



Infeasible Search in Oversubscribed Scheduling

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Infeasible Search

Including infeasible solutions in a search can be an efficient way to find 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 new evidence that short-cuts occur.

How can we exploit this?

Problem Domains

Oversubscribed Scheduling: more tasks than resources can accommodate.

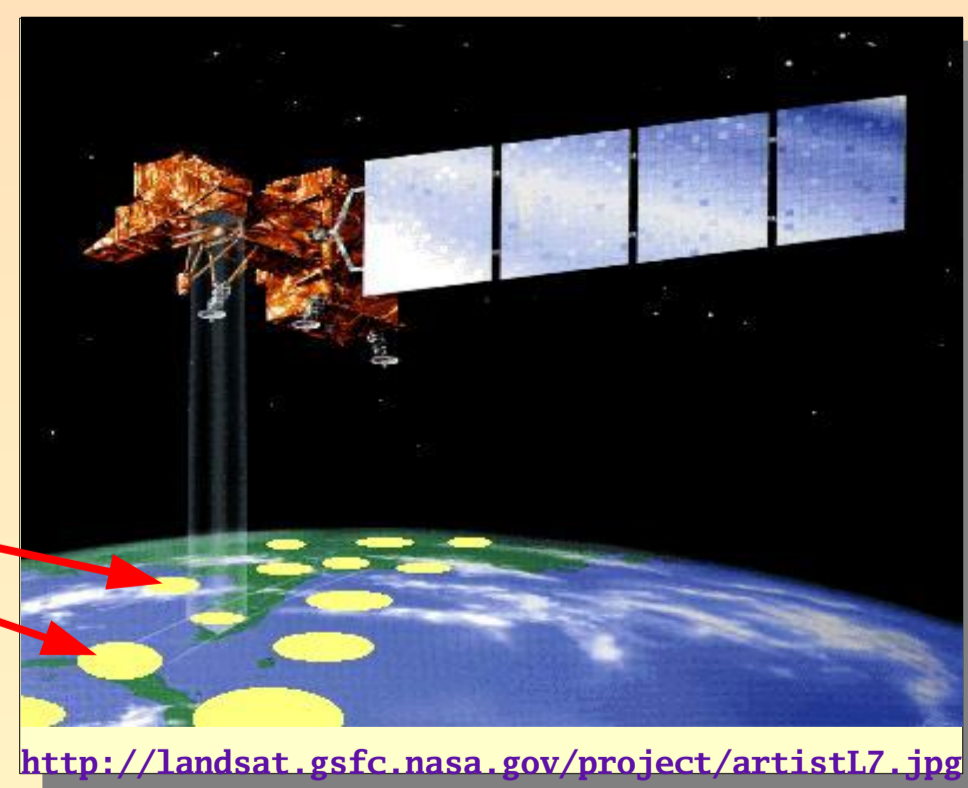
ROADEF

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

EOS

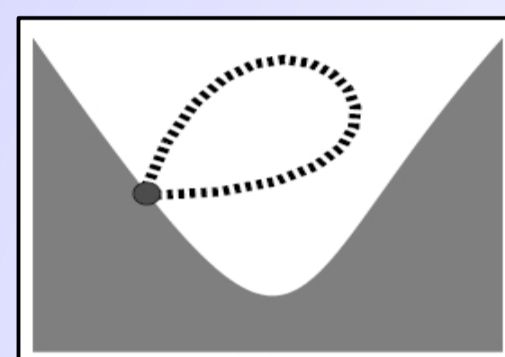
- Single Satellite
- Multiple Orbit
- 200-2100 Requests
- Minimize image degradation

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



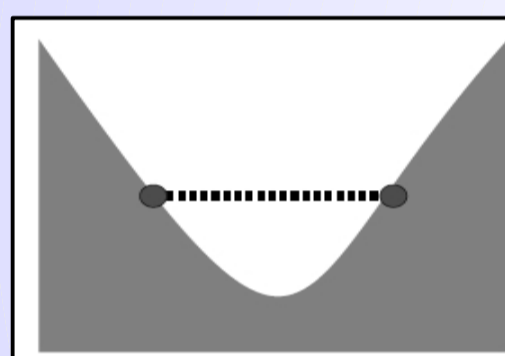
<http://landsat.gsfc.nasa.gov/project/artist17.jpg>

