipeline is used to render the embroidery layout on a 3D object. In step 1, the lighting environment on the 3D object is captured. In step 2, the lighting environment is used to render stitches in surface space, creating a lit embroidery texture. In step 3, the embroidery texture is mapped back onto the 3D object.

ACKNOWLEDGEMENTS

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