

Planning and risk in navigation

Background (1)

Good navigation requires planning

Planning is becoming a central topic (again)

Good planning is an unresolved problem

Background (2)

One approach for planning is HRL

HRL applies the “split-and-conquer” strategy to reduce the cost of learning

Criteria on how to build this hierarchy is unresolved

Background (3)

Risk should also be important since we don't know everything

Exploration / Exploitation trade-off

Deadlines

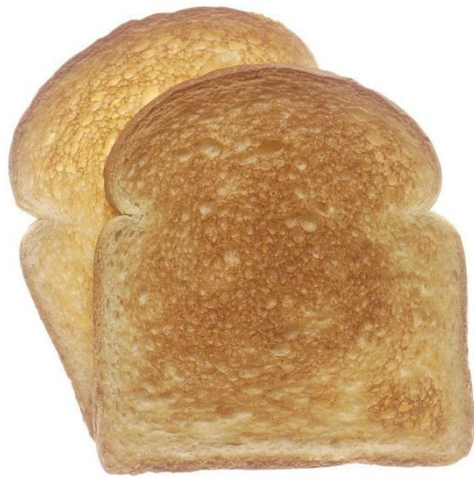
Rationale (1)

Planning is modular

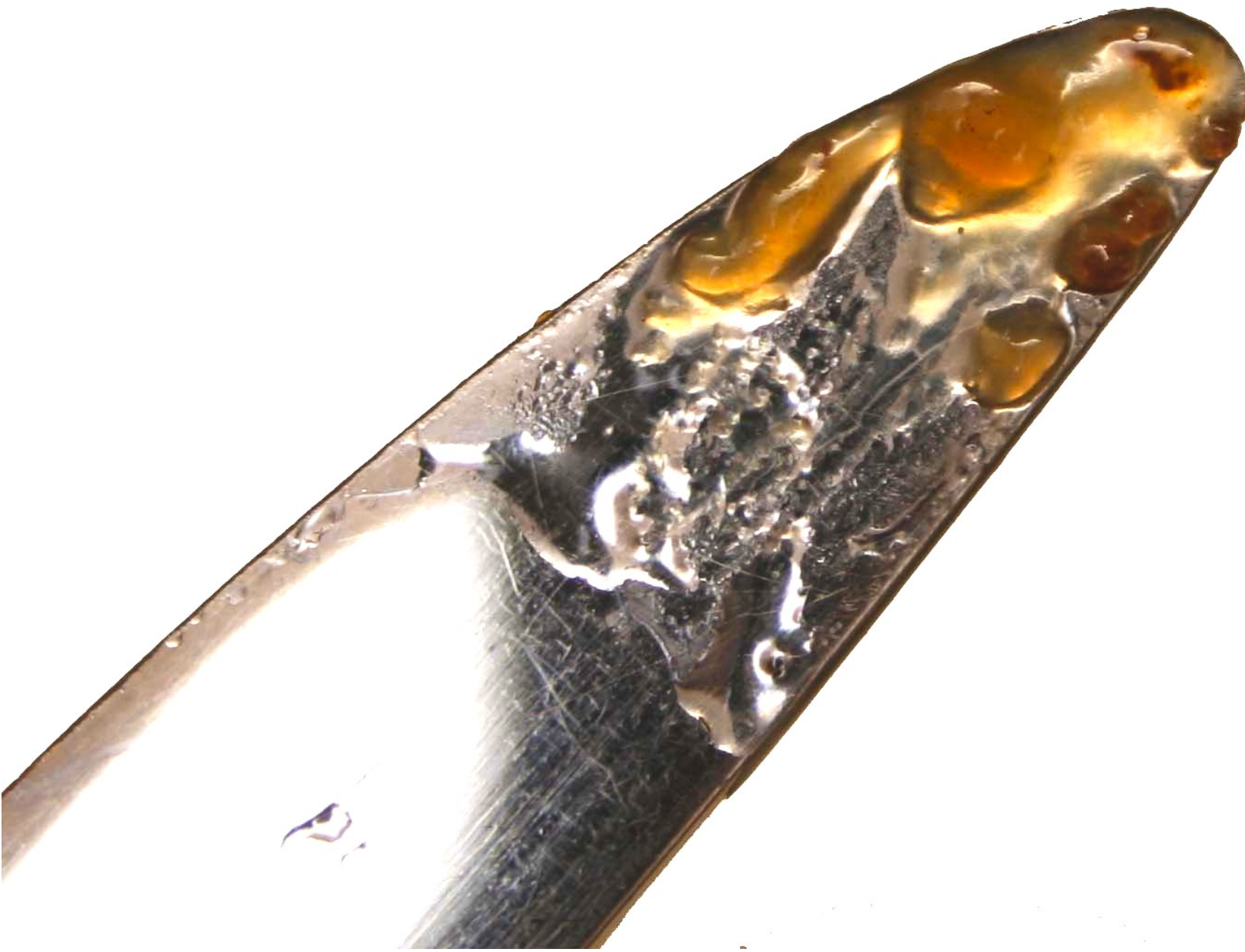
There is a difference between planning a novel action
and reproducing an habit

