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Data Mining Of An Image Using Singular Value Decomposition

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Abstract

Image decomposition is now essential for transmission and storage in database. Eigen value is one of the vital roles in image processing. The processing is the measurement of image sharpness can be done using the concept of eigen values. The aim of this paper is to image compression and reduce dimensionality of an image using singular value decomposition.

Key words: singular value decomposition, eigenvalue,

Introduction

Data mining of an Image is any form of information processing, in which the input is an image. Data mining of an Image studies how to transform, store, retrieval the image. Singular value decomposition method can transform matrix A into product USV T, which allows us to refactoring a digital image in three matrices [1], [3]. The using of singular values of such refactoring allows us to represent the image with a smaller set of values, which can preserve useful features of the original image, but use less storage space in the memory, and achieve the image compression process[2][8]. The experiments with different singular value are performed, and the compression result was evaluated by compression ratio and quality measurement. It performs recognition with Singular value decomposition. An image can be defined as a two dimension [4], [6].

Function f (x, y), where x and y are spatial coordinates, and the amplitude of f at any pair of (x, y) is gray level of the image at that point.

A = USVT

To measure the performance of the SVD image compression method, we can computer the compression factor and the quality of the compressed image. Image compression factor can be computed using the Compression ratio. Face image compression, representation and recognition has drawn wide attention from researchers in arrears of computer vision, neural network, If a matrix A is the form of A = USVT, where U is a matrix whose columns are the eigenvectors of the AAT matrix. These are termed the left eigen vectors. S is a matrix whose diagonal elements are the singular values of A[5]. This is a diagonal matrix, so its nondiagonal elements are zero by definition [7]. V is a matrix whose columns are the eigenvectors of the ATA matrix. These are termed the right eigenvectors. VT is the transpose of V.

A* = U* S* VT*. This process is termed dimensionality reduction, and A* is referred to as the Rank k Approximation of A or the "Reduced SVD" of A. The top k singular values are selected as a mean for developing the representation of A that is now free from noisy dimensions.

Image compression is one of the applications in Singular value decomposition. Consider some matrix A with rank 1000; that is, the columns of this matrix span a 1000 dimensional space. Encoding this matrix on a computer is going to take quite a lot of memory. We might be interested in approximating this matrix with one of lower rank. An image is a section of random access memory that has been copied to another memory or storage location. The singular value decomposition closely associated to the companion theory of diagonaling a symmetric matrix. If A is a symmetric real n x n matrix there is an orthogonal matrix V and a diagonal D such that

A=VDVT.

Here the columns of V are latent vectors for A and diagonal entries of D are eigen values of A for Singular Value Decomposition begins with m x n real matrix. There are orthogonal matrices U and V and a diagonal matrix S, such that Here U is m x m and V is n x n, so that S is rectangular with the same dimensions as A. The matrix S can be formatted to be non-negative and in order of decreasing order. The columns of U and V are called left and right Singular vectors for A.

Data Base

The name of the image is tulips Size of the image is 1920 rows, 2560 columns and 3 colours

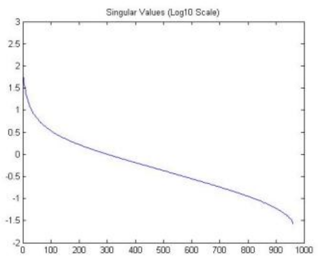
Analysis

The analysis is using MAT LAB soft ware. The image can convert to black and white, and then the image treat as a matrix, where is the pixel intensity at the relevant location.

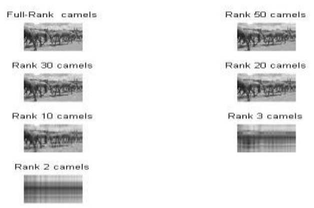
a=imread('camels. jpg');

```
imshow(a)
[m, n, k]=size(a)
camels = rgb2gray(imread('camels. jpg'));
camels = im2double(imresize(camels, 0. 5));
[U, S, V] = svd(camels);
```


```
sigmas = diag(S);
figure; plot(log10(sigmas)); title('Singular Values (Log10 Scale)');
```




```
figure; subplot(4, 2, 1), imshow(camels), title('Full-Rank camels');ranks = [50, 30, 20,
10, 3, 2];
for j = 1:length(ranks)
approx_sigmas = sigmas; approx_sigmas(ranks(j):end) = 0;
ns = length(sigmas);
approx_S = S; approx_S(1:ns, 1:ns) = diag(approx_sigmas);
approx_camels = U * approx_S * V';
subplot(4, 2, j + 1), imshow(approx_camels), title(sprintf('Rank %d camels',
ranks(j)));
end
```



From the above images it shows more singular value doesn't seem to the quality of the image singular value decomposition is compressed a 1920 X 2560 pixel image into a 960 x 960 for U, 960 X 1280 as S and 1280 x 1280 in V. Singular values can be used to highlight which dimensions are affected the most when a vector is multiplied by a matrix. Thus, the decomposition allows us to determine which singular values can be retained, from here the expression "singular value decomposition"

Conclusion.

The above result reveals that singular value decomposition is one of the main techniques in the digital image processing. Two specific areas of image processing are investigated and tested and singular value decomposition is a stable and effective method to split the system into a set of linearly independent components, each of them is carrying their own database to contribute to the system, Thus, both rank of the problem and subspace orientation can be determined. It has the advantage of providing a good compression ratio, and that can be well adapted to the statistical variation of the image. The image is reduce dimensionality using singular value decomposition. From this we can reduce the space in the data base. Future work consists work on 3D images with singular value decomposition technique for image compression and recognition.

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