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Shape Processing and its Application to Stroke Rendering and Stylization

An automated inking system

By
Tsang Hao Fung

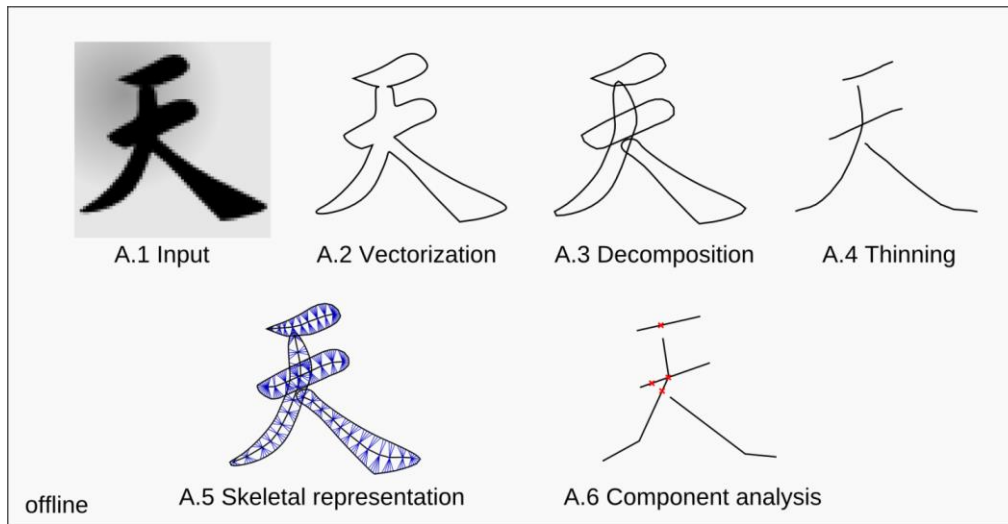
Advised by
Prof. Pedro SANDER

Shape Processing and its Application to Stroke Rendering and Stylization

“An automated inking system”

By Tsang Hao Fung, Advised by Prof. Pedro SANDER

This project aims to develop a stylization system that generates ink work from plain curves that can match the quality of those drawn by artists. We state the importance of stroke interactions and propose a novel data-driven model that can capture the art of inking. We address the existing limitations and present a stack of shape processing algorithms used to construct the automated inking system. Our system is able to generate plausible inking of Chinese calligraphy and cartoons at a quality level not reached before.



- Stage A (offline). Library construction
1. Input images of stroke samples
 2. Perform thresholding, edge extraction and vectorization
 3. Decompose the shapes into individual strokes
 4. Thinning: compute the central axis
 5. Compute the skeletal representation
 6. Perform component analysis
 7. Build a library of component strokes

offline

Stage B (online). Matching and stylization

1. Input digitized unstroked curves
2. Perform component analysis
3. Search for the best match in the library
4. Compute correspondence between input curves and sample curves
5. Compute the skeletal stroke deformation
6. Output the stroked set

