Endomorphic metalanguage and abstract planning for real-time intent recognition

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A what ?

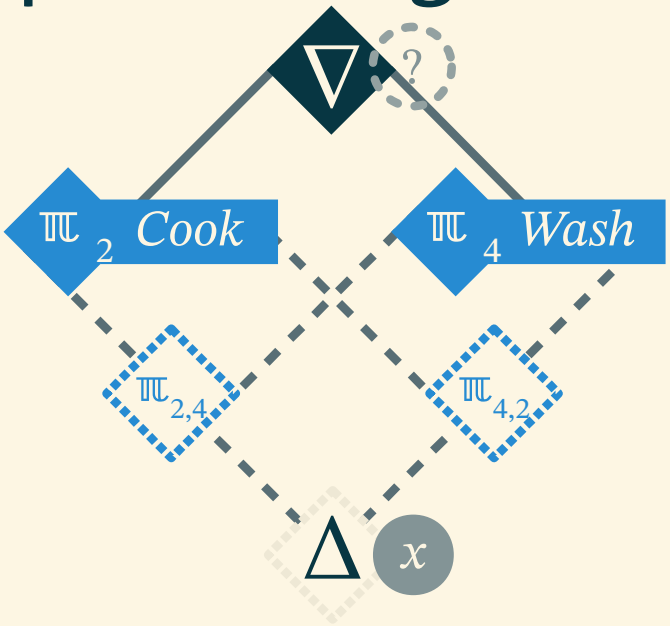
- *Dependent people need help !*
  - Not **annoying** the person
  - Can't see *everything* they are doing
- How to help without asking ?
  - Guessing the intent somehow
- **Intent Recognition**
  - Observed behavior → Goal
  - Using action sequences: Plans

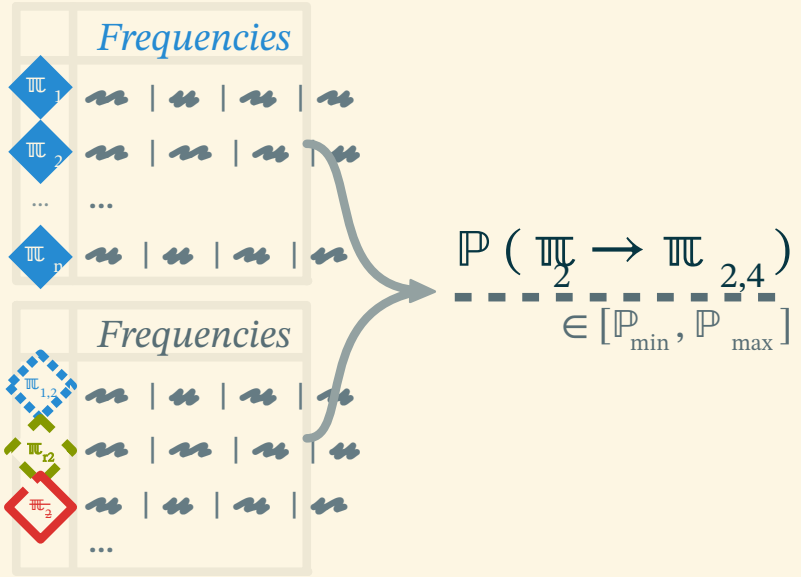
1 Intent Recognition

Logic Approach

[@Bouchard_2006]

