h^{FF} and other exercises

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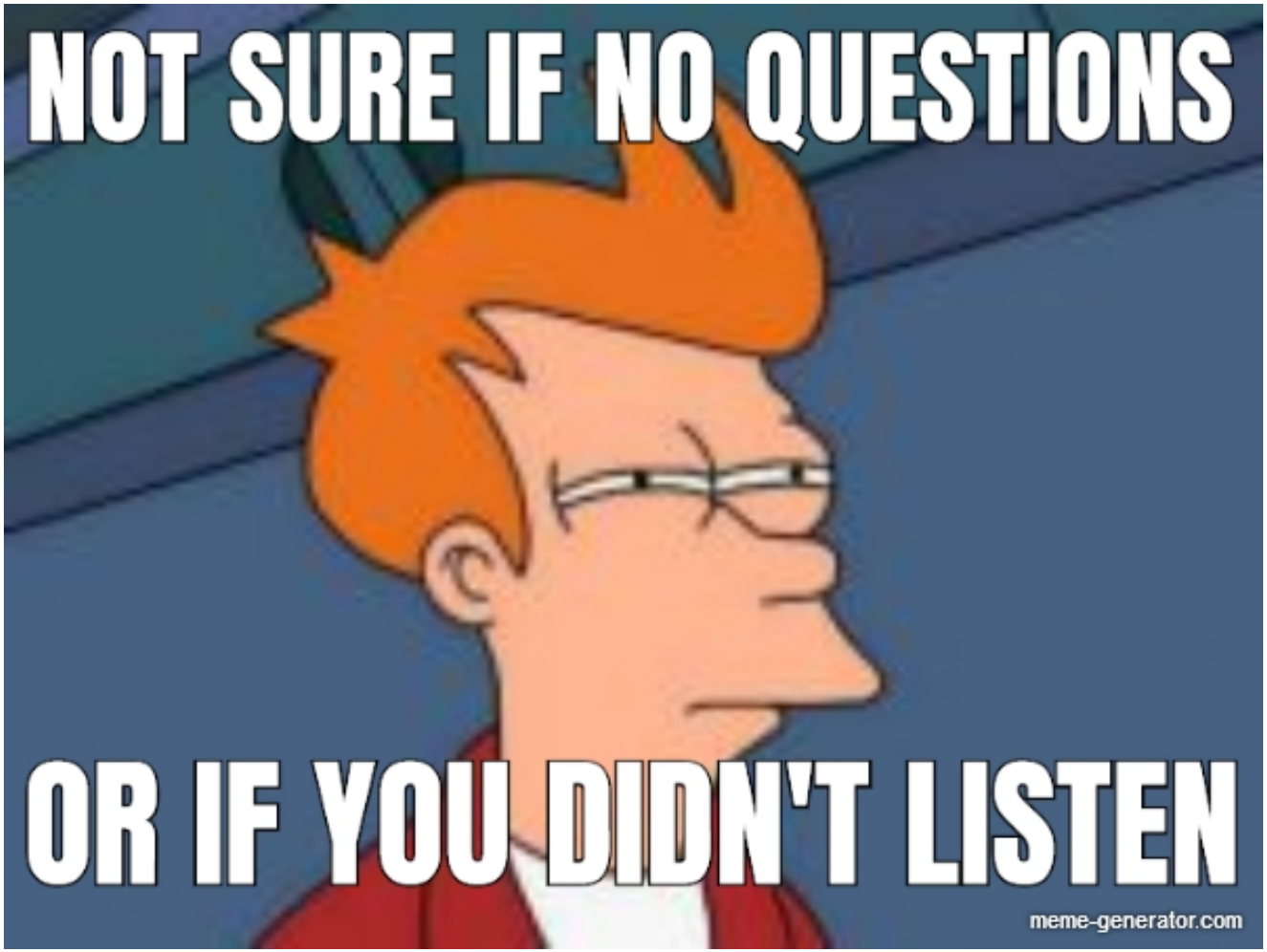
PUI Tutorial
Week 6

Lecture check

- Any questions regarding the lecture?



