

Deadline-Aware Search Using On-line Measures of Behavior

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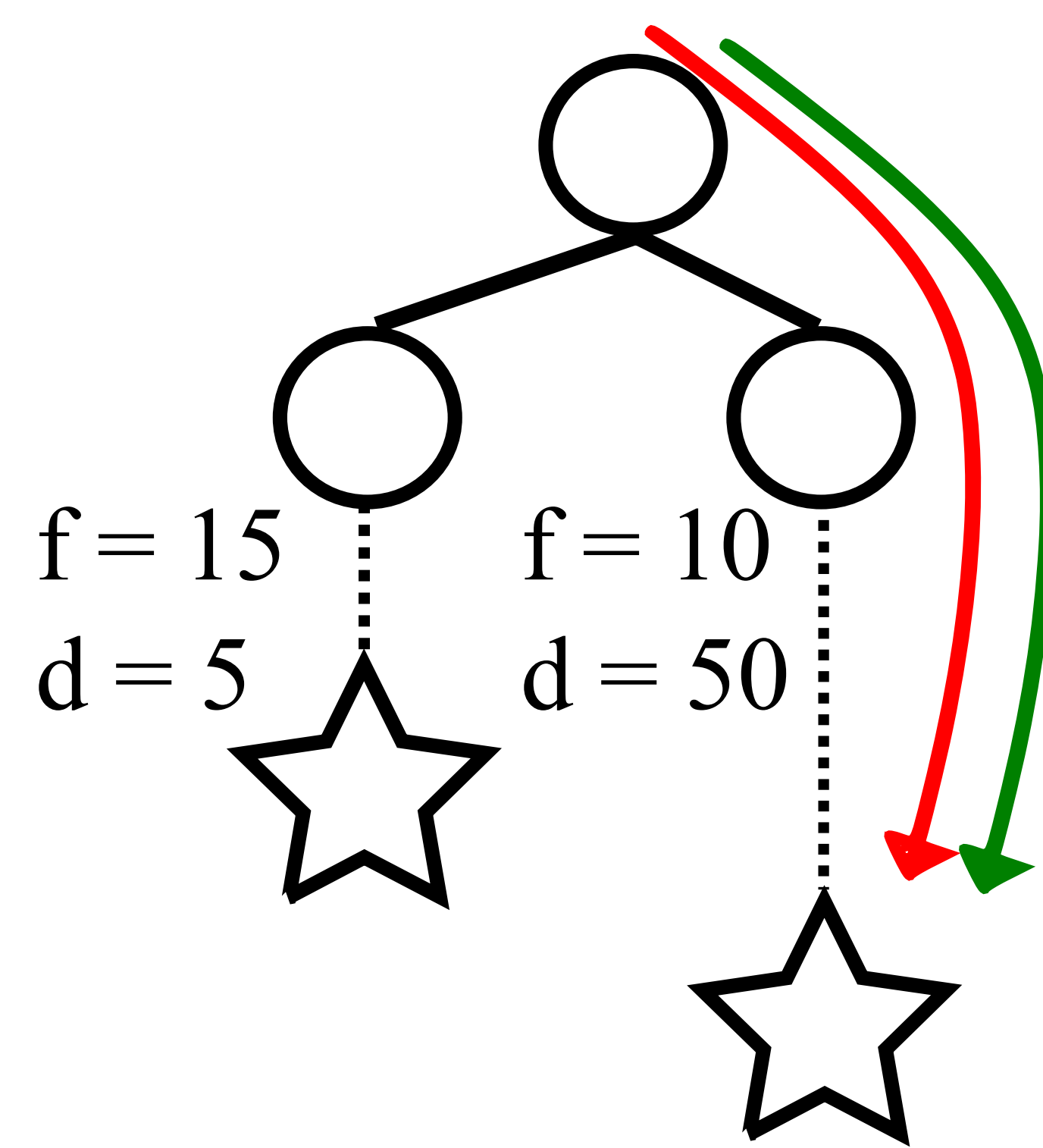
Goal:

Given a user-specified time deadline, find the best solution to the problem within the deadline.