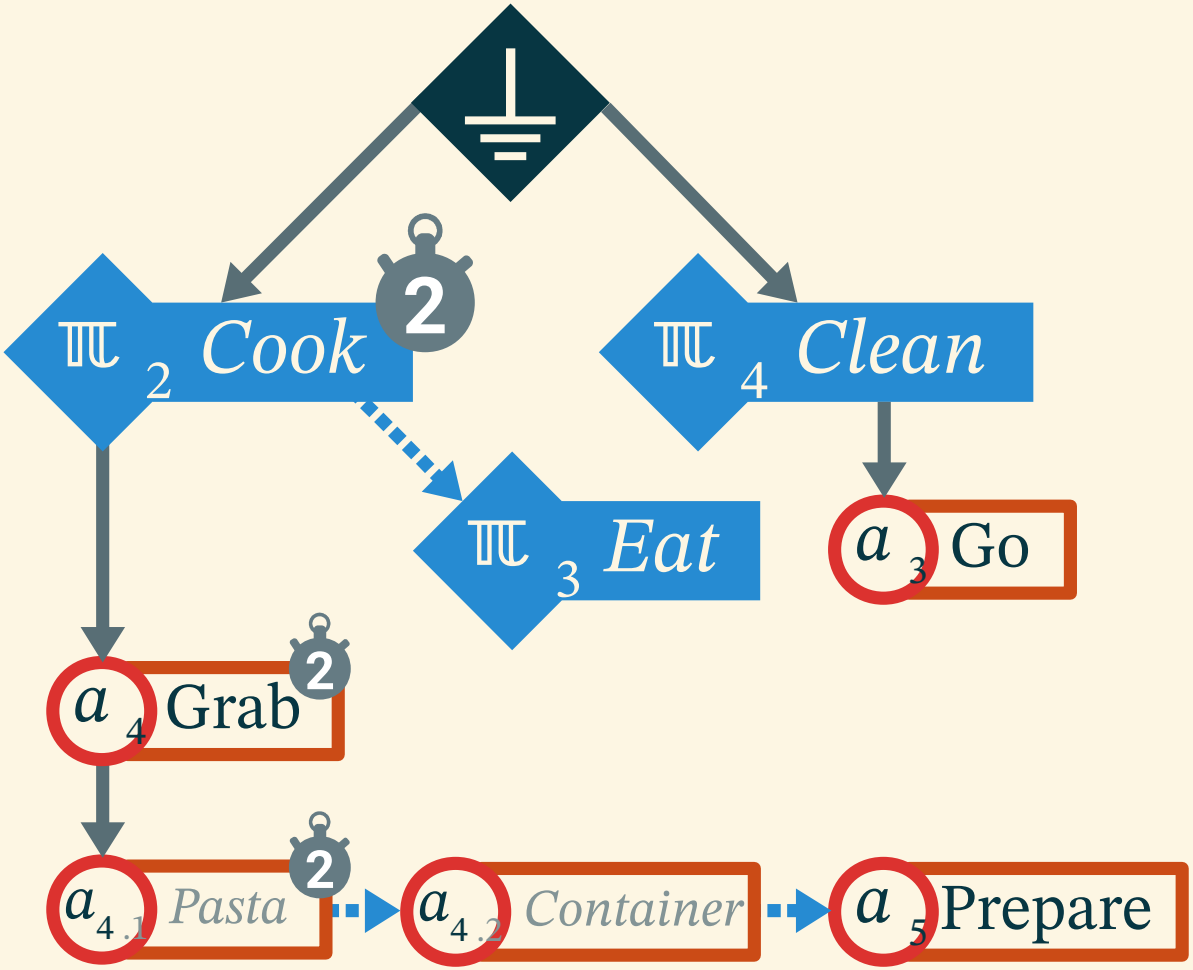
- Lattice Based
- Fast and efficient
- Exponential growth