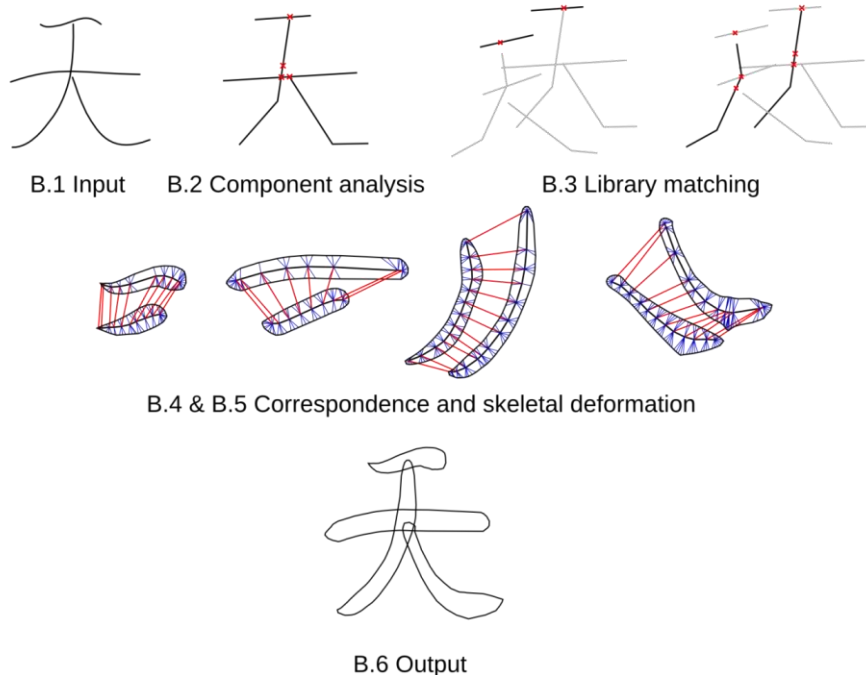


Figure 1. Visual summary of the automated inking system



Figure 4. Cartoon stroke library. Artwork courtesy AnarchyWulf, reproduced without permission.

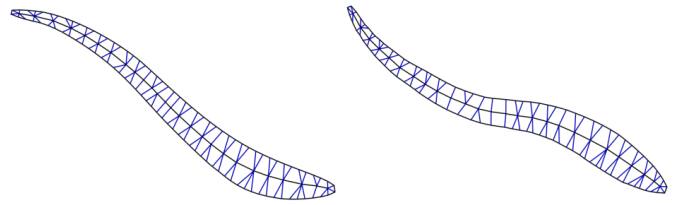


Figure 2. Skeletal stroke representations (left); deformation (right).

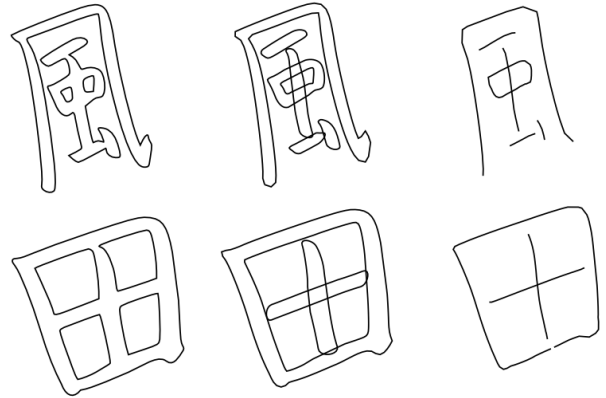


Figure 3. Decomposition and thinning of 2 hollow shapes



Figure 5. Input (left), basic stylization (middle), cartoon-stylized result (right). The solid eyes were added afterwards for aesthetic purpose. It was originally a frame extracted from the animation *Toy Tinkers*, 1949 by Walt Disney Productions. Reproduced without permission.