**We can calculate the cost of
a novel plan vs. an association**

Rationale (1)



Rationale (1)



Rationale (1)



Option 1

Rationale (1)



Option 1

Rationale (1)



Option 1

Rationale (1)



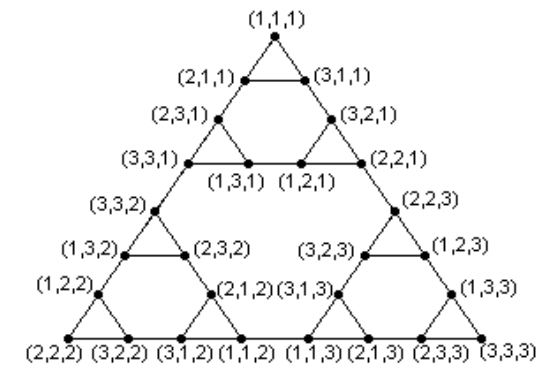
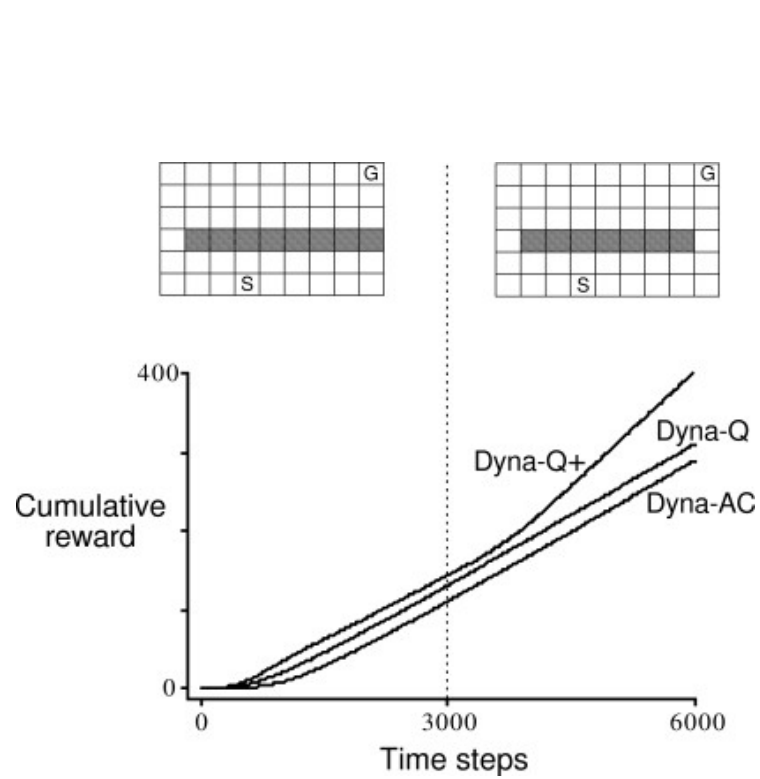
Option 2

Rationale (2)

A unique criteria for planning in HRL models

“Bottle-necks”

Rationale (2)



Rationale (3)

Bigger variance means more possibilities

i.e., a bigger span between min and max

The optimal risk depends on the criterium to “win”

