

International Planning Competition 2020

On Hierarchical Task Network (HTN) Planning

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University of Freiburg / Saarland University / The Australian National University

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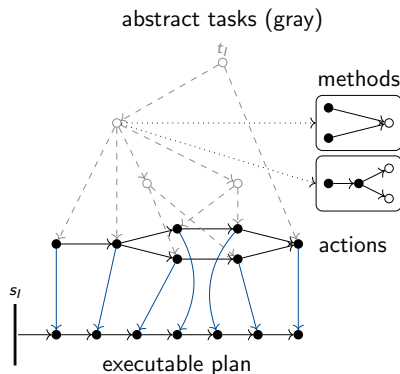
Australian
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How did this came to pass?

The 2nd ('00) and 3rd ('02) IPC had tracks on “Hand Tailored Systems”.

Among them HTN planners participated.

- ⇒ Comparison between quality of the HTN structure
- ⇒ Now: How well can your planner exploit a **given** HTN structure?



Setting

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- Common output format and verifier (solution must respect HTN structure, i.e. VAL is not enough)

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Technical Setting

- Planner are run in singularity containers
- 8GB of RAM and 30 minutes (= 1800 sec) of runtime per instance
- IPC-Time-Score: $\min\{1, 1 - \log(t) / \log(1800)\}$ for runtime t
- 10 runs of all experiments

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Two Tracks:

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Two Tracks:

Total Order

Partial Order

Planners

- Lilotane
(Dominik Schreiber)
- SIADEX
(Juan Fernández-Olivares, Ignacio Vellido Expósito)
- HyperTensioN
(Mauricio Cecilio Magnaguagno, Felipe Meneguzzi, Lavindra de Silva)
- PDDL4J-TO
(Damien Pellier, Humbert Fiorino)
- PDDL4J-PO
(Damien Pellier, Humbert Fiorino)
- pyHiPOP
(Charles Lesire, Alexandre Albore)

Domains

Total Order

- 40 Submissions from 9 different groups
- 24 included (892 instances)

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Partial Order

- 11 Submission from 2 different groups
- 8 included (204 instances)

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- 24 included (892 instances)

Partial Order

- 11 Submission from 2 different groups
- 8 included (204 instances)

Acyclic

- no direct submission
- only three domains

Results - Total Order

AssemblyHierarchical	30	0.08	0.12	0.06	0.06	0.00	0.02
Barman-BDI	20	1.00	0.74	0.49	0.48	0.92	0.00
Blocksworld-GTOHP	30	0.43	0.63	0.43	DSQ	0.34	0.01
Blocksworld-HPDDL	30	0.89	0.02	0.00	0.00	0.00	0.00
Childsnack	30	1.00	0.87	0.46	0.46	0.50	0.00
Depots	30	0.76	0.72	0.60	0.57	0.70	0.00
Elevator-Learned	147	1.00	0.78	0.01	0.01	0.07	0.01
Entertainment	12	0.00	0.14	0.26	0.19	0.00	0.07
Factories-simple	20	0.14	0.19	0.00	0.00	0.00	0.01
Freecell-Learned	60	0.00	0.05	0.00	0.00	0.00	0.00
Hiking	30	0.83	0.60	0.39	0.31	0.00	0.00
Logistics-Learned	80	0.26	0.32	0.00	0.00	0.00	0.00
Minecraft-Player	20	0.25	0.03	0.03	0.03	0.13	0.00
Minecraft-Regular	59	0.87	0.33	0.32	0.32	0.33	0.00
Monroe-Fully-Observable	20	0.00	0.78	0.58	0.49	0.25	0.00
Monroe-Partially-Observable	20	0.00	0.73	0.03	0.03	0.00	0.00
Multiarm-Blocksworld	74	0.11	0.03	0.00	0.00	0.01	0.00
Robot	20	0.96	0.52	0.27	0.27	0.00	0.05
Rover-GTOHP	30	0.92	0.54	0.62	0.59	0.77	0.14
Satellite-GTOHP	20	1.00	0.59	0.73	0.44	0.00	0.19
Snake	20	1.00	0.74	0.71	0.71	0.29	0.03
Towers	20	0.77	0.39	0.61	0.58	0.47	0.09
Transport	40	1.00	0.76	0.70	0.65	0.03	0.23
Woodworking	30	0.23	0.98	0.17	0.17	0.10	0.09
	892	13.5091	11.6007	7.47006	6.36204	4.92931	0.938777

Results - Total Order

							p/HiPOP
AssemblyHierarchical	30	0.08	0.12	0.06	0.06	0.00	0.02
Barman-BDI	20	1.00	0.74	0.49	0.48	0.92	0.00
Blocksworld-GTOHP	30	0.43	0.63	0.43	DSQ	0.34	0.01
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Childsnack	30	1.00	0.87	0.46	0.46	0.50	0.00
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Results - Total Order

						SIADEX	p/HiPOP
AssemblyHierarchical	30	0.08	0.12	0.06	0.06	0.00	0.02
Barman-BDI	20	1.00	0.74	0.49	0.48	0.92	0.00
Blocksworld-GTOHP	30	0.43	0.63	0.43	DSQ	0.34	0.01
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Results - Total Order

