

Introduction to mobile robotics

Practical exercise on clustering

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Statement

We collect some data with a laser scanner at time t . Data is provided in meters in the cartesian framework of the laser: $P_0^t(0.2, -0.2)$; $P_1^t(0.3, -0.2)$; $P_2^t(0.4, -0.2)$; $P_3^t(0.5, -0.2)$; $P_4^t(0.7, -0.1)$; $P_5^t(0.7, 0)$; $P_6^t(0.7, 0.1)$; $P_7^t(0.6, 0.3)$; $P_8^t(0.5, 0.3)$; $P_9^t(0.4, 0.3)$;

Questions

- 1) Draw this data;
- 2) We define that two consecutive points belongs to the same cluster if they are located at less than 0.2meters one from the other. How many clusters do we have? We define a data structure C_i^t that stores for each point the cluster it belongs. Give the value of C_i^t for $0 \leq i \leq 9$;
- 3) We define a data structure S_j^t that stores the size of each cluster it belongs. Give the value of S_j^t for each cluster;
- 4) We define a data structure M_j^t that stores the middle point of each cluster it belongs. Give the value of M_j^t for each cluster;
- 5) We suppose that we have a data structure D_i^t that tells us if a point is dynamic or static: $D_0^t = \text{True}$; $D_1^t = \text{True}$; $D_2^t = \text{True}$; $D_3^t = \text{False}$; $D_4^t = \text{True}$; $D_5^t = \text{True}$; $D_6^t = \text{False}$; $D_7^t = \text{False}$; $D_8^t = \text{False}$; $D_9^t = \text{False}$; We define a data structure CD_j^t that stores the percentage of points of a given cluster that are dynamic. Give the value of CD_j^t for each cluster. This value is an integer;
- 6) When we end a cluster, give the formula to compute S_j^t , M_j^t , CD_j^t . We suppose that we have the variables start and end that give us the index of the point that starts and ends the current cluster. For instance, for the first cluster, we have start = 0 and end = 3. We suppose that we have a variable nb_dynamic that give us the number of points of the current cluster that are dynamic.