



Planning for AI (B4M36PUI)

FF-Replan

Lukáš Chrpa



Motivation

- Computational Complexity
 - FOND Planning in EXPTIME-complete
 - Classical Planning is PSPACE-complete
- A lot of non-deterministic outcomes do not occur during policy execution
- “Lazy” approach to tackle non-determinism
 - Handle unexpected situation when necessary



Determinization

- A non-deterministic action in form
 - $a=(\text{pre}(a),\text{eff1}(a),\text{eff2}(a),\dots,\text{effk}(a))$
- Converted to k deterministic actions in form
 - $a_1=(\text{pre}(a),\text{eff1}(a))$
 - $a_2=(\text{pre}(a),\text{eff2}(a))$
 -
 - $a_k=(\text{pre}(a),\text{effk}(a))$

FF-Replan

Let $P=(F,A,I,G)$ be a FOND Planning task

Let Ad be a set of action obtained by determinization from o
 $s=I$

$Dom(\pi)=\emptyset$

While $G \not\subseteq s$ **do**

If $s \notin Dom(\pi)$

$p=\mathbf{Plan}(F,Ad,s,G)$

If p doesn't exist **return** failure

RefinePolicy (π,p)

EndIf

$s=\mathbf{Apply}(s,\pi(s))$

EndWhile



Summary

- FF-Replan won the Probabilistic track of IPC 2004 and was the unofficial winner of IPC 2006
 - The “lazy” approach for handling non-determinism can be very efficient
- In planning tasks with **dead-ends** FF-replan might be unsafe (even though a safe solution exists)
- Novel approaches aim to avoid dead-ends while leveraging benefits of FF-Replan