Problem:

The current approach, anytime search, essentially ignores information provided by the deadline.

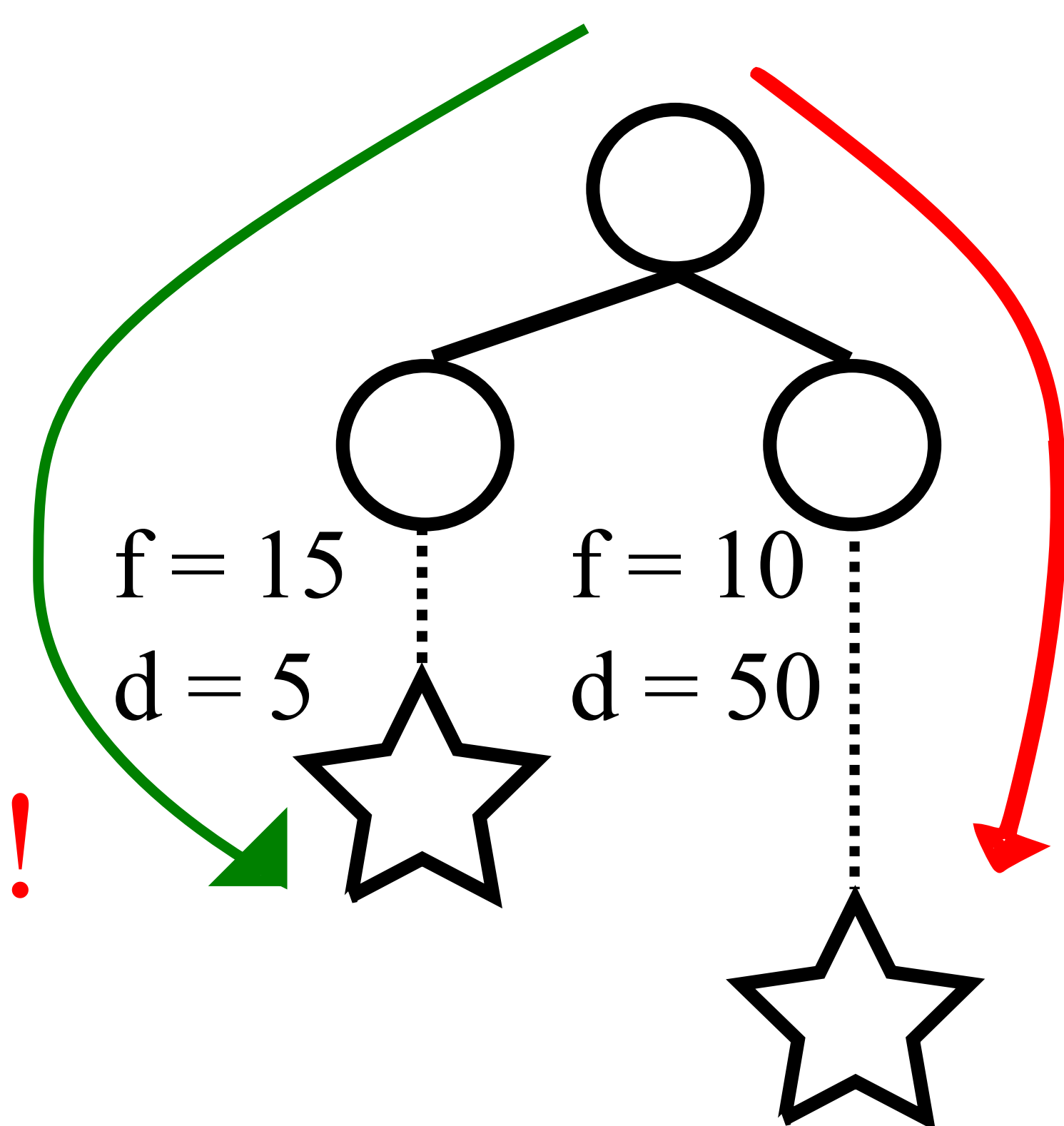
Anytime Algorithms



70 Expansions Remaining
