

GIS 5103

GIS Programming

Fall 2019
Bradford Johnson

MiniProject 1 (Part B)

Assigned September 12

You will work in a group (assigned by the instructor) to write a python script (`distance.py`) that takes the coordinates of two points and computes the distance between them. Computations should include Euclidean, Manhattan and Minkowski distances. Send your python script and answer to the last question in this handout (one submission per team) to bdjohnson@fsu.edu before our next class meeting.

1 Equations

- Euclidean distance between $(x1, y1)$ and $(x2, y2)$

$$d_{1,2} = [(x1 - x2)^2 + (y1 - y2)^2]^{1/2} \quad (1)$$

- Manhattan distance

$$d_{1,2} = |x1 - x2| + |y1 - y2| \quad (2)$$

- Minkowski distance

$$d_{1,2} = [|x1 - x2|^p + |y1 - y2|^p]^{1/p} \quad (3)$$

2 Program specifications

1. Write the `distance.py` script in a text editor (e.g., Notepad++, BBEdit, etc.) and run it at the command line (i.e., Anaconda Prompt or Terminal).
2. Minkowski distance requires the two points and an additional parameter p .
3. Compute the Euclidean, Manhattan and Minkowski distances between the two points.

4. Round the distances to three decimal places.
5. Return the distances using print statements such as: The Euclidean distance is 45.234.
6. The scipy library also has some distance functions. Run the code below, being sure that the variable names match what you used.
 - Import some distance functions: `from scipy.spatial import distance`
 - Test your euclidean result using: `distance.euclidean([x1,y1], [x2,y2])`
 - Test your Manhattan result using: `distance.cityblock([x1,y1], [x2,y2])`
 - Test your Minkowski result using: `distance.minkowski([x1,y1], [x2,y2], p)`
7. Write a test in python that returns `True` if your result matches scipy's and `False` if it does not.
8. What value of p results in Minkowski distance equaling Euclidean distance? What value of p results in Minkowski distance equaling Manhattan distance? [Note: the answers to these questions do not need to be coded, but they can be tested using your code.]