Top Ten Algorithms Class 14

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http://people.sc.fsu.edu/~jburkardt/classes/tta_2015/class14.pdf

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Our FINAL Algorithm List

1. Area of a triangle
2. Back Propagation algorithm
3. Bank routing number checksum for error detection
4. Barycentric coordinates of point in triangle
5. Bernoulli number calculation
6. Bootstrap algorithm
7. Caliper algorithm for bounding boxes (today)
8. Collinearity of three points
9. Compressed sensing
10. Computational geometry (triangle area, containment, mapping)

Our Current Algorithm List

1. Computing with very large numbers
2. Data stream: most common item
3. Discrete Cosine Transform
4. Discrete Fourier Transform
5. Euclid's greatest common factor algorithm
6. Finite Element linear triangle basis function evaluation
7. Gram-Schmidt vector orthogonalization algorithm
8. Hamming error correcting codes
9. Hilbert curves (today)
10. ISBN (International Standard Book Number) checksum

Our Current Algorithm List

1. k-means clustering algorithm
2. Luhn/IBM checksum for error detection
3. Monte Carlo Sampling
4. PageRank algorithm for ranking web pages
5. Pancake flipping algorithm for genome relations
6. Path counting with the adjacency matrix
7. Power method for eigenvector problems
8. Probability evolution with the transition matrix
9. Prototein model of protein folding
10. Quasirandom number generation

Our Current Algorithm List

1. QR (Quick Response) images and error correction
2. QR matrix factorization
3. QR iteration for eigenvalues
4. Reed-Solomon error correcting codes
5. Ripple Carry algorithm
6. Search engine indexing
7. Signal detection in noisy data
8. Trees for computational biology
9. Triangle-contains-point algorithm
10. Triangulation of a polygon
11. UPC (Universal Product Code) checksum for error detection
12. Zero Knowledge Proofs

Student Presentation

Amirhessam Tahmassebi, *Hilbert Curves*

Reference: Brian Hayes, "Crinkly Curves", American Scientist, May-June 2013

Reference: Nick Berry, "Hilbert Curves - fractal space filling fun", http://datagenetics.com/blog/march22013/index.html

Hilbert curves seem like a pretty pattern. But they contain an extreme mathematical regularity. And they are "space filling". And they can be used to index 2D data in a sensible way.

There are other versions of Hilbert curves in 2D and 3D.

Student Presentation

Juan Llanos, *The Convex Hull and the Caliper Algorithm*

Reference: Nick Berry, "Bounding Boxes",
http://datagenetics.com/blog/march12014/index.html

A convex hull is the smallest polygon that will contain a shape.

If we're dealing with a computer screen, then we may instead want the smallest rectangle that can contain a shape.