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An application of Hall's theorem to linear embeddings of graphs

Given a graph of order n , and any set of n locations on the real line, what is the best embedding of the vertices of G into these locations, so that the sum of squares of the distances of adjacent vertices is minimized? If the graph in question has a clear linear structure, i.e. is a proper interval graph, does the optimal embedding follows the natural ordering of the vertices? We give an affirmative answer for a special class of interval graphs, where the proof involves an application of Hall's theorem. Joint work with Nauzer Kalyaniwalla and Islay Wright.