Connect the Points

Problem author and developer: Dmitry Yakutov

There are a lot of ways to solve the problem.

1. **Brute Force.** Take all X- and Y-coordinates of given points and build a "grid" of nine points. Take all 18 segments between them and iterate over all subsets of these segments. Choose the best one.

2. **Deal with "cases".** Mark three points with label sorted by X-coordinate. Then order points by Y-coordinate and watch the labels. There are six different orderings. It is possible to build the optimal set of segments for each ordering.

3. **Median point.** Let x_m be median X-coordinate among all the points and y_m be median Y-coordinate. $M = (x_m; y_m)$ is the median point. Note that M can either be in the input set or not. It is provable that you can connect all three points with M in the shortest way and output the resulting set of segments.

4. **Median segment.** Let x_m be median X-coordinate as before and y_{min} and y_{max} be minimum and maximum Y-coordinates. Take the segment from $(x_m; y_{min})$ to $(x_m; y_{max})$ and connect all three points with this segment by horizontal segments. It is also provable that such a set of segments is correct.