Organization info

Next week

- Assignment 1 consultations
- Little talk on neural networks in planning

h^{FF}

- "Fast Forward" heuristic
- Relaxation
- Generates relaxed plans
- Length of said plans is the heuristic value

h^{FF} example

$F = \{a, b, c, d, e, f, g, h\}$
$s_I = \{a\}$
$s_G = \{c, d, e, f, g\}$

$O =$

	pre	add	del	c
o_1	a	b,c	$\emptyset$	1
o_2	a,c	d	$\emptyset$	1
o_3	b,c	e	$\emptyset$	1
o_4	b	f	$\emptyset$	1
o_5	d	e,f	$\emptyset$	1
o_6	d	g	$\emptyset$	1

h^{FF} example

Algorithm description

- Create reachability graph
- Mark the final G atom node
- Apply rules layers by layer until every marked node is justified

Justified node definitions

- Action node is justified if all precondition fact nodes are marked
- Atom node is justified if at least one predecessor node is marked

- Starting with marked goal node, apply the following rules **layer by layer** until **all marked nodes are justified**

1) Mark all immediate predecessors of a marked unjustified action node
2) Mark the immediate predecessor of a marked unjustified atom node with only one immediate predecessor
3) Mark an immediate predecessor of a marked unjustified atom node connected via an idle arc (to the same atom in the previous layer)
4) Mark any immediate predecessor of a marked unjustified atom node

h^{FF} example

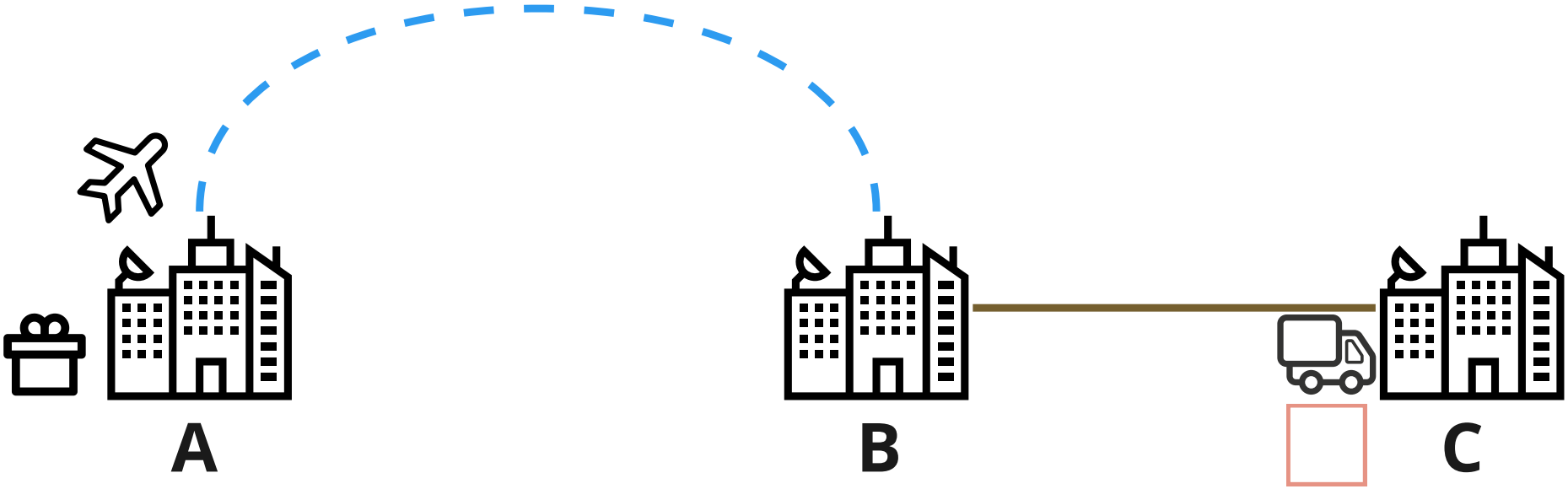
Value of h^{FF} is

- number of justified actions in the reachability graph
- cost of justified actions in the reachability graph

The ultimate exercise

Compute

- $h^{lm-cut} + h^{max}$
- h^{add}
- h^{FF}
- h^{flow}
- h^{pot}



The ultimate exercise

STRIPS problem $\Pi = \langle F, O, s_I, s_G, c \rangle$

$F = \{aA, aB, tB, tC, pA, pB, pC, pa, pt\}$

$s_I = \{aA, pA, tC\}$

$s_G = \{pC\}$

$O =$

	pre	add	del	c
fAB	aA	aB	aA	1
fBA	aB	aA	aB	1
dBC	tB	tC	tB	1
dCB	tC	tB	tC	1
laA	pA, aA	pa	pA	1
laB	pB, aB	pa	pB	1
ltB	pB, tB	pt	pB	1
ltC	pC, tC	pt	pC	1
uaA	pa, aA	pA	pa	1
uaB	pa, aB	pB	pa	1
utB	pt, tB	pB	pt	1
utC	pt, tC	pC	pt	1

