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Artistic Resizing: A Technique for Rich Scale-Sensitive Vector Graphics

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Artistic Resizing’s inference algorithm is based on a simple bivariate geometry interpolation technique we call orthogonal interpolation. It requires a set of graphic groups (variants) that share the same structure and have a bounding box. Each local affine transformation is extracted and interpolated independently from the others. The first line of the matrix is linearly interpolated along the width of the bounding boxes, whereas the second line is interpolated along their height. The assumption is that horizontal (resp. vertical) resizing only results in horizontal (resp. vertical) motions, i.e. translations, scales and shears. On more than two examples, two monovariate piecewise linear interpolations can thus be applied, eliminating the need for multivariate techniques.

Although simple, orthogonal interpolation has a number of useful properties. First, its results are independent from the graphics structure, provided that each tree path contains at most one varying transformation (graphics can be normalized to conform to this rule). Second, interesting geometrical properties are preserved on interpolated graphics, such as algebraic measures (allowing the specification of fixed margins and alignments), relative ratios (allowing centering), contact and parallelism.

Whereas advanced image interpolation techniques have been proposed in a variety of domains, Artistic Resizing shows that a minimalist approach can successfully serve the purposes of GUI resizing. Its properties differ from those of rigid interpolation schemes used in 2D and 3D computer animation [Shoemake et al. 1992], reflecting different requirements: GUI resizing is bivariate, non-rigid, axis-dependant and rarely involves rotations.

Artistic Resizing builds upon a reasonable trade-off between power and simplicity. Because it does not rely on an extensive search for invariants [Kurlander et al. 1993], it is not subject to combinatorial explosion and is efficient even on extremely complex graphics. In contrast with most by-example systems, it is predictable and does not require the user to prune unintended rules. Artistic Resizing additionally allows the expression of more subtle, non-linear resizing behaviors and can be easily combined with higher-level layout models (Figure 1, right).

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References


Figure 1: On the left, vector graphics with non-uniform resizing: the 2nd and 4th variants have been drawn in Illustrator, the other ones are interpolated. On the bottom right, a dock using Artistic Resizing.