A Theory of Elastic Presentation Space

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Overview

• Presentation space
• The framework
• Generalizing the framework
• Extensions
A Presentation Problem

 Insets

- have detail
- have some context
- lose local context
- not detail-in-context
A Presentation Problem

Separate views
• have detail
• have context
• not detail-in-context

Detail-in-Context
Detail-in-Context

Desired Functionality

- Detail-in-context
- Choice of focal shape
- Freedom of focal location
- Multiple foci
- Smooth integration
- Magnification to scale
Elastic Presentation Space?

- ‘elastic’ in the sense that adjustments and re-organizations are readily revertible
- taking advantage of the ability to interactively change presentations over time
- recognized by others - Stretch Tools (Sarkar et al.), Rubber Sheet (Sarkar & Brown), Malleable Graphics (Chuah et al.), Pliable Surfaces, Elastic Labels (Iturriaga & Lubiw), Elastic Windows (Kandogan & Shneiderman)

Motivation-why a Framework?

- understanding ‘presentation’ space → elasticity
  - many ‘point’ solutions
  - all distinct - visually and algorithmically
- a geometric framework
  - unites algorithmically
  - supports extrapolation between methods it unites
  - supports inclusion of more than one presentation method in a given interaction
- facing the dilemma ‘which is best?’
- making EPF accessible - the EPF library
Multi-Scale Views: 2D based approaches

- Spatially adjust a given 2D layout to another 2D layout
- Transformation function adjusts $x$ and/or $y$
  (Kadmon & Shlomi, Spence & Apperley, Keahey & Robertson)
- Magnification function is the derivative
- Reversing is non-trivial (Keahey & Robertson)

Multi-Scale Views: 3D based approaches

- Two step process:
  - Surface manipulation in 3D
  - Perspective projection
- Creates apparent transformation in 2D
- Simple relationship between magnification and transformation
The Framework

• Place 2D representation on a surface
• Place surface in three dimensions
• Manipulate the surface
• Display the result through perspective projection

Detail in Context
Providing a single focus

\[ h_p = h_f \cdot \exp^{-\left(\frac{(d_p)^2}{\sigma}\right)} \]
Components of a EPF Lens

- focal connection
- focal centre
- central alignment vector
- context connection
- context → distortion → focus → distortion → context
- lens

Magnification

- reference viewpoint
- view plane
- base plane
- \( d_b \)
- \( h_f \)
- \( h_r = d_b - (d_b / \text{mag}) \)
- \( x_m / d_b = x_i / (d_b - h_f) \)
- \( \text{mag} = x_m / x_i = (d_b / (d_b - h_f)) \)
Magnification

- on demand
- to scale
- infinite (within the numerical resolution of the computer)

$$h_f = d_b - (d_b / \text{mag})$$

Adjusting a drop-off function

- adjusting magnification
- adjusting focal radius
- linear drop-off
- adjusting lens radius
Arbitrary Focal Shape
Arbitrary Focal Shape

Arbitrary Focal Shape
Arbitrary Focal Shape
Single Centred Focus
Off-Centre Focus

framework: EPS

Off-Centre Focus

framework: EPS
Previous Solutions

- Freeze the distortion, move the information
  Perspective Wall (Mackinley et al.), Hyperbolic Browser (Rao & Card)
- Move the viewpoint
  Document Lens (Robertson & Mackinley),

Converging Vectors
Our Solution

Normalized Vectors

normalized vectors

Z normalized vectors
Buckling

Resolving Buckling
Blended Vectors

Blended Surface
Multiple Foci

framework: EPS

Multiple Foci