The ultimate exercise

FDR problem $P = \langle V, O, s_I, s_G, c \rangle$

$V = \{a, t, p\}$

$D_a = \{A, B\}$ $D_t = \{B, C\}$ $D_p = \{A, B, C, a, t\}$

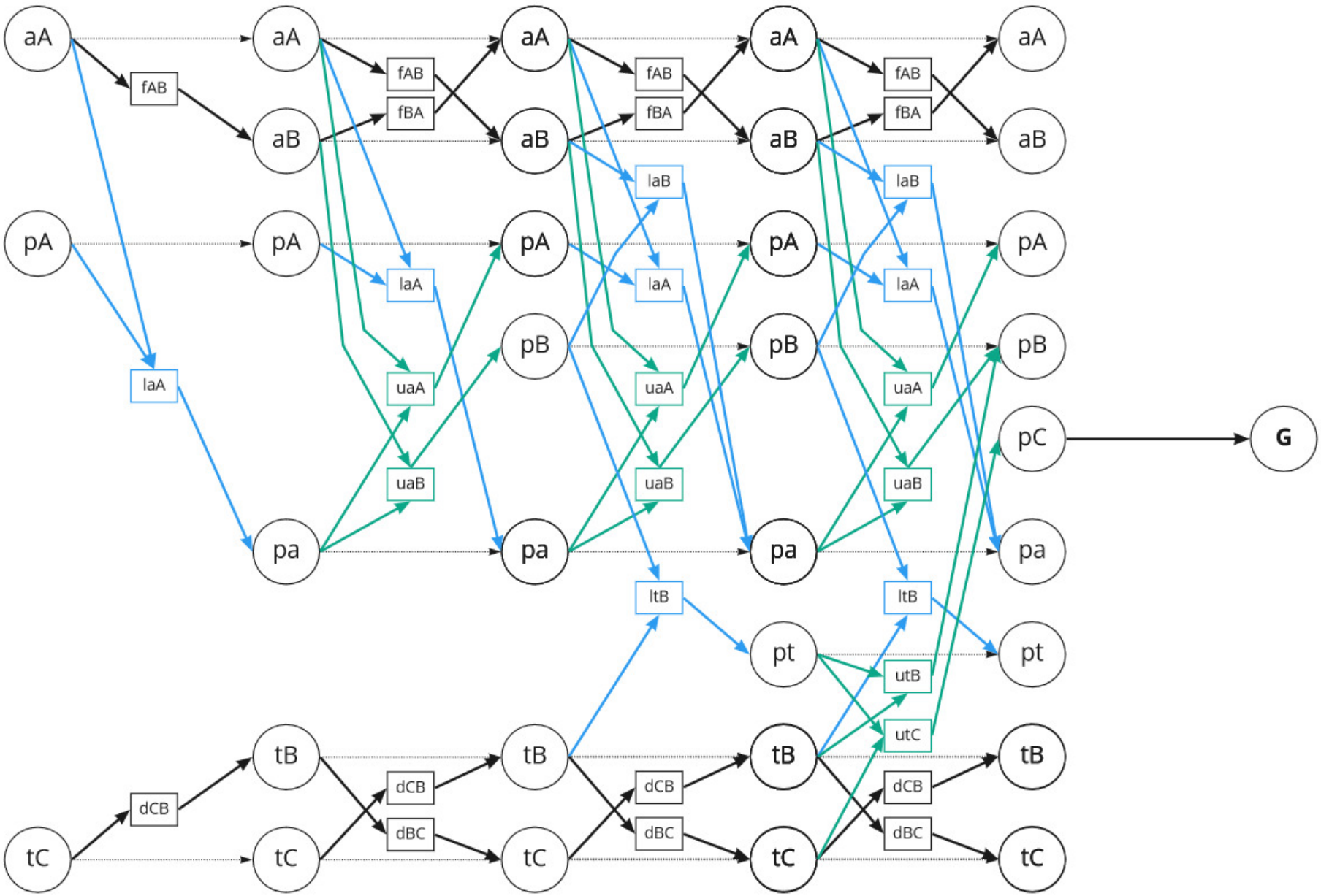
$s_I = \{a = A, t = C, p = A\}$

$s_G = \{p = C\}$

$O =$

	pre	eff	c
fAB	a=A	a=B	1
fBA	a=B	a=A	1
dBC	t=B	t=C	1
dCB	t=C	t=B	1
IaA	a=A, p=A	p=a	1
IaB	a=B, p=B	p=a	1
ItB	t=B, p=B	p=t	1
ItC	t=C, p=C	p=t	1
uaA	p=a, a=A	p=A	1
uaB	p=a, a=B	p=B	1
utB	p=t, t=B	p=B	1
utC	p=t, t=C	p=C	1

The ultimate exercise - h^{FF} reachability graph



Recap

- You should be able to compute all heuristics we talked about up until now
- If we didn't manage to finish all exercises we will finish them next week :)

The End

Feedback form link