Shri Ramdeobaba College of Engineering and Management, Nagpur

Department of Electronics Engineering

Digital Image Processing (ENT 355-3)

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Experiment No: 05

Aim: Write Python program to generate following Distance Transform Matrix for a given image

segment:

i. Euclidean Distance, ii. Manhattan Distance, iii. Chessboard distance

Theory: i. Euclidean Distance

-> A new algorithm for Euclidean distance transform is proposed in this paper. It propagates from the boundary to the inner of object layer by layer, like the inverse propagation of water wave. It can be applied in every dimensional space and has linear time complexity. Euclidean distance transformations of digital images in 2-D and 3-D are conducted in the experiments. Voronoi diagram and Delaunay triangulation can also be produced by this method.

ii. **Manhattan Distance**

->The Manhattan distance between two vectors (city blocks) is equal to the one-norm of the distance between the vectors. The distance function (also called a “metric”) involved is also called the “taxi cab” metric**.**

iii. **Chessboard distance**

-> The chessboard distance metric measures the path between the pixels based on an 8-connected neighborhood. Pixels whose edges or corners touch are 1 unit apart. The quasi-Euclidean metric measures the total Euclidean distance along a set of horizontal, vertical, and diagonal line segments.

Code:

```
import cv2
import numpy as np
import matplotlib.pyplot as plt
from scipy.spatial.distance import cdist
coord_data = [(25.056, -75.7226),
          (25.7411, -79.1197),
          (25.2897, -79.2294),
          (25.6716, -79.3378)]
print('The Euclidean Matrix Transformation is:')
X=cdist(coord_data,coord_data,'euclidean')
print(X)
print('The Manhattan Matrix Transformation is:')
Y = cdist(coord_data, coord_data, 'cityblock')
print(Y)
print('The Chessboard Matrix Transformation is:')
Z = cdist(coord_data, coord_data, 'chebyshev')
print(Z)
```

Output:

```
PS C:\Users\prajw\Downloads\prajwal13\DIP> python -u "c:\Users\prajw\Downloads\prajwal13\DIP\Expe05.py"
The Euclidean Matrix Transformation is:
[[0.         3.46549425 3.51457849 3.66723798]
 [3.46549425 0.         0.46453853 0.22890579]
 [3.51457849 0.46453853 0.         0.39698636]
 [3.66723798 0.22890579 0.39698636 0.        ]]
The Manhattan Matrix Transformation is:
[[0.     4.0822 3.7405 4.2308]
 [4.0822 0.     0.5611 0.2876]
 [3.7405 0.5611 0.     0.4903]
 [4.2308 0.2876 0.4903 0.    ]]
The Chessboard Matrix Transformation is:
[[0.     3.3971 3.5068 3.6152]
 [3.3971 0.     0.4514 0.2181]
 [3.5068 0.4514 0.     0.3819]
 [3.6152 0.2181 0.3819 0.    ]]
PS C:\Users\prajw\Downloads\prajwal13\DIP>
```