Research in the Effectiveness of Singular Value Decomposition of Pixel Data to Decrease the Amount of Essential Data to be Processed

With the advent and proliferation of today's graphic software, processing image data has become common place. Cyberspace receives an abundance of image transfers. These images take up considerable bandwidth. Mathematicians and scientist are studying ways to decrease the amount of data processed. The data manipulated is pixel data, which commonly uses integers from 0-255 to represent the data attributes of an image. Singular value decomposition is one method used to efficiently decrease the amount of data processed. Singular value decomposition involves the decomposition of a square matrix into three matrices, *u, s, vt*. The s matrix is an *n* by 1 matrix known as the diagonal matrix its values are the single values from which singular value decomposition gets its name. Singular value decomposition is not used directly on the pixel data. The pixel data is read in as a 1 by *n***n* matrix then formatted to fit an *n* by *n* matrix. Pixel data is then converted from integers to real numbers. The real numbers are then divided by the max pixel value within the data set. The resulting matrix is decomposed using singular value decomposition. Singular values less than 10-4 are then "thrown away." Each matrix is adjusted by truncating the respective matrix. The matrix is then reconstructed/composed from the truncated matrices. The final matrix is produced by multiplying the composed matrix by the max pixel value. The original matrix and the final matrix are analyzed for the relative error. The human eye cannot discern the difference between the images reproduced by the two data sets. The amount of essential transferable data has been decreased. Singular value decomposition does not reduce the rank of an image's pixel data to 1, but it does decrease the amount of data needed for processing an image.

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