

Chunking with Confidence

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June 17, 2005

25th Soar Workshop

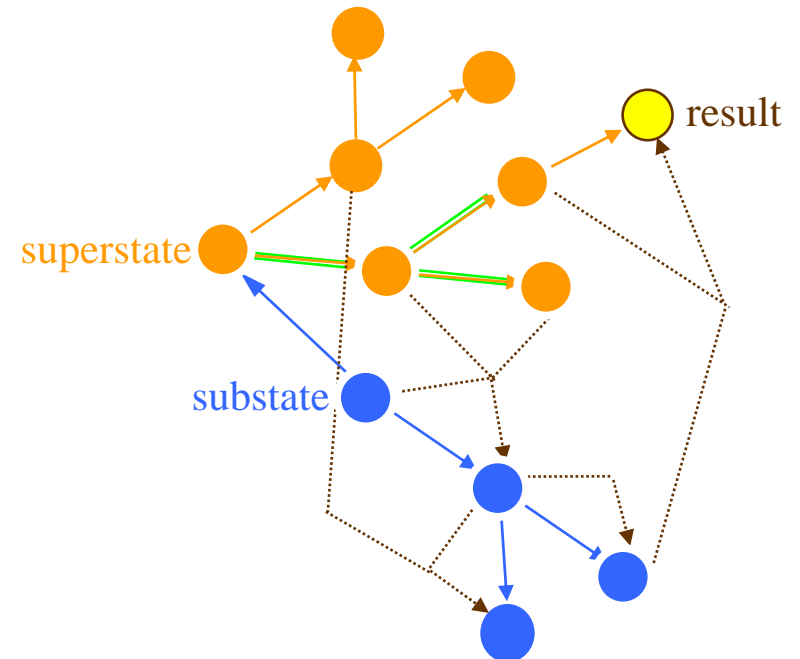
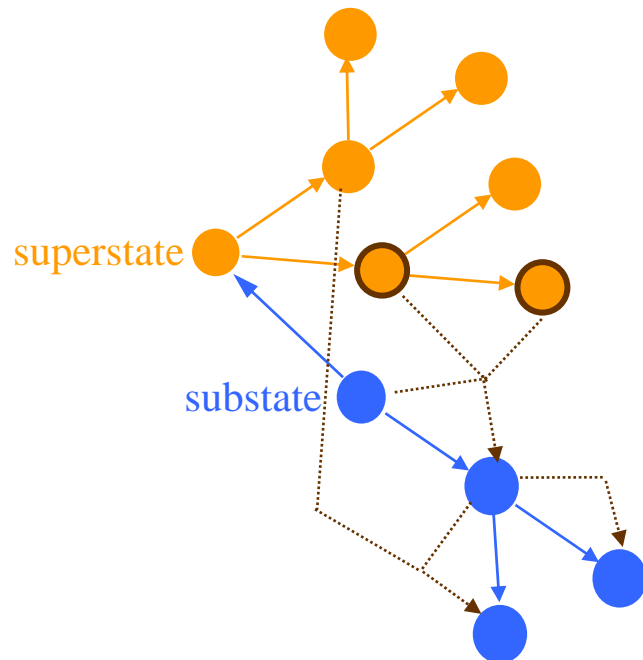
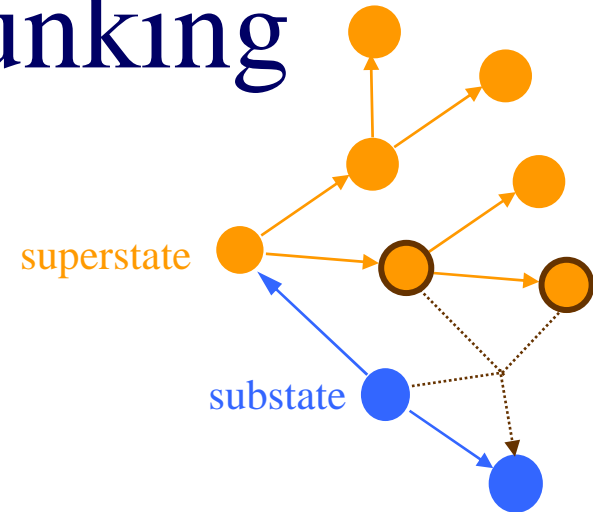
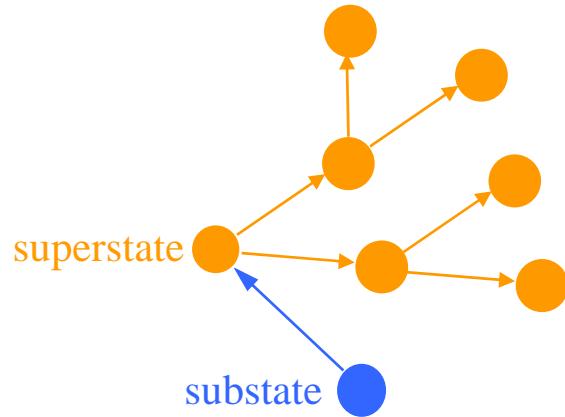
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Basics of Chunking

