Dictionary based Filtering

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Outline

INTRODUCTION

- First we take some training images of dimensions M x N and filtered image is obtained by classical convolution. Now we divide this image into patches each of dimensions P x Q where P, Q $<$ M, N and store it in the dictionary.

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- First we take some training images of dimensions M x N and filtered image is obtained by classical convolution. Now we divide this image into patches each of dimensions P x Q where P, Q $<$ M, N and store it in the dictionary.
- In the dictionary the key is noisy part of the image and the value is filtered part of the image. Now test image is taken and divided into patches and corresponding value is obtained by iterating the keys. If key is not found then add this new key - value pair in dictionary database.

DICTIONARY

- Take NxN Training image — MxM patches — Convolution — Dictionary: Key= Noisy part , Value = Filtered part of image — Calculate Avg of the pixel — Efficient Search Algorithm and find nearest possible match — If nearest possible match found then replace original image with nearest possible match or If nearest possible match not found then Add key to Dictionary — Qutput = final filtered Image.

FILTERING

- Low-pass Filter.

FILTERING

Low-pass Filter

- The most basic of filtering operations is called low-pass. A low-pass filter, also called a blurring or smoothing filter, averages out rapid changes in intensity. The simplest low-pass filter just calculates the average of a pixel and all of its eight immediate neighbors. The result replaces the original value of the pixel. The process is repeated for every pixel in the image.

CLASSICAL CONVOLUTION

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- $X[n] * h[n] -> Y[n]$
- Convolution operation is basically used to extract information from images. Convolution is basically linear and shift-invariant operation. The term linear indicates that a pixel is replaced by the linear combination of its neighbours. The term shift invariant indicates that the same operation is performed at every point in image.

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- Convolution is basically a mathematical operation where each value in the output is expressed as the sum of the values in the input multiplied by a set of weighting coefficients. Depending upon the weighting coefficients, convolution operation is used to perform spatial domain low-pass filtering of the image.

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- An image can be either smoothened or sharpened by convolving the image with respect to low-pass and high pass filter respectively. This principle is widely used in the construction of the image pyramid. Convolution has a multitude of the applications including image filtering, image enhancement, image restortion, feature extraction and template matching.

NOISE REDUCTION

- Black-and-White noise is a form of noise sometimes seen on images. It presents itself as sparsely occurring white and black pixels.For reducing either white noise or black noise, but not both, contra-harmonic mean filter can be effective. It is done through low pass filtering.

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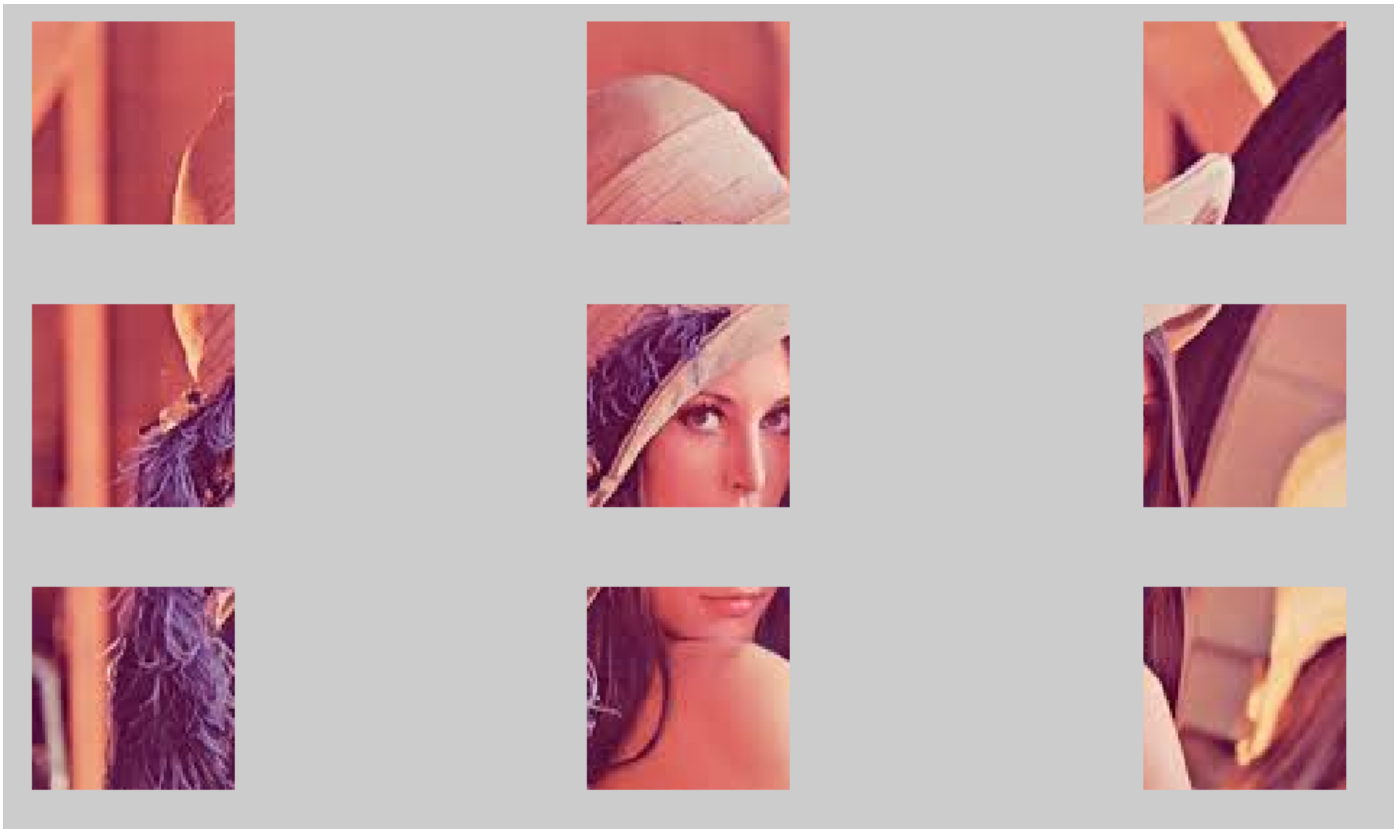
- First-Stage is a Detection the noise then Image In-painting of Noisy Pixels Using Spare and Redundant Representation.

RESULT



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- Thank You