Infeasible Path Types



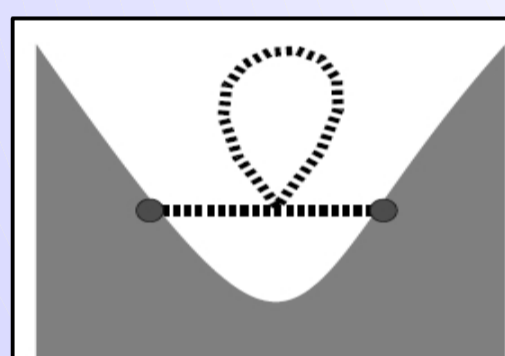
Cycle

A path that leaves a state unchanged



Short-cut

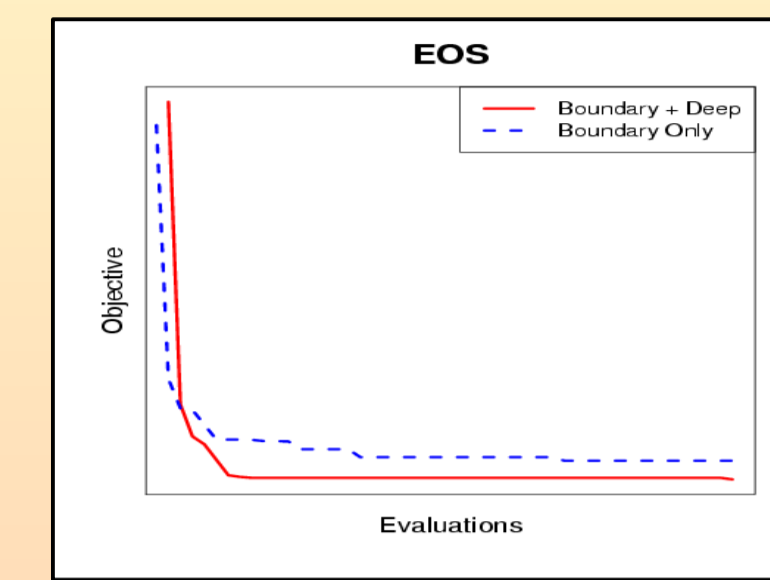
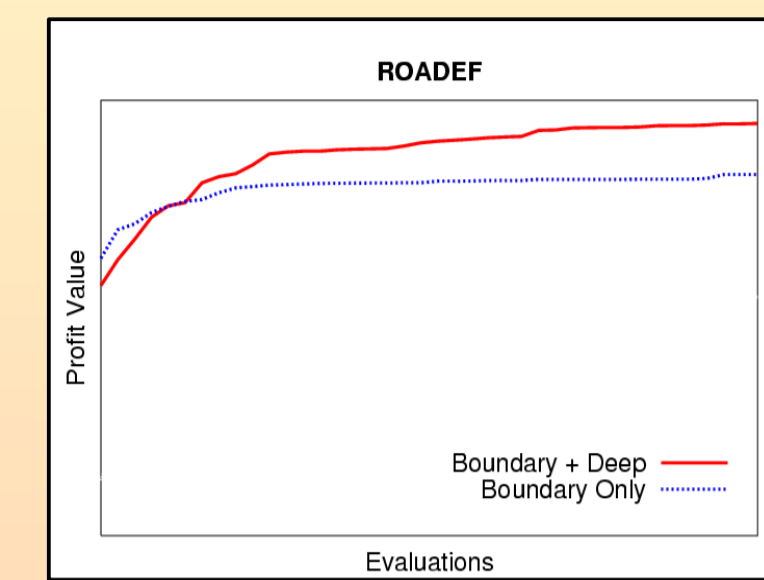
A path that takes fewer steps than any feasible path between two states



Detour

A path that includes a cycle but alters a state (may also be a short-cut)

Results

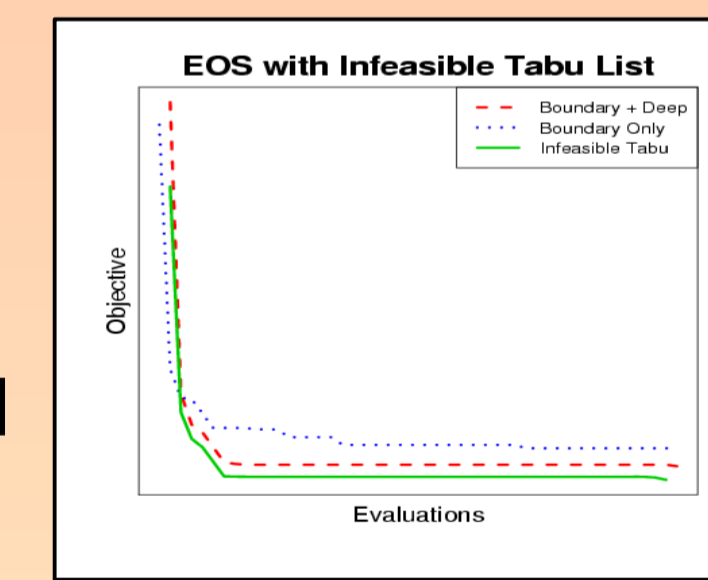


- Short-cuts confirmed, yield efficiency
- Offset by cycles and detours

Improving Efficiency

Infeasible Tabu List

- Eliminates cycles
- EOS search improved
- ROADEF search degraded



Embedded Classifier

- Predicts productive/unproductive forays
- Reduces wasted moves

“Jump” Search

- Executes multiple moves at once
- Reduces evaluations