7 Expansions Remaining

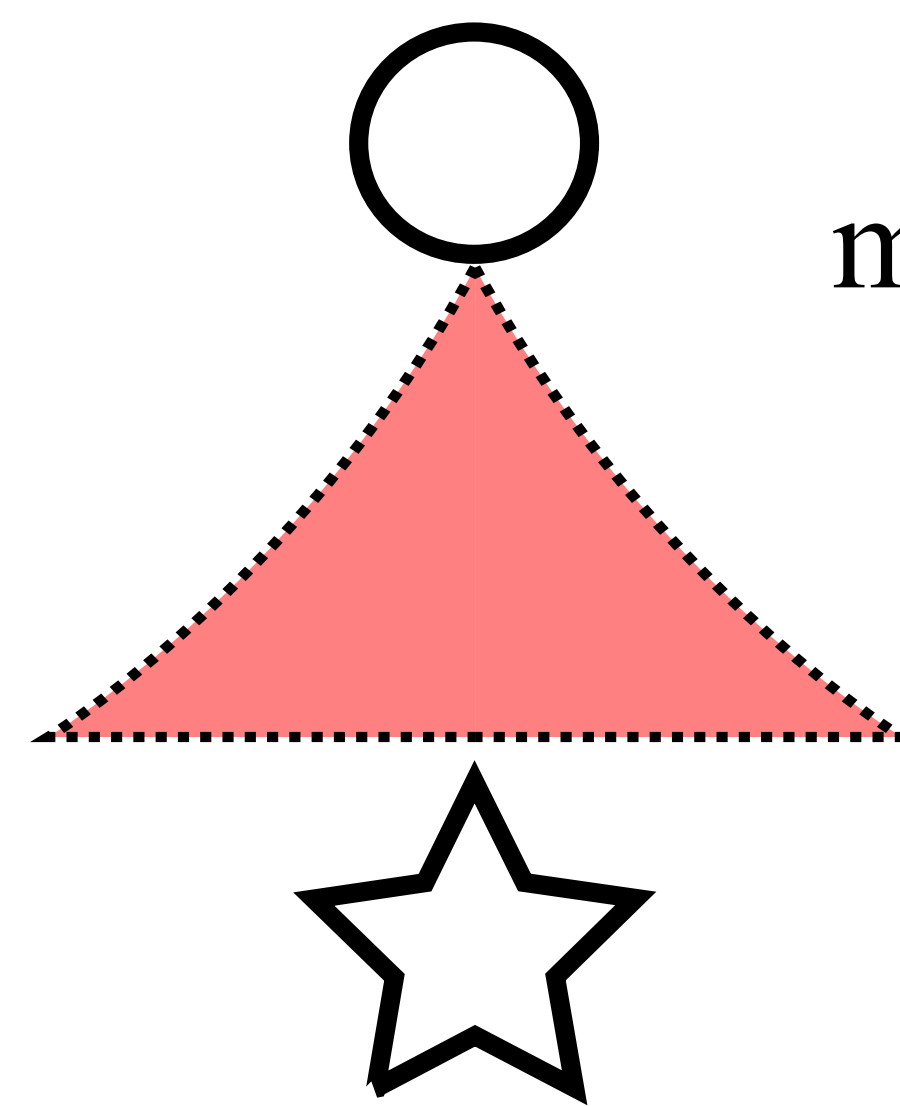
Current effective methods do not change behaviour based on the deadline.

Deadline Aware Search



The deadline should inform search decisions!

