PARIS: Planning Algorithms for Reconfiguring Independent Sets


Combinatorial Reconfiguration (CoRe)
- **Problem**: Transforming one solution into another with small changes
- **Changes**: Transformations preserve the solution space
- **Example**: Reconfiguring a network while maintaining household connections

Independent Set Reconfiguration (ISR)
- **ISR Problem**: A prominent representative of combinatorial reconfiguration
- **Independent Set**: A set with non-adjacent vertices
- **Objective**: Transforming an initial to a goal independent set
- **Permitted Changes**: Token Jumps – Maintaining independent set status

ISR as Classical Planning
- **Contribution**: Formulating the ISR problem as a classical planning problem
  - **State variables**: Describe world states
    - Used to represent the graph and token positions
  - **Discrete actions**: Specify world dynamics
    - Used for pick-up and place actions (IS condition encoded as precondition)
  - **Objective**: Find a sequence of actions (plan) from initial state to goal
    - Corresponds to a reconfiguration sequence to solve the given problem

Empirical Results
- **PARIS Solver**: Multiple planning techniques
  - E.g. heuristic and symbolic search
- **1st CoRe Challenge**: PARIS won several tracks

![Graph showing reconfiguration sequence](image)

Full paper.