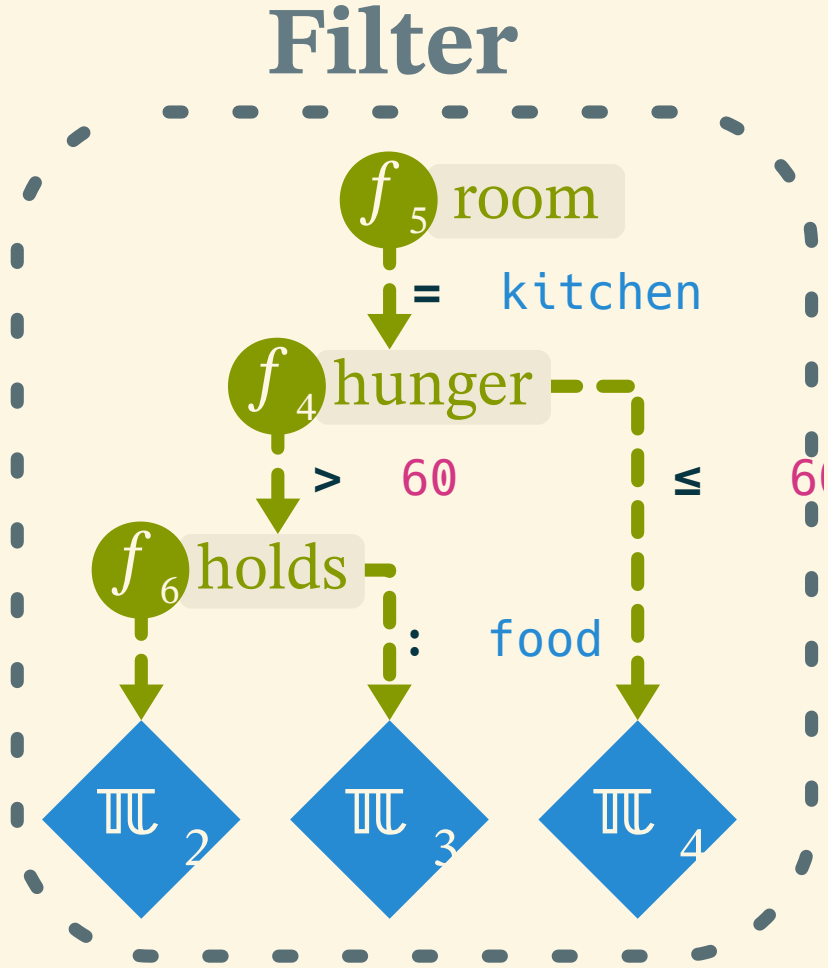




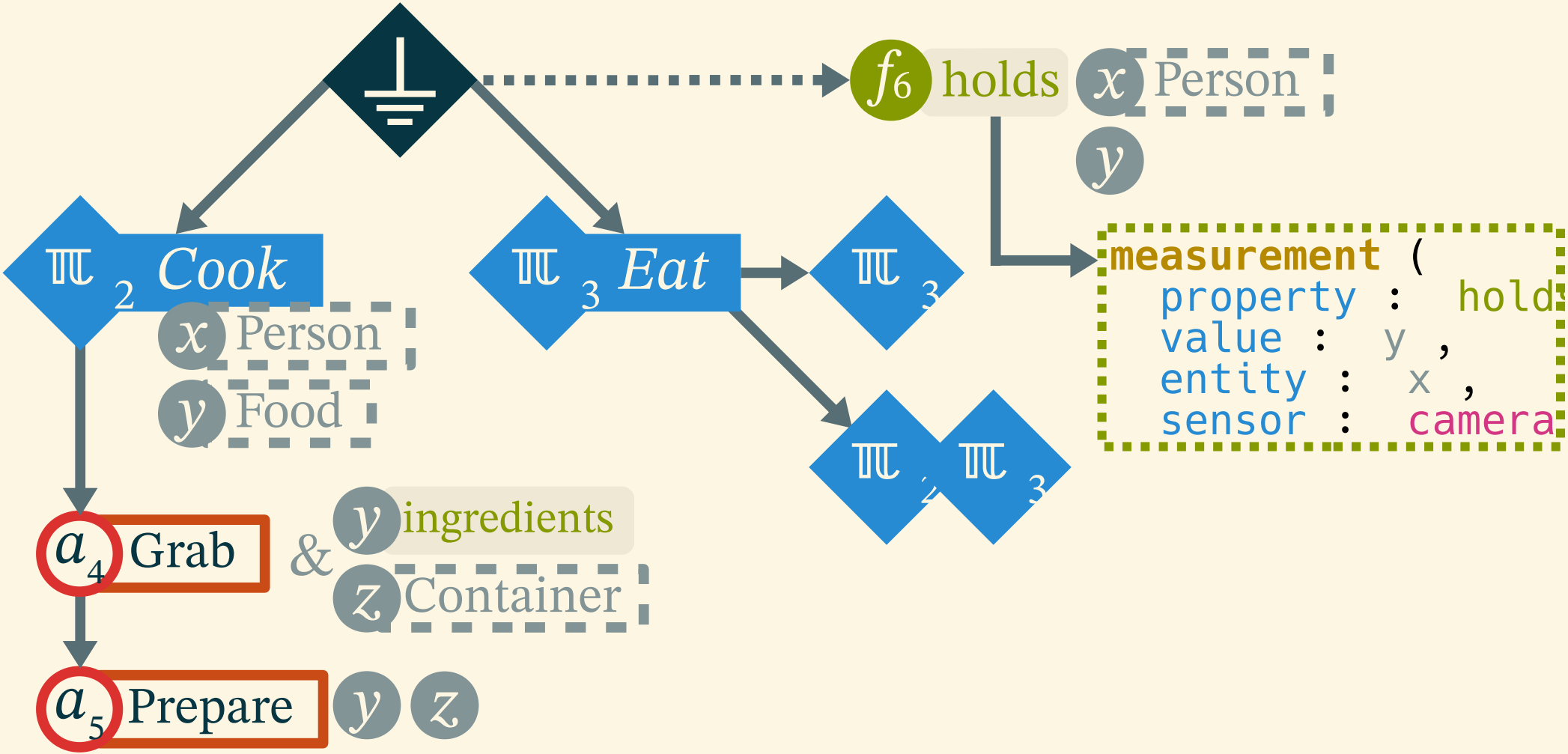
Stochastic Approach

[@avrahami_2006]





