Feature Extraction From Image
(Profile Correlation)

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Contents

Chapter 1

Introduction

1.1 Features in an Image

A feature is a piece of information about the content of an image; typically about whether a certain region of the image has certain properties. Features may be specific structures in the image such as points, edges or objects.

1.2 Features Extraction From Image

Feature extraction is a piece of the dimensionality decrease measure, in which, an underlying arrangement of the raw information is partitioned and diminished to more manageable groups. So when you want to handle it will be simpler. The main attribute of these huge informational sets is that they have an enormous number of variables. These variables require a lot of computing resources to process them. So Feature extraction assists with getting the best component from those large informational collections by select and combine variables into features, thus, effectively reducing the amount of data. These features are easy to process, but still able to describe the actual data set with the accuracy and originality.

1.2 Profile Correlation

Correlation is a statistical measure that indicates the extent to which two or more variables fluctuate together**.** In simple terms, it tells us how much does one variable changes for a slight change in another variable. It may take positive, negative and zero values depending on the direction of the change. A high correlation value between a dependent variable and an independent variable indicates that the independent variable is of very high significance in determining the output. In feature extraction from image we find Profile correlation between two images where one image is a template or subset of other image and the features where the template image matches with the original image we return that features from imag

2

Algorithm

In this section, we give an overview of the Profile Correlation algorithms.

Algorithms 1: Profile Correlation matrix of an image

Input : Read the image (.jpeg)

Output: ProfileCorr Matrix

1. Read the image in the form of M X N X 3 matrix.
2. Create a subset of image whose correlation we need to find with the original image.
3. Create a matrix field with zero whose size is equals to original image.
4. Calculating correlation coefficient of each pixel
5. For each row in original image

   For each column in original image:

   ```
   corr[i, j] = self.correlation(im1[i - d: i + d + 1,j - d: j + d + 1],
   im2[i - d: i + d + 1,j - d: j + d + 1])
   ```
6. Normalize the correlation matrix
7. Return the correlation matrix

3 Documentation of API

3.1 Package organization

Package Name: ProfileCorrelation

Class ProfileCorrelation

Parameters:

Image = It is a 3D matrix having dimension M X N X 3

3.2 Methods:

find_profilecorrelation(im1,im2)

This method returns correlation matrix. We pass two parameters i.e. im1 and im2 where im1 is the original image and im2 is the subset or template of the original image.

Correlation(patch1,patch2)

This method returns correlation coefficient of each pixel and we pass two parameters in the method i.e. patch1 and patch2 where patch1 is the original image and patch2 is the subset of the original image.

normalizeArray(a)

This method returns normalized correlation matrix and we pass one parameter which is correlation matrix.

Chapter 4

Example

4.1 Example 1

```
In [14]: im = io.imread('yashika.jpg', as_gray=True)

         im1 = im[16:263, 4:146]
         sh_row, sh_col = im1.shape
         im2 = im[16:263, 155:155 + sh_col]

         pc = ProfileCorrelation()
         pc_matrix = pc.find_profilecorrelation(im1, im2)
         print(pc_matrix)
```

```
c:\users\lenovo\appdata\local\programs\python\python38\lib\site-packages\skimage\feature\__init__.py:43: skimage_deprecation: F
unction ``register_translation`` is deprecated and will be removed in version 0.19. Use ``skimage.registration.phase_cross_corr
elation`` instead.
  removed_version='0.19')

Saving as: {output_file}
[[ 0.          0.          0.         ...  0.          0.
   0.        ]
 [ 0.          0.5782791   0.30952942 ...  0.32651416  0.
   0.        ]
 [ 0.          0.00156183 -0.42498232 ...  0.58844822  0.
   0.        ]
 ...
 [ 0.          0.49477909  0.82767662 ...  0.55902822  0.
   0.        ]
 [ 0.          0.          0.         ...  0.          0.
   0.        ]
 [ 0.          0.          0.         ...  0.          0.
   0.        ]]
```

InputImage:-

Output:- Correlate Matrix

```
Saving as: {output_file}
[[ 0.          0.          0.         ...  0.          0.
   0.        ]
 [ 0.          0.5782791   0.30952942 ...  0.32651416  0.
   0.        ]
 [ 0.          0.00156183 -0.42498232 ...  0.58844822  0.
   0.        ]
 ...
 [ 0.          0.49477909  0.82767662 ...  0.55902822  0.
   0.        ]
 [ 0.          0.          0.         ...  0.          0.
   0.        ]
 [ 0.          0.          0.         ...  0.          0.
   0.        ]]
```

Chapter 5

Learning Outcome

- Learn about feature extraction from image with the help of profile correlation.

- Learn about how to find a profile correlation between an image and its template

Bibliography

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