Branching Time Active Inference

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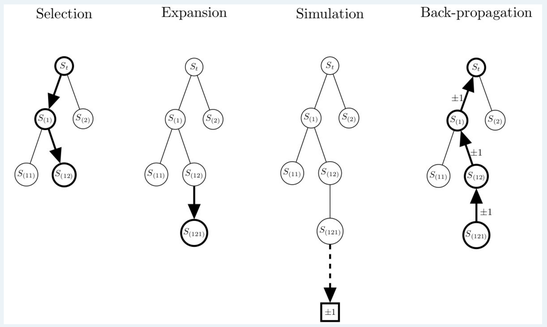
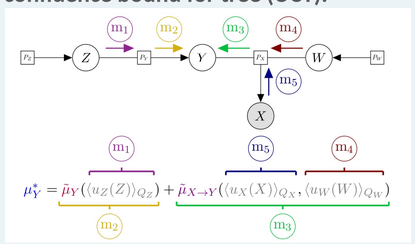
Overview



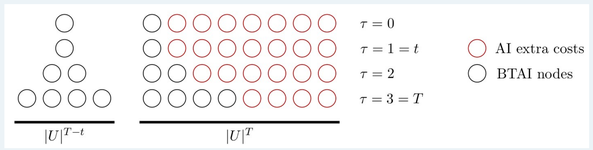
→ Tree search is performed by dynamically expanding the generative model of the agent.

→ The node selection is based on the upper confidence bound for tree (UCT).



→ Inference of the latent variables is performed by variational message passing.

Result: Complexity Classes



→ Active Inference (AI).

→ Branching Time Active Inference BTAI.

Result: BTAI outperforms AI

Environment	Policy size	P(goal)	P(trap)
first	3	1	0
second	5	1	0
third	8	crash	crash

Environment	Planning iterations	P(goal)	P(trap)
first	10	1	0
second	10	0.49	0.51
	15	1	0
third	10	0.47	0.53
	15	0.55	0.45
	20	1	0

Active inference is a unified framework for **action** and **perception** that can be **scaled up** using Monte Carlo **tree search** to **expand** the **generative model** dynamically.

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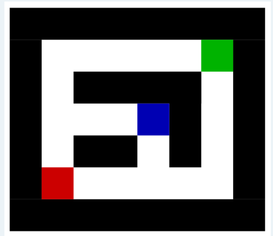
Maze Environment

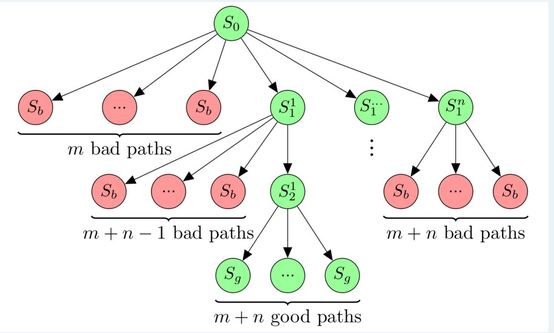


→ starting position in red.

→ exit in green.

→ local minimum in blue.

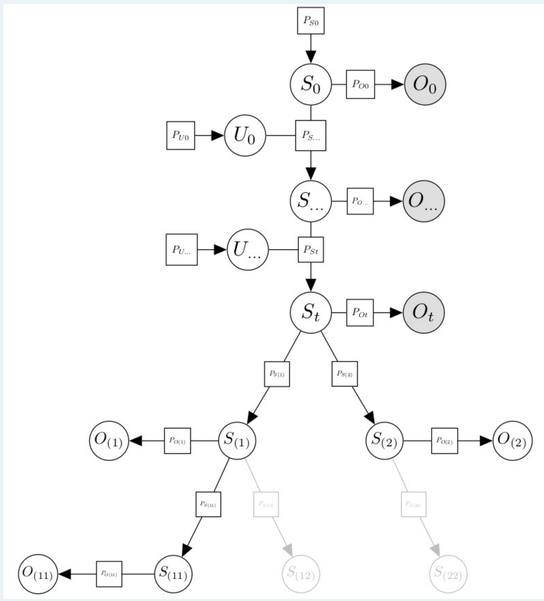
Deep Reward Environment



→ bad states in red.

→ good states in green.

Generative Model



→ squares are factors.

→ white circles are latent variables.

→ gray circles are observed variables.