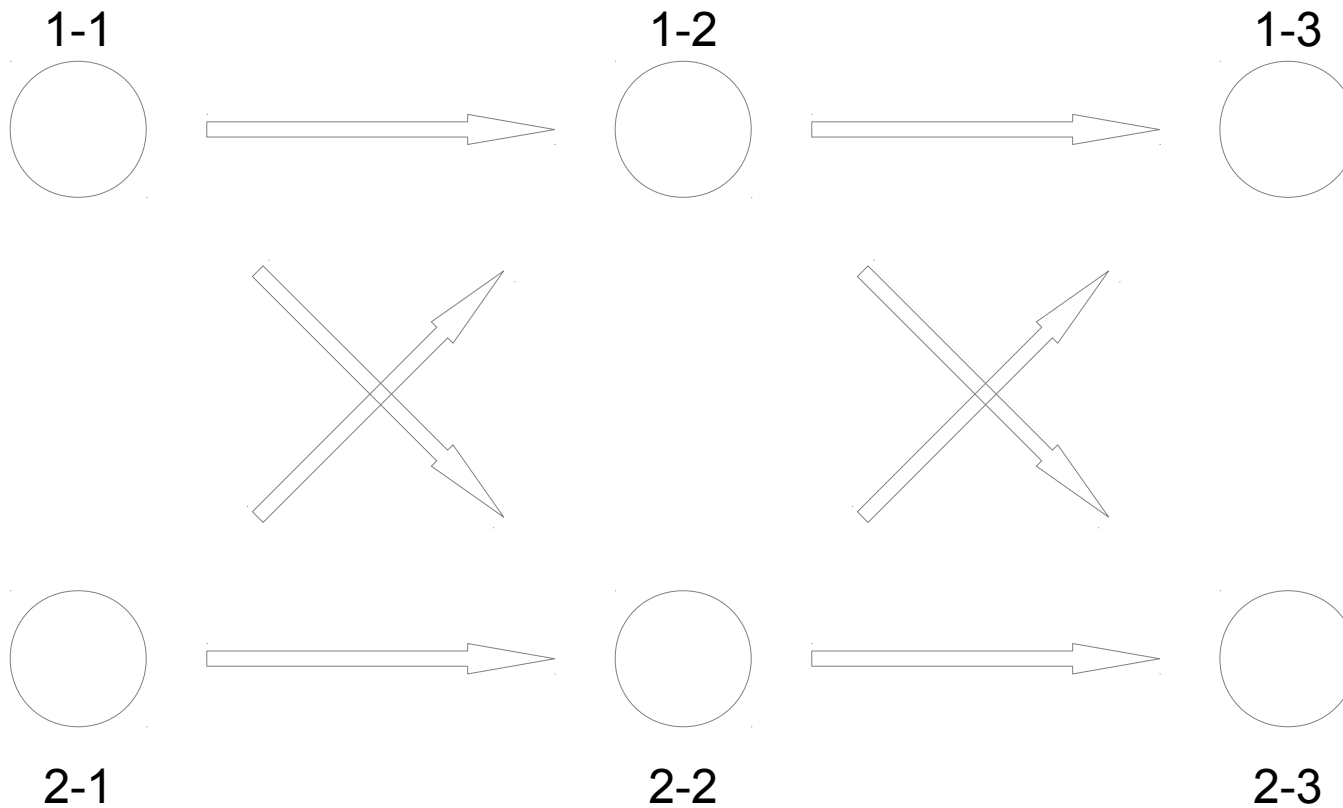
Rationale (3)



Proposal

Navigating in a subway shows all of it!

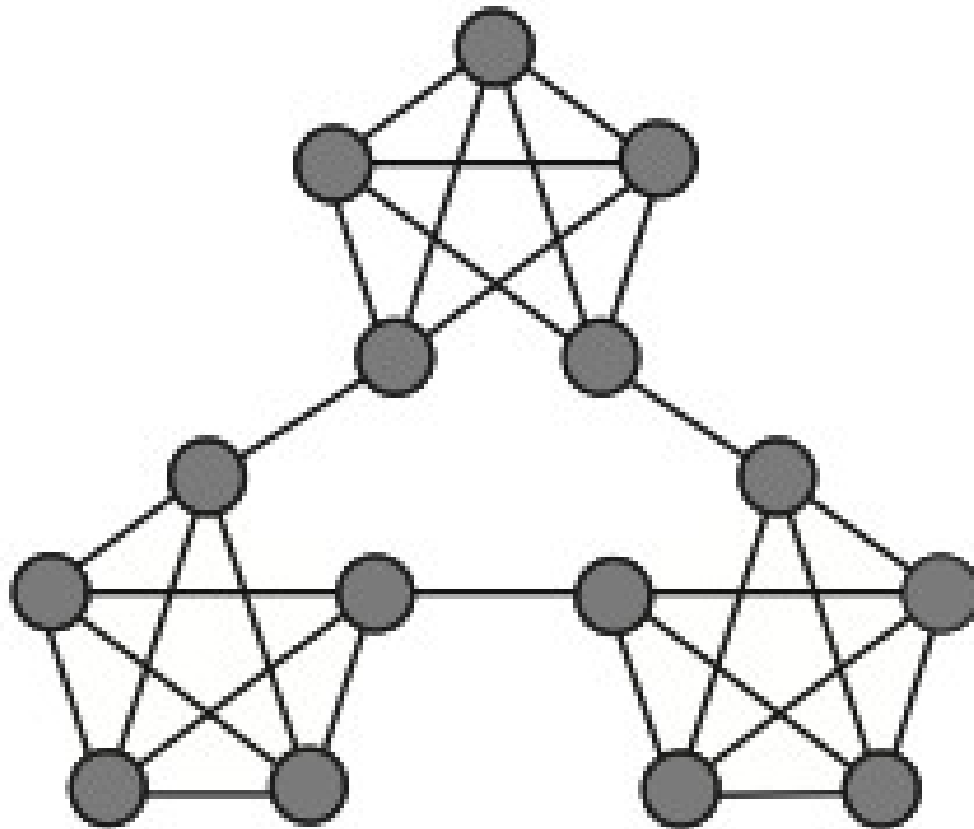
Proposal (1)



