CS225 Homework 2

Point Cloud Analysis

Deliverables: You will deliver 2 files as follows:

1. The Manager.java file, without modification.
2. Your Cloud.java file, modified to meet the assignment requirements.

Only electronic documents submitted via Canvas are acceptable. Do not submit a hard copy of your assignment. Do not email your assignment to the course instructor or grader. You may submit the deliverables as individual files or provide as a single zipped file, either is acceptable.

Important: Late assignments will not be graded.

Problem Description: A point, P, is a location in a Cartesian coordinate system given by the ordered pair P = (Px, Py). A point cloud, C, is a set of such points, C = {P0, P1, P2, …. PN}. A point cloud shall be designated by an Nx2 array of ordered pairs. For example, Table 1 provides an example of a point cloud, where P[2] is at ( 8.0, 4.0).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| i | Px | Py |  | i | Px | Py |  | i | Px | Py |
| 0 | 5.0 | 1.0 |  | 0 | 5.0 | 0.0 |  | 0 | 1.0 | 1.0 |
| 1 | 3.0 | 3.0 |  | 1 | -5.0 | 0.0 |  | 1 | 1.0 | 1.0 |
| 2 | 8.0 | 4.0 |  | 2 | 4.0 | 0.0 |  |  |  |  |
| 3 | 1.0 | 8.0 |  | 3 | 0.0 | 0.0 |  |  |  |  |
| 4 | 5.0 | 6.0 |  |  |  |  |  |  |  |  |
| Table 1 | | |  | Table 2 | | |  | Table 3 | | |

Software Requirements: (If two or more points meet any criteria, choose the lowest index.)

R1. The software shall correctly identify the indices of the two points having the minimum distance between them.

R2. The software shall correctly identify the indices of the two points having the maximum distance between them.

R3. The software shall correctly calculate the center of mass of the point cloud, (Cx, Cy).

R4. The software shall correctly identify the index of the point closet to the center of mass.

Test Cases: Test cases are given in the table below for requirements R1 through R4.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test**  **Cases** | **Input Parameters** | **Expected Output** | | | | **Actual Output** | | | |
| **R1** | **R2** | **R3** | **R4** | **R1** | **R2** | **R3** | **R4** |
| 1 | Table 1 | 0, 1 | 0, 3 | (4.4, 4.6) | 1 |  |  |  |  |
| 2 | Table 2 | 0, 2 | 0, 1 | (1.0, 0.0) | 3 |  |  |  |  |
| 3 | Table 3 | 0, 1 | 0, 1 | (1.0, 1.0) | 0 |  |  |  |  |

Note: For this assignment, the test cases have been provided to you and are built into the software (Manager.java class). In future assignments you will be required to create your own requirements and test cases.

Instructions: In addition to these instructions you have been provided with two Java files: Manager.java and Cloud.java. Modify the methods in the Cloud.java file to complete the assignment.

Rubric: Per that grading rubric below.

|  |  |  |
| --- | --- | --- |
| **Deliverable** | **Points** | **Awarded** |
| Code format, style, | 10 |  |
| Code compilation | 5 |  |
| Correct code outputs using console input | 10 |  |
| Correct Test Case Results (5 pts per test case) | 10 |  |
| Totals | 35 |  |