Vidyam Classes
Excellence in No Time

Drone Delivery System Optimization Using Closest Pair of Points Algorithm

The objective of this coding assignment is to develop a program that optimizes a drone delivery system by finding the closest pair of delivery points using the Closest Pair of Points algorithm. You will implement both brute-force and divide-and-conquer approaches to solve the problem and apply it to a simulated drone delivery system. The drone will visit every delivery point, and you will compare the time taken and distance traveled by both algorithms.

Tasks to Perform:

Implementing the Brute-Force Approach:

- *Write a function to generate a list of random delivery points (1000) (x, y coordinates) in a 2D plane.*
- *Implement the brute-force algorithm to find the closest pair of points.*
- *Use this to simulate the drone's path visiting every point and calculate the total distance traveled.*
- *Test the brute-force implementation with various sizes of input data and measure its performance.*

Implementing the Divide-and-Conquer Approach:

- *Implement the divide-and-conquer algorithm to find the closest pair of points.*

- *Use this to simulate the drone's path visiting every point and calculate the total distance traveled.*
- *Test the divide-and-conquer implementation with various sizes of input data and measure its performance.*

Simulating the Drone Delivery System:

- *Write a function to simulate a drone delivery system where the drone visits every delivery point in the order determined by the closest pair of points algorithm.*
- *Visualize the delivery points and the optimized path taken by the drone.*

Evaluating the System:

- *Evaluate the efficiency of the drone delivery system in terms of total travel distance and time.*
- *Compare the performance of the brute-force and divide-and-conquer approaches in the context of the delivery system.*

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Brute Force:
Total Distance: 102689.45175278849
Time Taken: 0.0010008811950683594

Closest Pair:
Total Distance: 0.2502838030389597
Time Taken: 0.0019996166229248047
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Also test you code on these 500 points,

[(79, 10), (79, 26), (96, 51), (64, 53), (70, 28), (44, 8), (79, 87), (35, 98), (62, 64), (61, 61), (89, 40), (90, 44), (81, 72), (22, 69), (54, 65), (24, 16), (25, 78), (6, 42), (89, 53), (52, 44), (100, 80), (99, 31), (49, 97), (91, 76), (11, 26), (35, 86), (85, 73), (43, 98), (9, 19), (8, 98), (72, 25), (55, 84), (57, 21), (41, 43), (72, 55), (88, 2), (35, 15), (24, 60), (40, 33), (33, 59), (14, 44), (69, 18), (18, 2), (92, 17), (13, 83), (12, 37), (23, 90), (22, 69), (0, 13), (65, 55), (77, 5), (62, 4), (6, 75), (83, 21), (26, 11), (8, 45), (71, 71), (12, 28), (16, 92), (41, 73), (3, 61), (80, 47), (36, 92), (69, 16), (16, 74), (20, 16), (96, 96), (100, 65), (96, 61), (61, 56), (38, 91), (35, 56), (71, 91), (41, 84), (70, 21), (5, 28), (40, 91), (20, 60), (34, 99), (7, 16), (95, 4), (55, 11), (74, 53), (18, 88), (15, 12), (21, 39), (82, 44), (25, 25), (95, 35), (43, 84), (81, 14), (78, 35), (32, 47), (52, 10), (6, 57), (77, 39), (18, 32), (45, 60), (86, 41), (52, 93), (16, 36), (14, 49), (36, 29), (70, 64), (73, 80), (85, 66), (7, 1), (44, 37), (2, 61), (29, 78), (91, 88), (56, 87), (70, 33), (13, 63), (16, 80), (92, 31), (79, 88), (28, 43), (81, 19), (56, 47), (13, 67), (6, 88), (39, 98), (7, 22), (58, 22), (95, 85), (70, 18), (57, 43), (10, 40), (0, 33), (59, 59), (74, 91), (88, 66), (17, 40), (6, 30), (72, 9), (7, 51), (100, 62), (40, 39), (91, 91), (93, 15), (71, 98), (12, 33), (26, 4), (23, 58), (25, 65), (74, 8), (27, 73), (90, 68), (4, 98), (45, 82), (35, 17), (1, 44), (87, 24), (99, 10), (19, 60), (74, 1), (93, 64), (1, 0), (80, 85), (99, 68), (64, 70), (27, 43), (14, 53), (59, 39), (84, 59), (82, 8), (40, 42), (48, 34), (36, 71), (52, 62), (53, 80), (76, 50), (71, 17), (93, 56), (21, 49), (57, 96), (40, 53), (88, 2), (66, 61), (37, 87), (39, 56), (17, 6), (46, 72), (23, 88), (36, 18), (16, 96), (96, 5), (45, 36), (37, 63), (37, 6), (65, 72), (10, 80), (39, 35), (83, 33), (91, 35), (55, 77), (93, 80), (46, 97), (11, 42), (0,

