Image Interpolation Algorithms Comparative Study

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APPLICATION OF INTERPOLATION

- RESCALING
- VOLUME RENDERING
- ZOOMING-IN, ZOOMING-OUT IMAGES
- TOMOGRAPHY RECONSTRUCTION

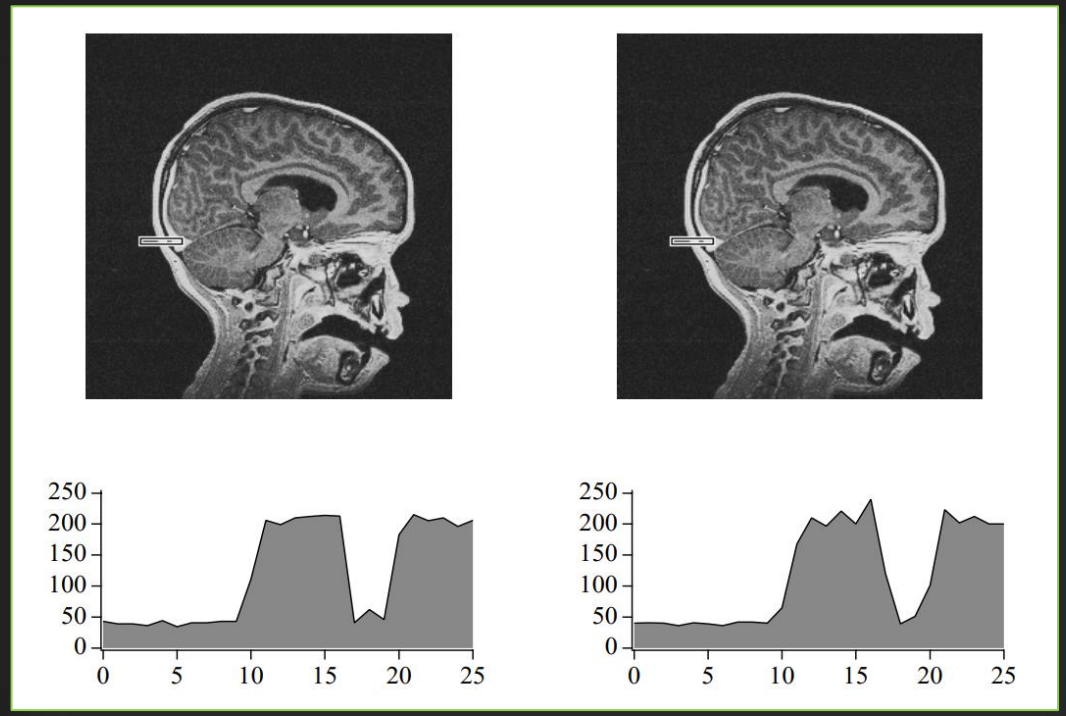


IMAGE INTERPOLATION

The methods of increasing the number of pixels that an image contains are often termed as image interpolation algorithms.

- Nearest Neighbour Interpolation Algorithm
- Linear Interpolation Algorithm
- Bilinear Interpolation Algorithm
- Bicubic Interpolation Algorithm
- Cubic B-Spline Interpolation Algorithm

NEAREST NEIGHBOUR INTERPOLATION ALGORITHM

- The synthesis function associated to nearest-neighbour interpolation is the simplest of all, since it is made of a square pulse.
- The approximation order is one.
- Discontinuous
- Modest memory requirements
- Fastest computation time
- Requires 2 grid points in each dimension