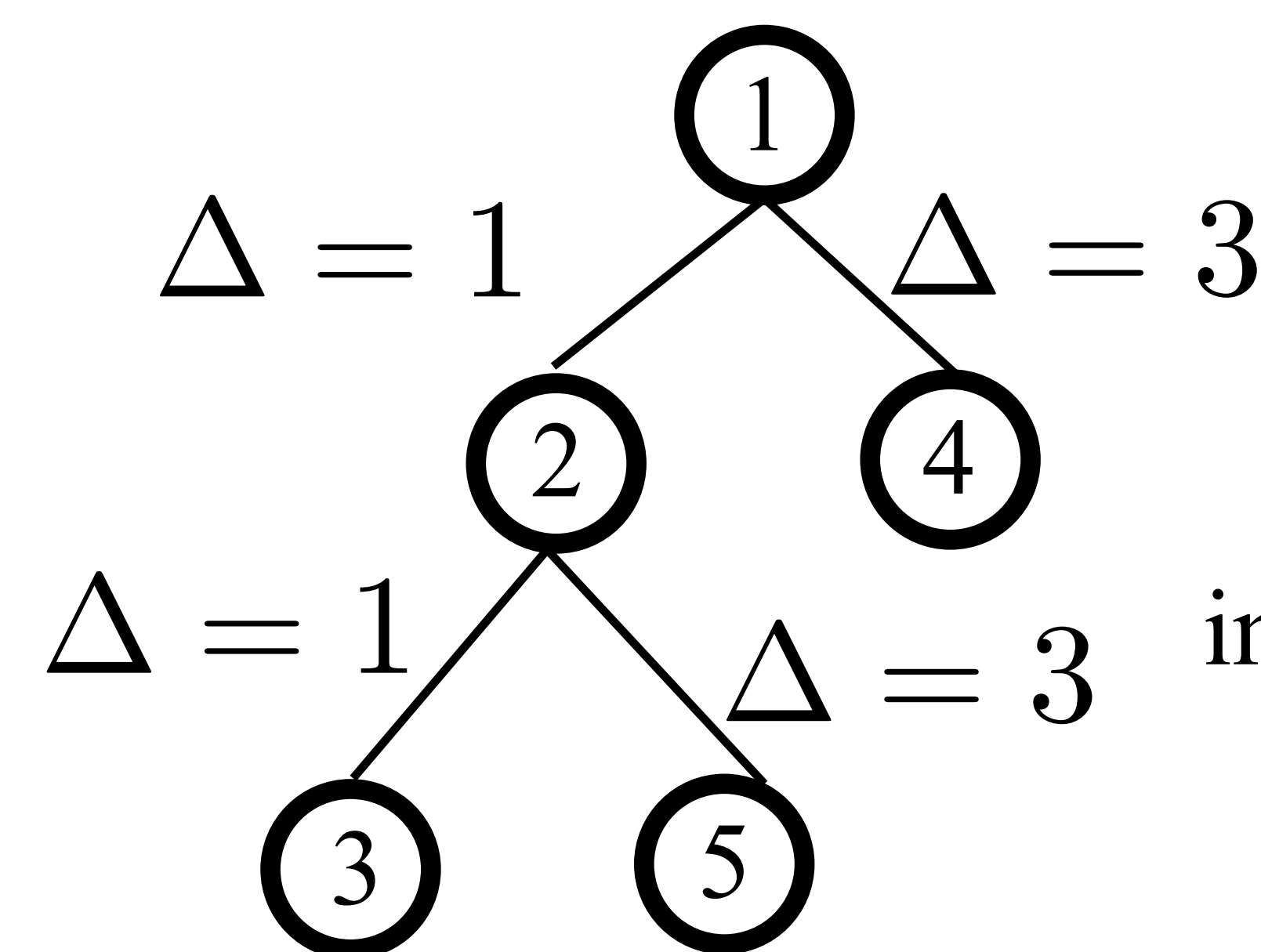
Estimating Remaining Effort



search tends to explore many paths simultaneously because heuristics are imperfect

distance alone is insufficient

time between expansion of parent and child estimates indecision, or *vacillation* in search



vacillation changes during search and in response to pruning!

