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

distance alone is insufficient

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

\[ \Delta = 1 \quad \Delta = 3 \]

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

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

Estimating Remaining Effort

search tends to explore many paths simultaneously because heuristics are imperfect

Conclusions

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