Fast blending of planar shapes based on invariant invertible and stable descriptors

Emna GHORBEL, Faouzi GHORBEL, Ines SAKLY and Slim M'HIRI

CRISTAL Laboratory - GRIFT Research group, National School of Computer Sciences, Manouba university, Tunisia

Introduction

- General approach for the interpolation of continuous and closed curves based on invariant descriptors is introduced.
- A shape blending approach based on the Fined Fourier-based Invariant Descriptor (Fined-FID) that is invertible, invariant under Euclidean transformations, complete and stable.
- Due to the inversion criterion the intermediate shapes are easily recovered by applying the inverse analytical expression to the weighted mean descriptors
- Compared to previous works, the Fined-FID-based morphing avoid the usual registration step, generates naturally closed intermediate contours and ensure invariance under Euclidean transformations and invariance to the starting point, while being computationally efficient (almost linear complexity)..

Problem Formulation

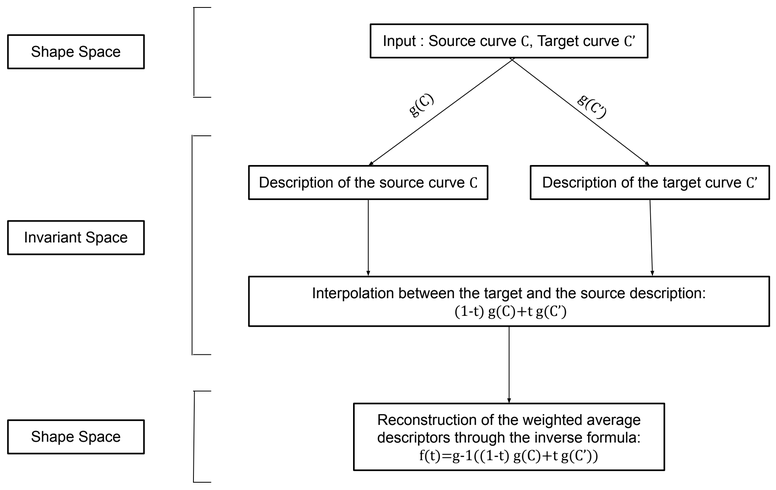


Figure 1: diagram of the proposed approach

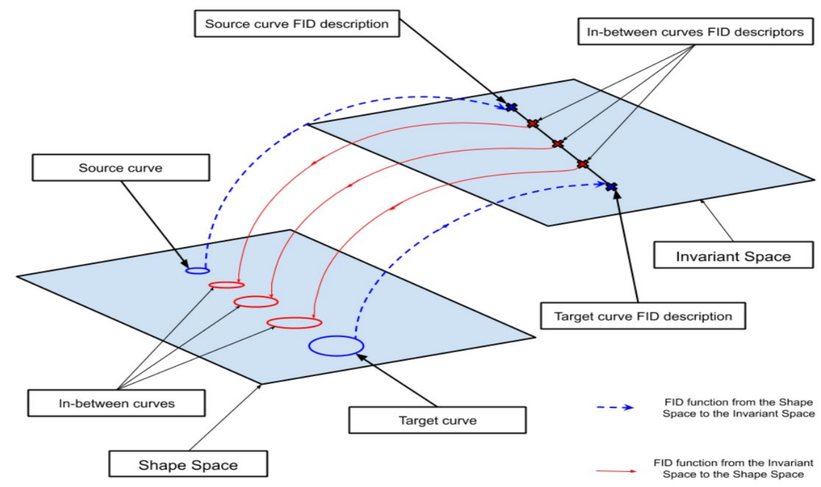
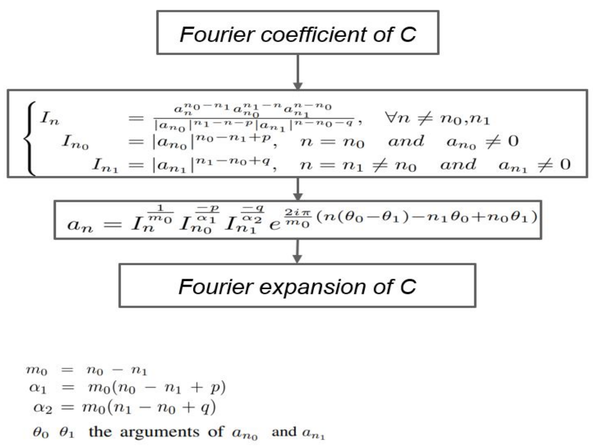
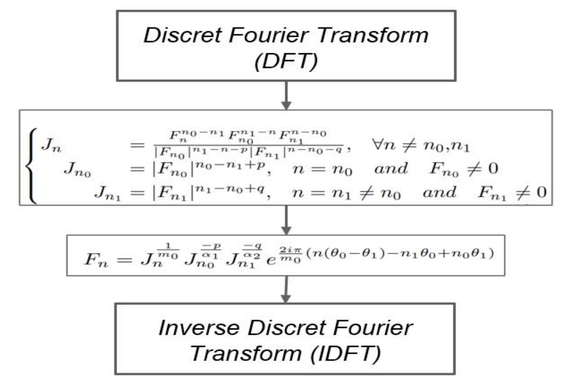