$$\bar{\Delta} \cdot d(n) = \text{approximate effort to goal}$$

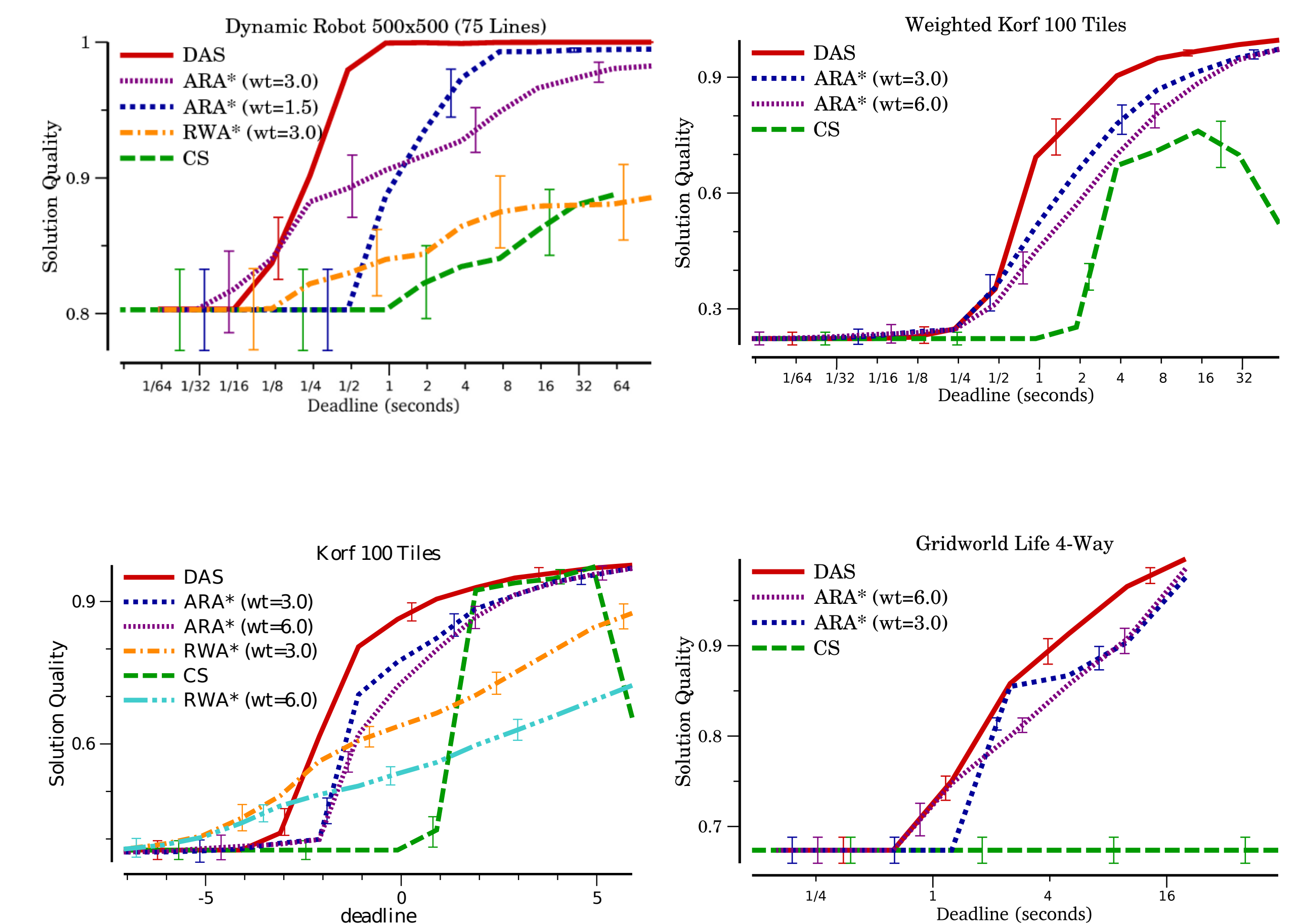
This allows us to prune paths to goals we likely can not reach.

Deadline Aware Search

select node with minimum $f(n)$

if you can reach it, expand it otherwise, discard it.

if you run out of nodes before time refill open from discarded nodes



Conclusions

- no training
- no parameter tuning
- on-line estimation of required effort
- improved performance under known deadline