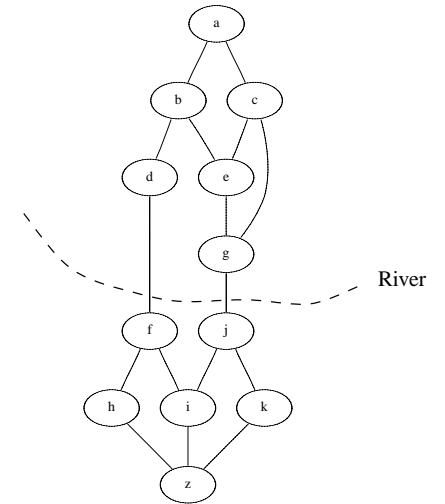


Artificial Intelligence

Advanced Search

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Decomposable problem:



And/Or Graphs

Idea: any solution has to use a bridge

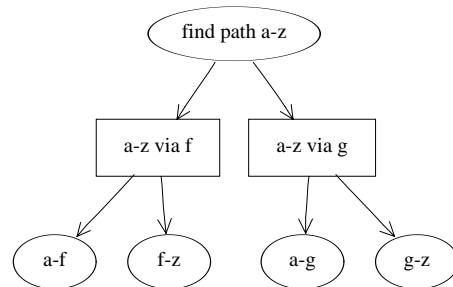
I.e.: for path a-z find
 path a-z via f
 or path a-z via g

Decomposition:

for path a-z via f find
 path a-f
 and path f-z

analogously for g

And/Or Graph: *or*-nodes as ellipses,
and-nodes as boxes



And/Or Graphs (contd.)

Note: goal “nodes” are subproblems that are trivial or atomic, e.g. direct route from a-c

Solution Tree:

- the problem is the root node of the solution tree
- if P is an *or* node, exactly one successor (with its solution tree) is in T
- if P is an *and* node, all of its successors (with their solution trees) are in T

Endgame Algorithm: for a

1. consider final (0-step) winning positions for a
2. compute 1-step losing positions for b, i.e. all positions for b from which *all* immediate successors lead to a 0-step winning position for a
3. compute 2-step winning positions for a, i.e. all positions where a can choose *one* immediate successor to lead to a 1-step losing position for b
4. compute 3-step losing positions for b, i.e. all positions for b where *all* successors lead to a less-than-3 (i.e. 2- or 0-) winning position for a.
5. and so on, until no more new positions are collected or maximum depth are exhausted

Result: if no maximum depth limit, the final outcome is a list of winning positions for a (with maximum depths), a list of losing positions for b (with maximum depths) and a list of tied positions

More Precisely:

- two-person (not multi-person; no gang-ups)
- perfect information (no card games)
- deterministic (no backgammon)
- alternating moves (no rock/scissors/paper)
- zero-sum (no prisoner's dilemma)

games

Game Structure

Conditions: game is over when *terminal* position reached where game ends (no successor moves).

Possible Outcomes: consider *win/loss/draw*. Other, intermediate outcomes also possible.