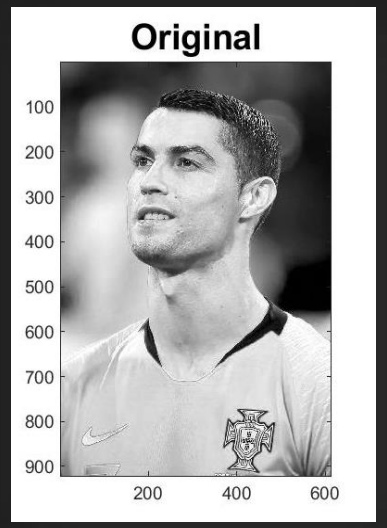
LINEAR INTERPOLATION ALGORITHM

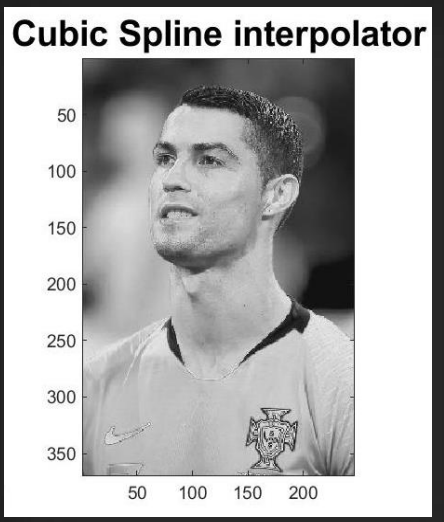
- The linear interpolation has very low implementation complexity.
- Its support covers 2 units; it is an interpolant, and its approximation order is 2.
- It is continuous but not differentiable.
- Continuous
- Requires more memory and computation time than nearest neighbour
- Requires at least 2 grid points in each dimension

CUBIC B-SPLINE INTERPOLATION ALGORITHM

- This function is piecewise polynomials of degree 2
- This is globally symmetric and 2 times continuously differentiable.
- Continuous
- Requires more memory and computation time than linear.
- Grid must have uniform spacing, though the spacing in each dimension does not have to be the same.
- Requires at least 4 points in each dimension.

COMPARISON OF ALGORITHMS

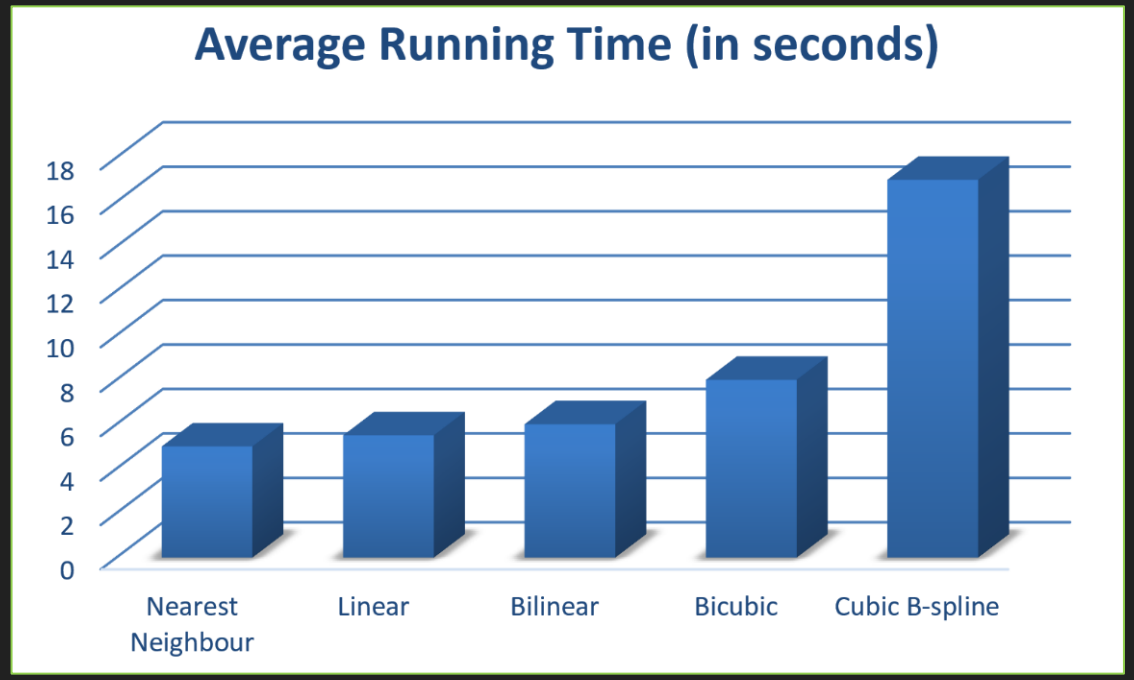




COMPARISON OF ALGORITHMS

Time Complexity of different Algorithms are given as:

INTERPOLATION ALGORITHMS	TIME (in sec)
Nearest Neighbour	0.081
Linear	0.099
Bilnear	0.140
Bicubic	0.169
Cubic B-spline	0.174



Evaluation of Different Interpolation Algorithms

Interpolation Algorithm	Subjective Feelings	Evaluation (Reviews)	Processing Time (seconds)
Nearest Neighbour	Obvious mosaic	Worst	5
Linear	Very Blurry	Worse	5.5
Bilinear	Blur, not Sharp	Bad	6
Bicubic	Fuzzy, Sharper	Better	8
Cubic B-spline	Relatively Clear, Sharp	Good	17

THANK YOU