

Extending Partial Geometric Representations of Graphs

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Geometric representations of graphs are popular and well studied for their practical motivation and interesting structural and algorithmic properties. Many of intersection defined classes of graphs, such as interval graphs, circle graphs, permutation graphs, and others, can be recognized in polynomial time, desired representations can be constructed efficiently, and many optimization problems NP-hard in general can be solved in polynomial time on these graph classes.

Only recently a natural question of extending partial representations has been considered. This question falls into the paradigm of completing a partial solution, whose instances are often provably more difficult than constructing a solution without being given initial constraints. Such examples are well known for instance in the area of graph coloring problems. Architects describe this phenomenon by saying that "Building from scratch is easier and cheaper than reconstructing an old house".

In the talk we will survey existing complexity results about extending partial representations of interval, proper interval, unit interval, circle, permutation, and function graphs. To our surprise in all of these cases the partial representation extension problem remains polynomially solvable. On the contrary, extending partial contact representations of planar graphs becomes NP-complete.