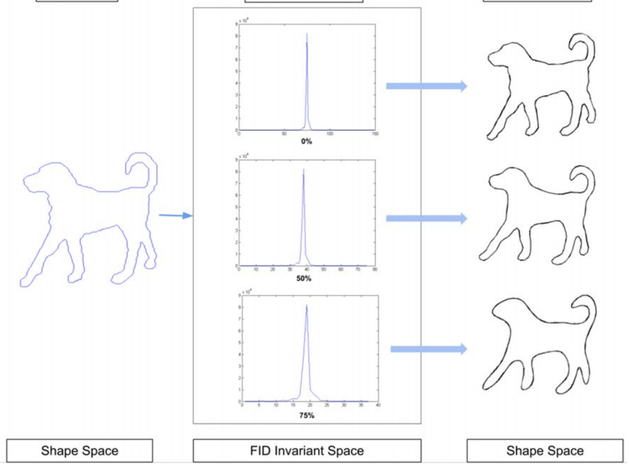
Figure 2: Overview of the Fined-FID based blending approach: the idea is to go from the shape space to the invariant space, perform linear interpolation in the invariant space, then return to the shape space to obtain the intermediate shapes.

THE Fined-FID

FID Formula and the reconstruction expression → **A discrete modelization termed fined-FID** → **Truncation step**



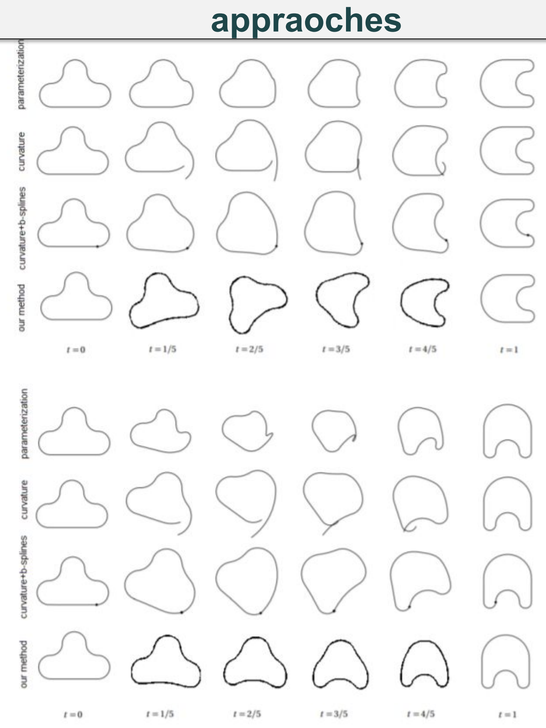




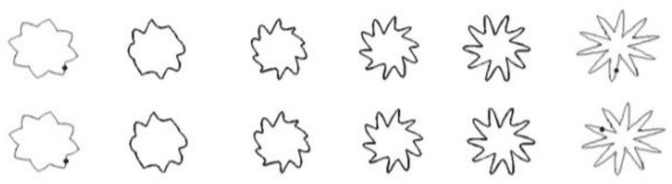
Window: [n0 − N/A, n0 + N/A], N = 150

Experimental results

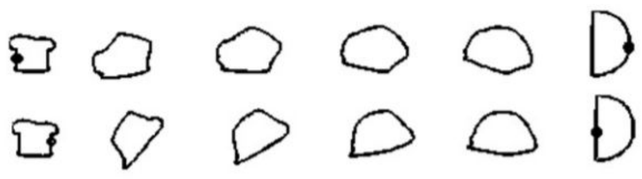
A. Equivariance to Euclidean transformations and comparison with other appraoches



B. Invariance to starting point and comparison with curvature approach

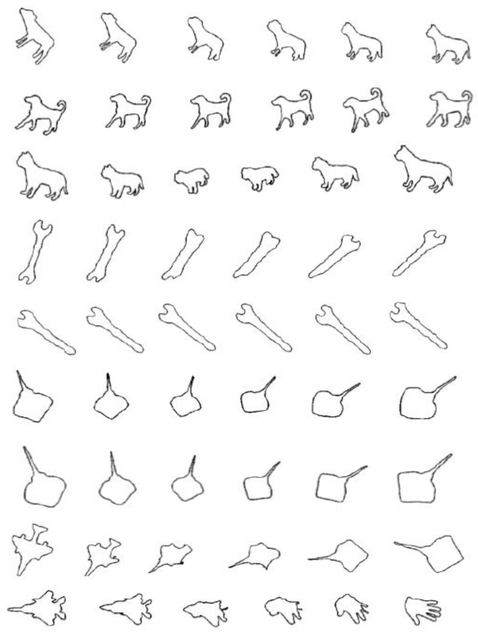


Fined-FID blending with Different starting point on the same curve



Curvature blending with Different starting point on the same curve

C. Morphing on Kimia99 Data base



Conclusion and Perspectives

- **Generalization of Surazhsky and al. [6] work & employ FID instead curvature**
- **The proposed approach is equivariant to Euclidean transformations and invariant to the starting point.**
- **The registration steps between commonly applied between the target and source curves are avoided -> Computationally-efficient (O(nlog(n)))**
- **Carry out an optimization study to find the (non-linear) path in the invariant space.**

Bibliographical references

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