99), (14, 15), (20, 24), (48, 43), (71, 88), (77, 96), (47, 67), (71, 95), (74, 99), (72, 11), (37, 49), (51, 94), (97, 26), (86, 97), (10, 41), (89, 91), (77, 64), (72, 0), (20, 35), (81, 100), (25, 52), (47, 49), (26, 34), (4, 14), (39, 68), (15, 35), (24, 51), (14, 99), (26, 1), (99, 0), (47, 50), (89, 61), (38, 72), (21, 80), (73, 8), (26, 42), (76, 17), (8, 44), (31, 33), (55, 92), (41, 79), (23, 56), (49, 31), (64, 60), (10, 18), (22, 84), (69, 32), (42, 24), (73, 3), (40, 18), (26, 5), (93, 44), (44, 68), (66, 33), (47, 47), (49, 78), (54, 49), (67, 45), (77, 36), (26, 79), (28, 8), (94, 71), (53, 85), (12, 44), (13, 3), (52, 61), (25, 20), (42, 7), (60, 43), (82, 26), (27, 73), (5, 88), (25, 67), (47, 32), (46, 18), (45, 9), (34, 63), (31, 68), (80, 69), (27, 22), (11, 33), (63, 20), (63, 32), (75, 98), (78, 32), (37, 78), (70, 6), (58, 38), (64, 93), (34, 58), (24, 94), (39, 99), (1, 96), (6, 45), (45, 0), (69, 48), (79, 92), (54, 77), (50, 98), (62, 37), (56, 74), (28, 54), (76, 15), (10, 93), (63, 79), (51, 70), (71, 7), (10, 59), (6, 46), (12, 39), (85, 29), (93, 0), (15, 7), (32, 37), (100, 100), (60, 91), (42, 27), (73, 18), (80, 94), (83, 78), (73, 11), (13, 51), (28, 9), (77, 54), (58, 33), (68, 97), (55, 76), (69, 93), (3, 87), (58, 8), (43, 31), (17, 16), (44, 62), (51, 80), (79, 30), (45, 45), (86, 61), (3, 97), (4, 62), (92, 7), (0, 11), (4, 26), (79, 32), (39, 58), (18, 66), (63, 91), (59, 4), (36, 21), (53, 14), (54, 12), (83, 65), (9, 25), (64, 55), (79, 53), (6, 26), (83, 56), (14, 33), (65, 19), (100, 56), (23, 42), (51, 51), (73, 76), (40, 9), (99, 14), (77, 78), (70, 5), (13, 85), (34, 86), (65, 4), (61, 60), (15, 35), (60, 50), (76, 15), (79, 41), (5, 53), (16, 99), (96, 40), (79, 77), (97, 42), (39, 76), (91, 78), (96, 80), (44, 43), (1, 40), (42, 46), (21, 99), (53, 88), (90, 31), (32, 19), (50, 37), (83, 55), (98, 100), (49, 8), (47, 39), (60, 67), (87, 11), (59, 40), (72, 88), (27, 54), (99, 15), (48, 18), (72, 26), (94, 5), (13, 48), (53, 38), (40, 39), (47, 44), (30, 59), (86, 63), (23, 41), (25, 19), (54, 46), (54, 39), (40, 34), (58, 58), (97, 42), (97, 34), (0, 39), (35, 26), (44, 14), (51, 15), (55, 64), (34, 55), (82, 13), (18, 6), (4, 17), (2, 19), (11, 48), (65, 4), (11, 92), (36, 32), (20, 45), (17, 67), (63, 1), (73, 2), (98, 10), (50, 33), (23, 79), (69, 20), (55, 56), (30, 36), (13, 12), (80, 27), (12, 90), (61, 11), (44, 46), (82, 27), (17, 30), (73, 81), (74, 76), (93, 13), (16, 56), (54, 97), (49, 86), (96, 51), (16, 77), (23, 31), (1, 14), (20, 95), (53, 8), (26, 23), (3, 12), (61, 16), (87, 85), (65, 5), (36, 54), (99, 81), (72, 53), (53, 54), (58, 8), (82, 50), (100, 84), (7, 90), (80, 80), (21, 85), (51, 75), (71, 23), (20, 85), (94, 40), (87, 55), (85, 49), (100, 10), (74, 56), (9, 68), (20, 39), (16, 97), (26, 39), (45, 42), (33, 17), (50, 63), (1, 34), (15, 11), (56, 16), (84, 26), (100, 75), (99, 81), (18, 40), (39, 31), (89, 14), (4, 24)]