Association: 1-1 to 1-2 to 2-3

Best option: 1-1 to 2-2 to 1-3
(combination never used before)

Proposal (2)



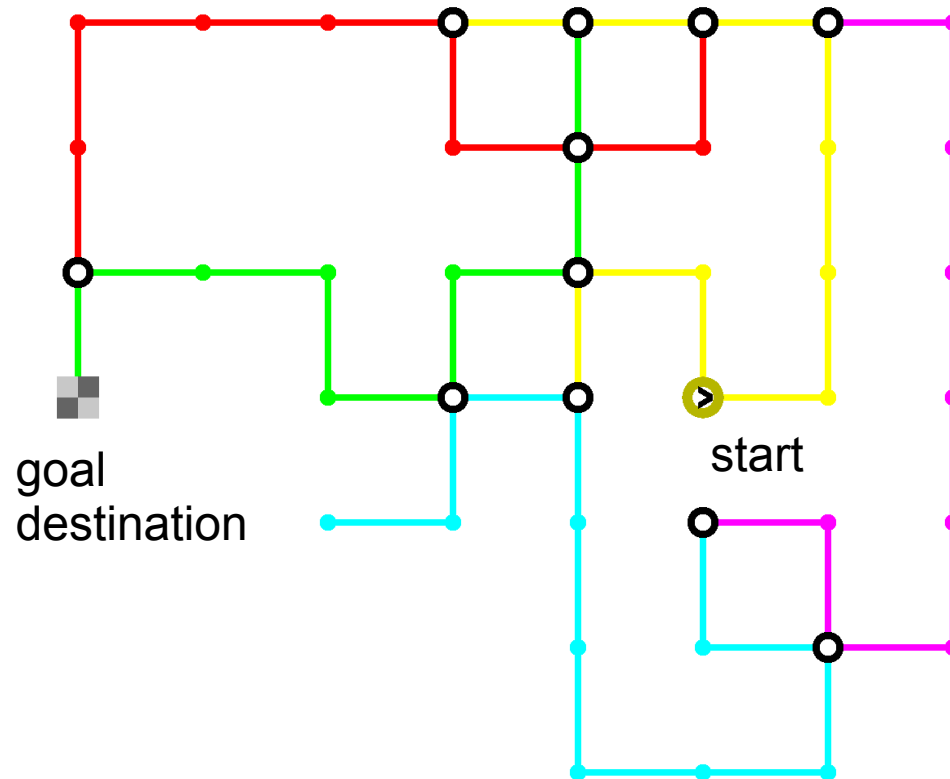
Key stations

Proposal (3)