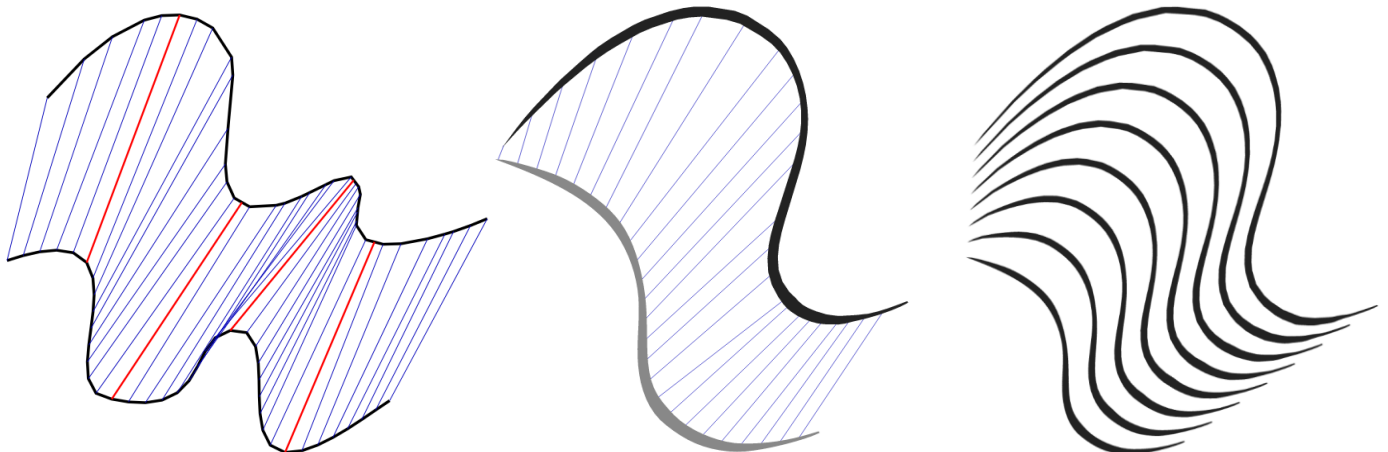


Figure 6. Curve correspondence (left), stroke transfer (center), stroke interpolation (right)

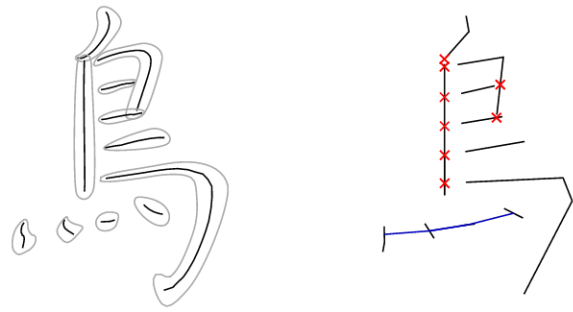


Figure 7. Component profile. Stroke and path (left), characteristic polyline (right).
Intersections are marked as red crosses and dot proximities in blue lines.

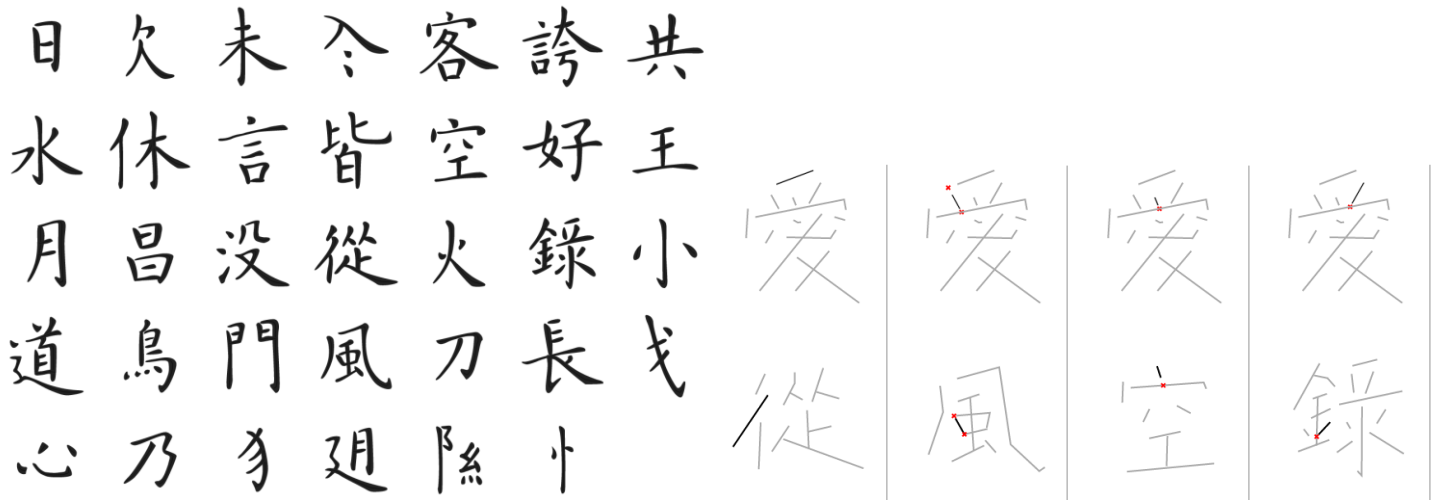


Figure 8. Stroke library of Chinese calligraphy (left); Component matching (right)



Figure 9. Input curves



Figure 10. Stylization result