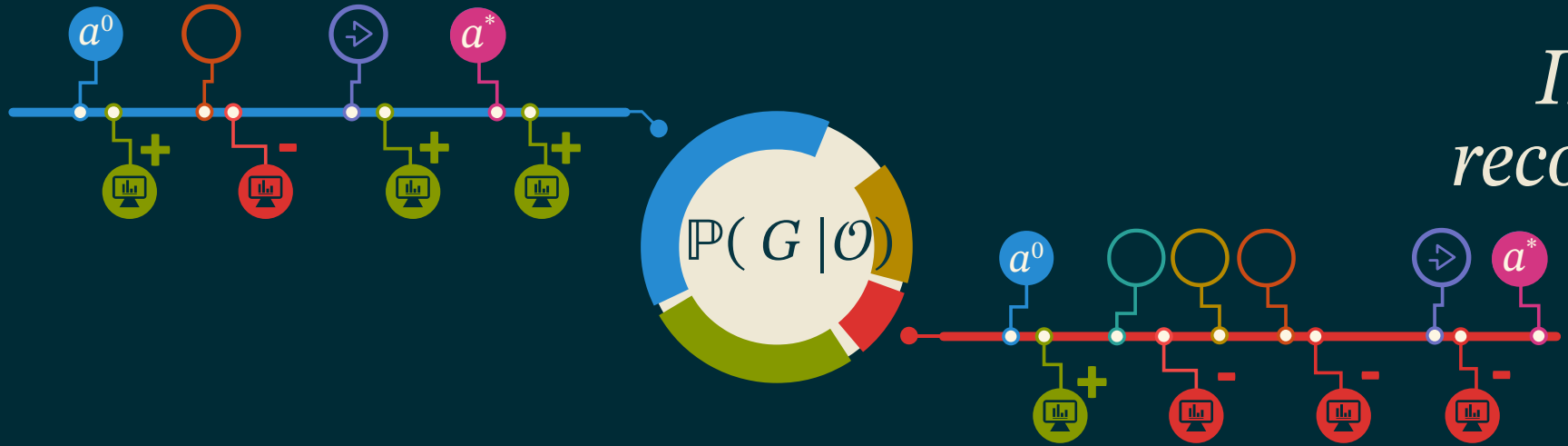
Grammatical Approach



Invert Planning

- **Theory of Mind**

"*The easier the plan, the more likely the goal*



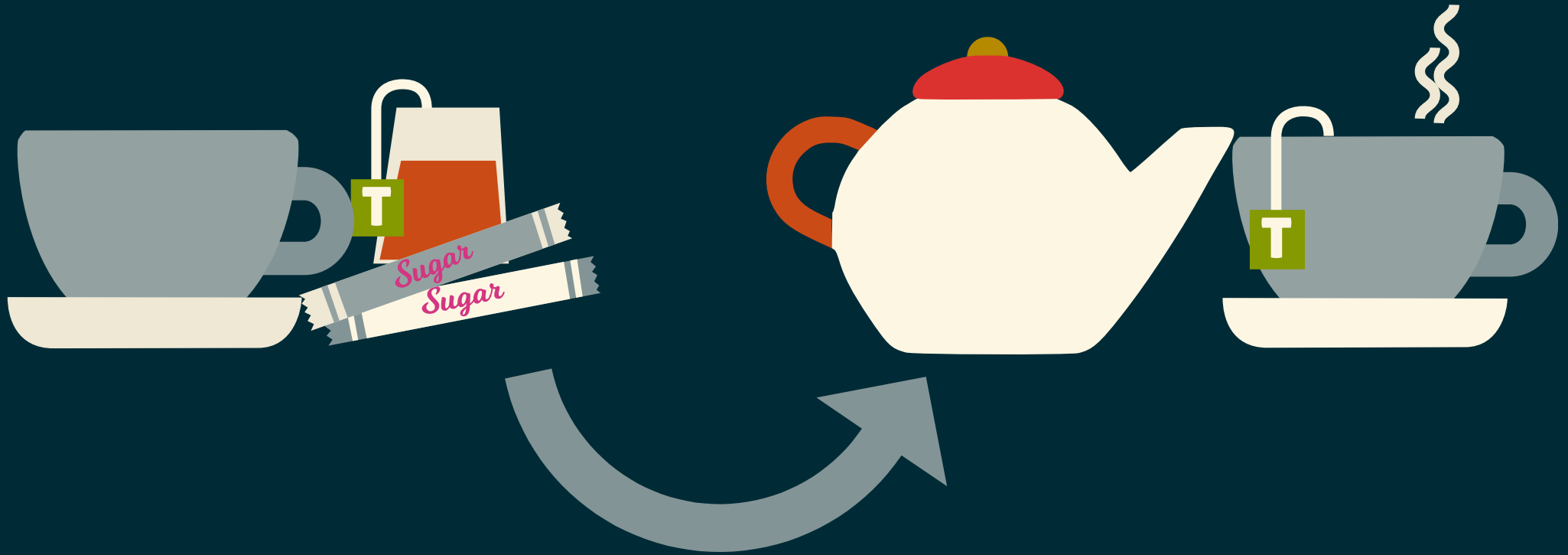
Intent recognition

Classical Planning

- Domain
  - Fluents
    - Formula over objects
  - States
    - Properties of the world
    - Formula over fluents
  - Actions
    - Precondition
    - Effects
- Problem
  - Initial state
  - Goal state
- Plan (solution)
  - Action sequence
  - Order
    - Total
    - Partial

Example

- Having some tea, aren't we ?



X General Planning Framework

Another Perspective on Planning

- States
  - And/Or trees
  - Verifying
  - Applying
- Actions
  - Precondition, Effects (States)
  - Constraints (State)
  - Cost, Duration, Probability
  - Methods (Plans)

Search Space

- Starting point s_0
- Search space S
- Solution predicate q_s^*
- Iterator χ_S

General Planning Algorithm

- $\Pi * (s *, s\,0, q\,s *, h, \gamma\,S, D)$
  - Shortest Path Algorithm

Planning Approaches

- State-transition
  - $\Pi * \square = \Pi * ((\square, A), pre(\omega), eff(\omega))$
- Plan space
  - $\Pi * \Pi = \Pi * (r, a\ 0 \rightarrow a *, \otimes(s) = \varnothing)$
- Case based
  - $\Pi\ C = \Pi * (r *, \{\!\{ min : \pi \in C \wedge \pi(pre(\omega)) \models eff(\omega) \}\!\}, s(pre(\omega)) \neq \varnothing)$
- Probabilistic
  - $\Pi\ P = \Pi * (pol, pre(\omega), s \models eff(\omega))$
- Hierarchical
  - $\Pi\ \omega = \Pi * (r +, \Pi(\omega), \otimes(s) = \varnothing \wedge \forall a \in A\ \pi \in s\ \Pi(a) = \varnothing)$

COLOR Framework

Thanks for listening !