

University of
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Modeling and Analyzing Changes in Scripts

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Introduction

Development of Scripts

Human handwriting is a variable activity. It does not always produce an exact identical copy of a glyph. During each production process, the glyph is modified in several ways.

Scripts begin with a uniform normal form of the characters. Cumulative effects of the variations over several centuries tend to completely alter the shapes of the characters and modify the scripts' appearance over time.

Development of Devanagari /ka/

In particular, Indic scripts which were derived from Brahmi have diverged significantly due to such development into nearly 200 different descendant scripts.

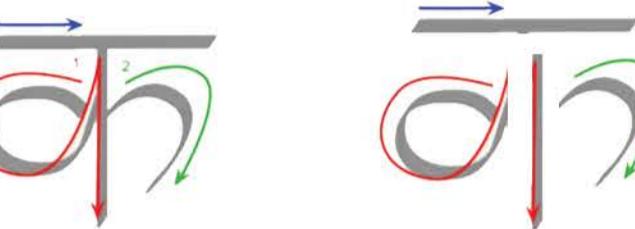
Motivation

Modeling script development facilitates the study of human handwriting and its effect on allograph production through variations in strokes and introduction of artifacts.

A well defined framework is necessary to analyze the changes occurring in the shape, both qualitatively and quantitatively. Such a framework aids in better analysis of human handwriting behavior.

Proposed Methodology

Glyph Processing



Reconstruct Trajectory & Glyph Structure

The written trajectory of the characters is reconstructed based on heuristics from their corresponding shapes.

Depending on the trajectory, the glyph structure of the character is constructed containing stroke level information such as order, orientation, penup/pendown events.

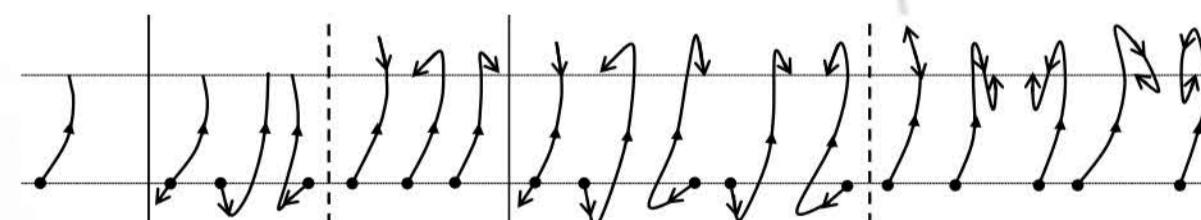
Derive Glyph Metrics

Various metrics associated with the glyph such as complexity are derived from this structure. If required, additional metrics can be defined.

Handwriting Modeling

Stroke Modeling

The variations in the strokes that are most likely to be introduced during the trajectory construction of the glyph are modeled as transformations.



Possible variations of a basic stroke

Modeling the Development

The development of a script is to be modeled as the successive cumulated shape change of the glyphs.

These shape changes can be modeled in terms of inter-stroke behavior such as variation, interaction, ligation and the introduction of artifacts.

Analysis Framework

Quantitative Analysis

The changes in the scribal handwriting can be quantitatively measured employing well-defined metrics instead of abstract notions. Based on these quantified metrics, the changes can be further statistically analyzed in detail for interesting patterns.

Qualitative Analysis

Stroke correspondences between two successive developments can be established, based on the glyph structure of the character.

Various kinds of interaction between the strokes can also be studied in detail. The development process can be further analyzed by modifying the conditions of the model and studying the result.

Applications

Reconstruction of Trajectory Change

The model would be able to suggest a possible trajectory change that leads from one shape to another, as a set of transformations. Using this it can be possible to visualize the evolution of the character and reconstruct possible intermediate forms.

Reconstruction of Unattested Characters

Based on the stroke behavior between two successive developments, it is possible to reconstruct the shape of the unattested characters in the source and target scripts.