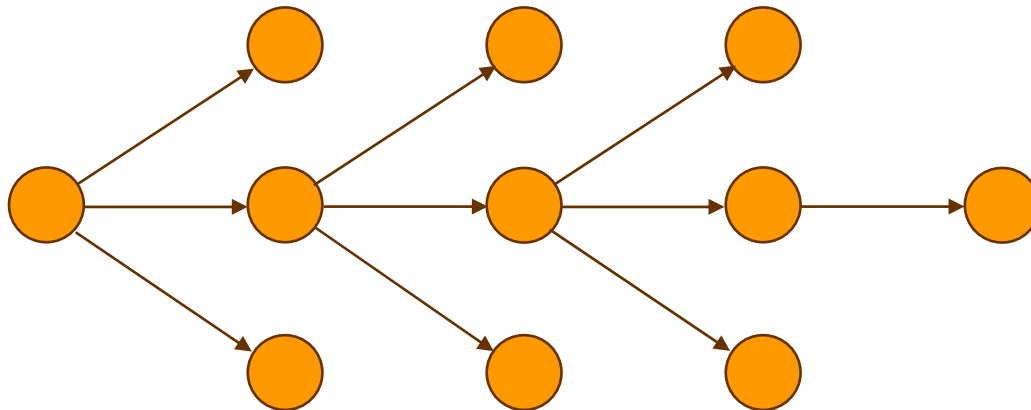
- Compile processing in subgoal into a single rule
- Rule will fire in future and make subgoal unnecessary.

Basics of Chunking



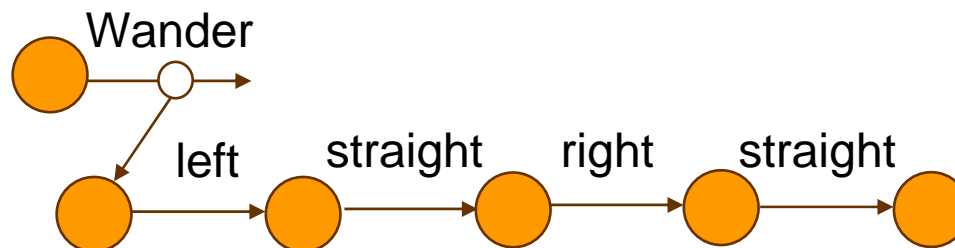
Original Philosophy Behind Chunking

- Chunks cache the processing in a subgoal
 - Replace problem solving with recognition
- Originally assumed goal test was *complete*
 - Any path from initial state to goal was valid
 - Could ignore control knowledge - just impacts efficiency



Changes in Soar

- Control knowledge is used to constrain behavior
 - Goal test may be simplified and “assume” control knowledge
- Results are returned immediately when produced
 - No guaranteed that they fulfill goal
 - Wandering around looking for food – random decisions in subgoal



Proposal: Symbolic Preferences

- Include in chunks the rules that create preferences: they incorporate the “goal concept”.
 - Not just operator proposals and applications
- Impact:
 - Some chunks will be more specific.
 - Will not have any impact on selection space chunks.
 - Data chunking will be more difficult.

Proposal:

Numeric Indifferent Preferences

- Create chunks only if there is high *confidence* in result.
 - Result confidence = confidence in each selected operator for every indifferent decisions on path to result
 - Include conditions of rules computing expected value
- Confidence determined by reinforcement learning
 - Decayed trailing standard deviation of best choice
- Impact:
 - Chunking will not be immediate when there is indifference
 - Time to chunk will vary
 - Won't chunk over decisions with no clear best choice
 - Can overcome by deliberately converting to symbolic preferences
 - Chunking “freezes” high confidence solutions

Nuggets and Coal

- Nugget:
 - Resolves final issues in chunking
 - Could lead to the promised land = ubiquitous chunking
- Coal:
 - Not implemented
 - Depends on implementation of reinforcement learning
 - Must have rewards = goal tests in subgoals