A Theory of Elastic Presentation Space

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2 Lenses in 3D

DEMO
Resulting Grid in 2D or 3D

Information in 2D
Information in 2D

Magnify 3D & Magnify 2D

- **Magnify 3D**
  - returns (x, y, z)
  - user responsible for perspective projection

- **Magnify 2D**
  - returns (x, y) on the baseplane
  - does perspective projection
  - person using can keep everything 2D
Magnify 2D

reference viewpoint

view plane

base plane

Magnify 3D returns

Magnify 2D returns

Distance metrics - \( L_2 \)

Eucilidean distance

\[ L_2 = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \]

generalizing distance

\[ L_p = \sqrt[p]{(x_1 - x_2)^p + (y_1 - y_2)^p} \]
Distance metrics - $L_1$

$L_1$ Manhattan metric

Simplifies to

$L_1 = |x_1 - x_2| + |y_1 - y_2|$

Distance metrics - $L_\infty$

$L_\infty$

Simplifies to

$L_\infty = \max(|x_1 - x_2|, |y_1 - y_2|)$
\[ L_p = \sqrt[p]{(x_1 - x_2)^p + (y_1 - y_2)^p} \]

**EPF - Partial dimensions**

- Thus far distance calculated on both \( x \) an \( y \)
- EPF - Perspective wall
  - linear drop-off function
  - distance based on \( x \) only
  
  \[ L_p = \sqrt[p]{(x_1 - x_2)^p} \]
  
  - simplifies to
  
  \[ \text{dis} = |x_1 - x_2| \]
EPF - Partial dimensions

• Works for either $x$ or $y$ giving scrolls in either direction

\[ L_p = \sqrt{\left(x_{fac} (x_1 - x_2)\right)^p + \left(y_{fac} (y_1 - y_2)\right)^p} \]
Zoom

Step drop-off functions

Magnified inset

Manhattan lens
Step Functions

- Occluding step
- Non-occluding step
- Multiple level step

Changing Drop-off Functions

- Linear
- Cosine
- Gaussian
- Hemisphere
- Hyperbola
EPF - Insets

- Uses folding

EPF - Offsets

- Uses folding
EPF - Dragmag (Ware et al.)

An offset with visual cues (Ware et al.)

DragMag

EPF - Manhattan Lens

Manhattan Lens

Linear drop-off function
Focal radius = lens radius
EPF - Perspective Wall (Mackinley et al.)

Perspective Wall

Linear drop-off function

$L_\infty$ distance metric

(Mackinley et al.)

EPF - Document Lens (Robertson & Mackinley)

Document Lens

Linear drop-off function

$L_\infty$ distance metric

(Robertson and Mackinley)
EPF - Graphical Fisheyes (Sarkar et al.)

Graphical Fisheyes

- Linear drop-off function
- $L_2$ distance metric
- Point focus

Folding

- Windows provide freedom of repositioning
- Windows cost detail-in-context
- Distortion can provide detail-in-context
- Detail-in-context cost freedom of repositioning
- Can we have both?
Multi-Scale View
An Integrated Lens

A displacement-only, constrained, radial, Gaussian lens
An Integrated Lens

A displacement-only, constrained, radial, Gaussian lens
Selectively Applying Displacement

Looking at edge congestion
Selectively Applying Displacement

Looking at edge congestion

An Edge Distortion Lens

An edge-displacement-only, constrained, radial, Gaussian lens
An Edge Distortion Lens

An edge-displacement-only, constrained, radial, Gaussian lens

References