INTRODUCTION

Image scaling is one of the most common image processing functions in visualization applications. Interpolators can be classified as scene-based or object-based. Here we compare a new registration-based (object-based) method to bilinear interpolation (scene-based).

METHODS

The new method is a one-dimensional implementation of control grid interpolation [1]. The fundamental assertion of the method is the brightness constraint. Generally, the brightness constraint states:

- The intensity associated with any given location in the originating data set is preserved and located somewhere in the destination data set.
- For the one dimensional application, the intensities associated with pixels in a given row (or column) are preserved in the neighboring row (or column).
- A single dimension of freedom is incorporated by allowing the matching pixels to be offset by a unknown displacement.
- The collection of displacements that map one row (column) of pixels to its neighboring row (column) is found by minimization of the brightness constraint.
- Smoothness is imposed on the transform by linking neighboring displacements. Only displacements at “nodes” are independently define, others are interpolated.

RESULTS

The proposed method can be used to expand an image along each of the four cardinal directions. The final, uniformly resized image is generated by weighted averaging.

CONCLUSION

This work demonstrates control grid interpolation of a single image as a one dimensional problem.

- By treating the interpolation along the column dimension as separate from interpolation along the row dimension, the flow of pixel intensities is constrained to one degree of freedom at a time.
- Performance was always as good or better than bilinear interpolation.
- The optimization framework establishes the groundwork for penalizing deviation from desired behaviors beyond the brightness constraint.

REFERENCES


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