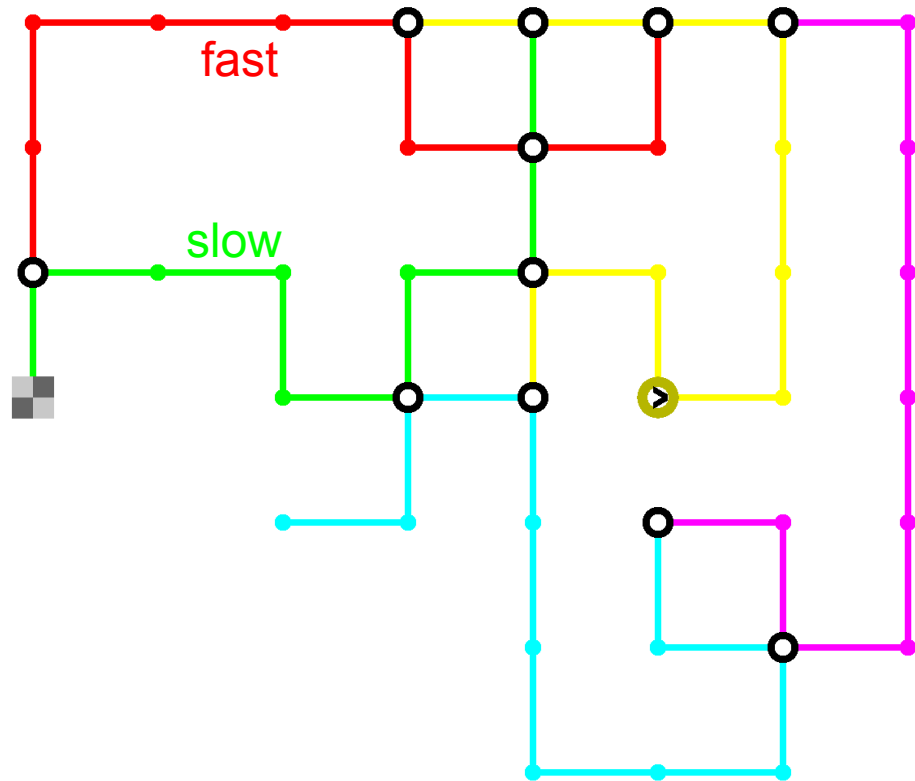


Reward-based deadlines

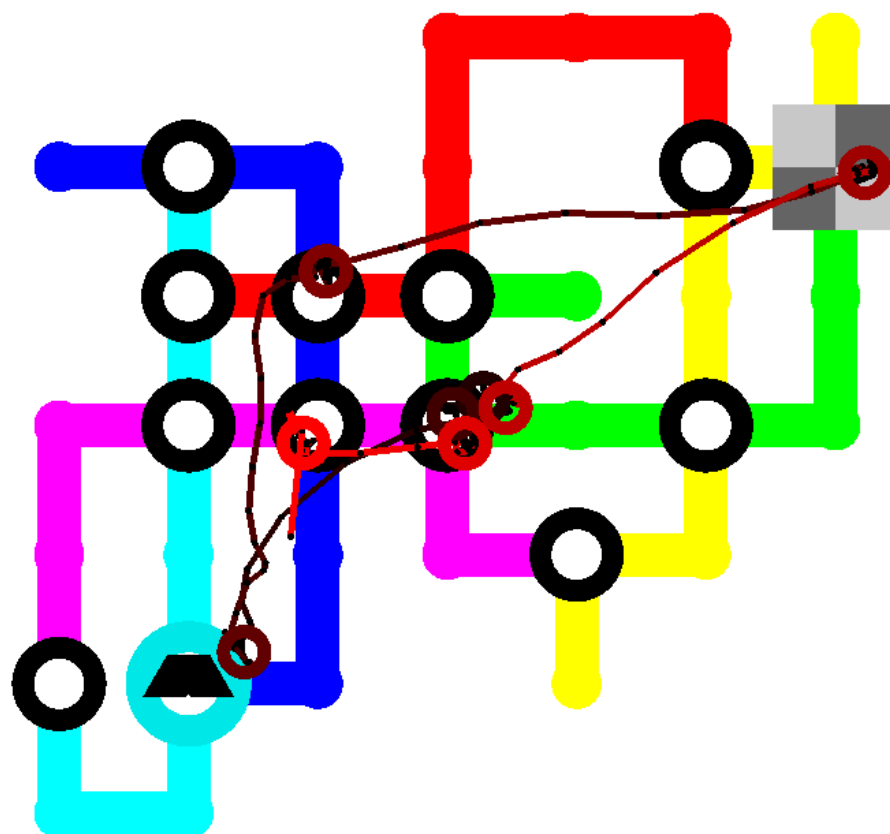
Task



Task



Task



Predictions

The switching point between planning and using habitual actions should have a difference in time (that is, the planning cost)

We could validate key -bottleneck- stations using eye fixations. Models can also exploit this strategy to improve HRL

Optimal planning might be risky in uncertain situations

This is it !