

Comparing Soar and UM-PRS at the knowledge and symbol levels

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Objective

To experimentally study the tradeoffs in the design space of architectures.

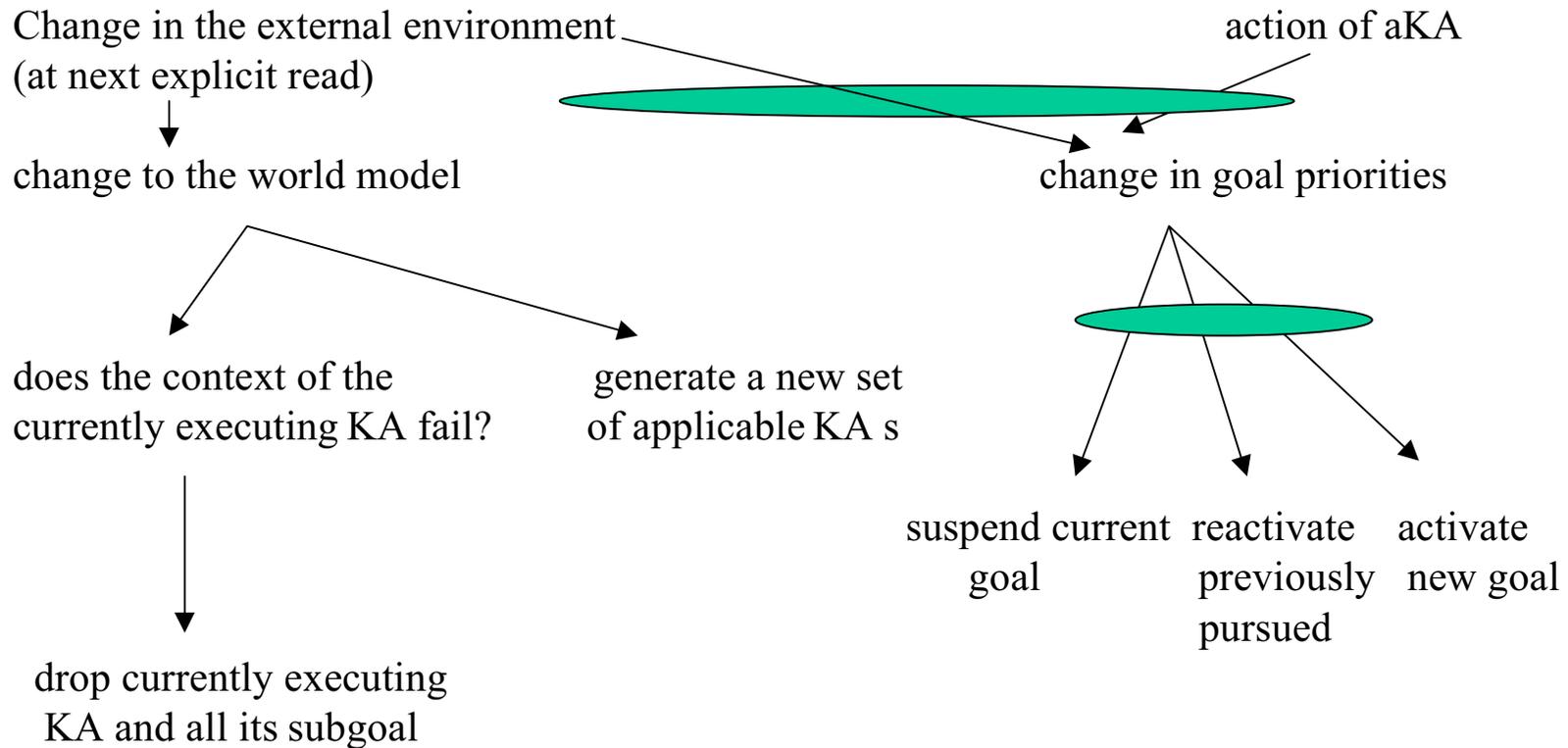
Architectures: Soar
UM-PRS

Plan execution architectures in dynamic environment.

UM-PRS features

Knowledge areas :	context
	body
World model :	working memory
Goals :	system goals non-system goals goals to achieve goals to maintain

Decision-making in UM-PRS



Experiment design

In each experiment, parameters to vary:

- 1) A specified behavior
- 2) One of the degrees of freedom afforded by Soar
- 3) One of the degrees of freedom afforded by UM-PRS
- 4) A task characteristic

Commitment strategy

Blind, closed-minded, open-minded

Plan execution in testbed

W	H	H	H	H	H						
	H	H	H	H	H						
	H	H	F	H	H	W			D	=	wood
	H	H	H	H	H	W			H	=	hole
	H	H	H	H	H	W	D	D	W	=	wall
			<u>Q</u>			W			<u>Q</u>	=	agent
	W	W	W	W	W	W			F	=	food

exogenous events allowed

penalty depends critically on interval between successive environmental reads.

A sample experiment

Behavioral characterization : abandonment of current plan
when world changes

Degrees of freedom : Soar -- none
UM-PRS -- KA can be redesigned
to incorporate Q as condition

Task characteristics : interruptibility,
knowledge dependencies between
data structures

Soar
if (Q = <A>) and () ... ()
→
do [something]

UM-PRS
if () and () ...
→
read Q
do [something]

or

if (Q = <A>) and () and ()
→
do [something]

Tradeoffs

What does this experiment illustrate?

Tradeoffs in sensitivity of plan execution to conditions of execution

- Architecture forces a finer level of control in Soar
- Forcing Q to be part of binding in UM-PRS can lead to an over-specific KA (Soar is least-commitment).

E.g. abundant food

- no need to check for woods and holes

sparse food

- may be good to check for woods and holes

Hypothesis: An architecture favoring more specific invocation condition will favor strategies with higher level of commitment.

Further experiments

1) Relationship of data reads and KA activation /
operator proposal

Degree of freedom: read once in how many cycles?

Task parameter to vary: Frequency of exogenous events

2) Reactivation of suspended plans

Degree of freedom: KA length

Task parameter: Frequency of false alarms

Nuggets and coal

Nuggets: 1) improved understanding of tradeoffs between architectures
2) maybe useful beyond Soar and UM-PRS

Coal: 1) experiments not yet implemented, only preliminary forays so far
2) how generalizable are the experiments?