The Complexity of Distance-r Dominating Set Reconfiguration

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Model: Graph Reconfiguration

In a *reconfiguration variant* of a computational problem, two *feasible solutions* S and T are given along with a *reconfiguration rule* that describes how to slightly modify one feasible solution to obtain a new one.

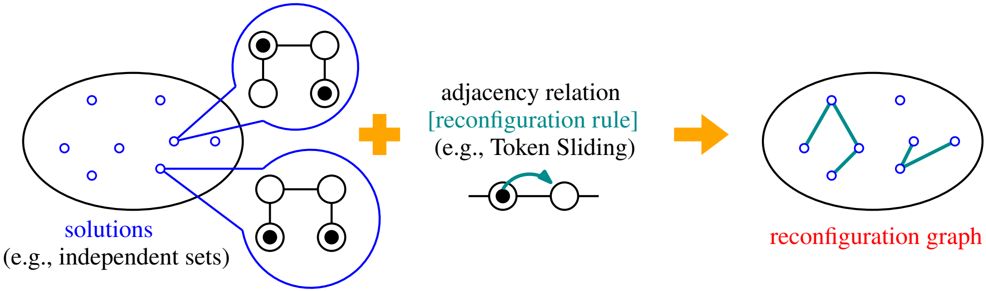

Figure: Reconfiguration

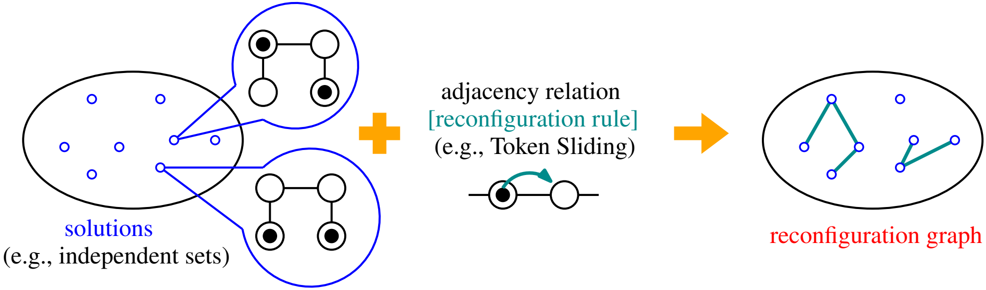

Figure: Reconfiguration

Main questions:

- Reachability: Is there a path between two given solutions? Can we transform S into T via a sequence of feasible solutions.

  Such a sequence, if exists, is called a *reconfiguration sequence*.

- Shortest Path: If Reachability is yes, can we find a shortest path between S and T?

Computation problem we consider: Distance-r Dominating Set

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Definition:

Distance-r dominating set (DrDS) of G is a vertex subset D where each vertex of G is within distance r from some member of D.

Distance-r Dominating Set Reconfiguration DrDSR

DrDSR: We solve Reachability of DrDS in the reconfiguration graph.

DrDSR

We prove hardness results of DrDSR in different graph classes for $r \geq 2$ under reconfiguration rule of Token Sliding (TS) and Token Jumping (TJ).

DrDSR

We prove hardness results of DrDSR, $r \geq 2$ in different graph classes.

For example, DrDSR is PSPACE-Complete in Bipartite Graphs, Planar graphs and Chordal Graphs under TS and TJ.

DrDSR

There are other graph classes where DrDSR, $r \geq 2$ is solvable in polynomial time.

DrDSR can be solved in polynomial time on split graphs under both TS and TJ.

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DrDSR can be solved in polynomial time on split graphs under both TS and TJ.

DrDSR can be solved in polynomial time on trees under TJ.

DrDSR can be solved in polynomial time on interval graphs under TJ and co-graphs under both TS and TJ.

DrDSR

Open Questions:

- What is the complexity of DrDSR, $r \geq 2$ under TS on trees?
- What is the complexity of DrDSR, $r \geq 2$ under TS on interval graphs?

Thank You!