Infeasible Search in Oversubscribed Scheduling

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Infeasible Search

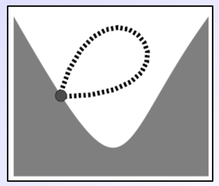
Including infeasible solutions in a search can be an efficient way to search for optima. Researchers have posited two reasons for this efficiency:

- The best solutions may be nearly infeasible and occur along a feasible/infeasible *boundary*.
- Infeasible paths find *short-cuts* through the space.

Boundary-region efficiency has been documented, but until now, short-cuts have not. We provide the first evidence that short-cuts occur.

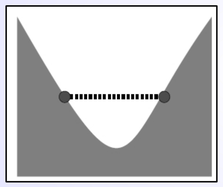
How do we exploit this?

Infeasible Path Types



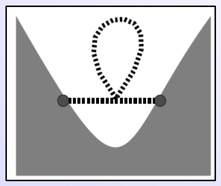
Cycle

A path that does not alter a schedule.



Short-cut

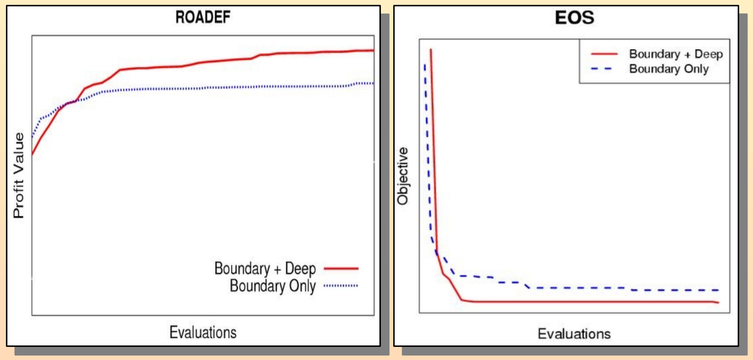
A path that takes fewer steps than any feasible path between two states



Detour

A path that includes a cycle but alters a schedule. May also be a short-cut.

Results



- Short-cuts confirmed, yield efficiency
- Offset by cycles and detours

Problem Domains

Oversubscribed Scheduling: more tasks than resources can accommodate.

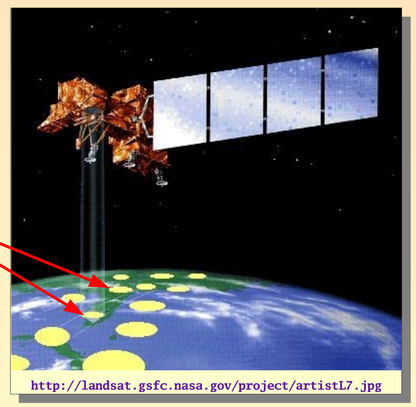
ROADEF

- Single Satellite
- Single Orbit
- 200-500 Requests
- *Maximize* profit

EOS

- Single Satellite
- Multiple Orbit
- 200-2100 Requests
- *Minimize* image degradation

- Schedule maximizes # images taken, minimizes camera rotations
- Satellite camera captures images of ground targets

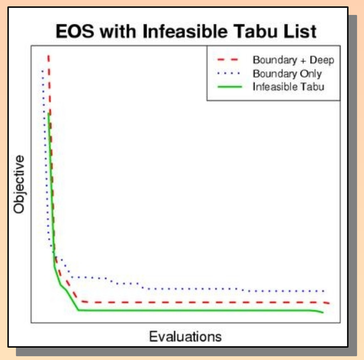


http://landsat.gsfc.nasa.gov/project/artistL7.jpg

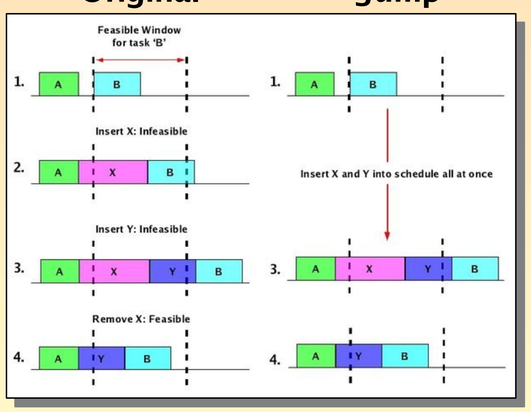
Ongoing Work: Improving Efficiency

Tabu list

- Eliminates cycles
- EOS search improved
- ROADEF search degraded



Original **"Jump"**



Jump Search

- Multiple insertions at once
- Reduces evaluations
- Problem-specific jump size