					PDDL4J-PO	SIADEX	PyHiPOP
AssemblyHierarchical	30	0.08	0.12	0.06	0.06	0.00	0.02
Barman-BDI	20	1.00	0.74	0.49	0.48	0.92	0.00
Blocksworld-GTOHP	30	0.43	0.63	0.43	DSQ	0.34	0.01
Blocksworld-HPDDL	30	0.89	0.02	0.00	0.00	0.00	0.00
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Results - Total Order

			Lilotane	PDDL4J-TO	PDDL4J-PO	SIADEx	p/HiPOP
AssemblyHierarchical	30	0.08	0.12	0.06	0.06	0.00	0.02
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Blocksworld-GTOHP	30	0.43	0.63	0.43	DSQ	0.34	0.01
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Childsnack	30	1.00	0.87	0.46	0.46	0.50	0.00
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Freecell-Learned	60	0.00	0.05	0.00	0.00	0.00	0.00
Hiking	30	0.83	0.60	0.39	0.31	0.00	0.00
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Total Order – Runner Up

Lilotane

Dominik Schreiber

Results - Total Order

			Lilotane	PDDL4J-TO	PDDL4J-PO	SIADEx	p/HiPOP
AssemblyHierarchical	30	0.08	0.12	0.06	0.06	0.00	0.02
Barman-BDI	20	1.00	0.74	0.49	0.48	0.92	0.00
Blocksworld-GTOHP	30	0.43	0.63	0.43	DSQ	0.34	0.01
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Freecell-Learned	60	0.00	0.05	0.00	0.00	0.00	0.00
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Multiarm-Blocksworld	74	0.11	0.03	0.00	0.00	0.01	0.00
Robot	20	0.96	0.52	0.27	0.27	0.00	0.05
Rover-GTOHP	30	0.92	0.54	0.62	0.59	0.77	0.14
Satellite-GTOHP	20	1.00	0.59	0.73	0.44	0.00	0.19
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Woodworking	30	0.23	0.98	0.17	0.17	0.10	0.09
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Results - Total Order

		HyperTension	Lilotane	PDDL4J-TO	PDDL4J-PO	SIADEx	p/HiPOP
AssemblyHierarchical	30	0.08	0.12	0.06	0.06	0.00	0.02
Barman-BDI	20	1.00	0.74	0.49	0.48	0.92	0.00
Blocksworld-GTOHP	30	0.43	0.63	0.43	DSQ	0.34	0.01
Blocksworld-HPDDL	30	0.89	0.02	0.00	0.00	0.00	0.00
Childsnack	30	1.00	0.87	0.46	0.46	0.50	0.00
Depots	30	0.76	0.72	0.60	0.57	0.70	0.00
Elevator-Learned	147	1.00	0.78	0.01	0.01	0.07	0.01
Entertainment	12	0.00	0.14	0.26	0.19	0.00	0.07
Factories-simple	20	0.14	0.19	0.00	0.00	0.00	0.01
Freecell-Learned	60	0.00	0.05	0.00	0.00	0.00	0.00
Hiking	30	0.83	0.60	0.39	0.31	0.00	0.00
Logistics-Learned	80	0.26	0.32	0.00	0.00	0.00	0.00
Minecraft-Player	20	0.25	0.03	0.03	0.03	0.13	0.00
Minecraft-Regular	59	0.87	0.33	0.32	0.32	0.33	0.00
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Multiarm-Blocksworld	74	0.11	0.03	0.00	0.00	0.01	0.00
Robot	20	0.96	0.52	0.27	0.27	0.00	0.05
Rover-GTOHP	30	0.92	0.54	0.62	0.59	0.77	0.14
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Total Order – Winner

HyperTensioN

Mauricio Cecilio Magnaguagno, Felipe Meneguzzi,
Lavindra de Silva

Results - Total Order - Coverage

		HyperTension	Lilotane	PDDL4J-TO	PDDL4J-PO	HPDL	pyHiPOP
AssemblyHierarchical	30	3	5	2	1	0	0.5
Barman-BDI	20	20	16	11	5.5	10	0
Blocksworld-GTOHP	30	16	22.1	16	8.5	6.6	0.5
Blocksworld-HPDDL	30	30	1	0	0	0	0
Childsnack	30	30	29	20.9	10.5	11	0
Depots	30	24	23.4	23	11.4	11	0
Elevator-Learned	147	147	147	2	1	5.5	1
Entertainment	12	0	4.6	4.6	1.5	0	0.5
Factories-simple	20	3	4	0	0	0	0.5
Freecell-Learned	60	0	7.7	0	0	0	0
Hiking	30	25	21.3	17	7.3	0	0
Logistics-Learned	80	22	43.2	0	0	0	0
Minecraft-Player	20	5	1	1	0.5	1.5	0
Minecraft-Regular	59	57.1	29.2	23	11.5	17.5	0
Monroe-Fully-Observable	20	0	20	20	9.9	3.2	0
Monroe-Partially-Observable	20	0	20	1	0.5	0	0
Multiarm-Blocksworld	74	8	4	0	0	0.5	0
Robot	20	20	11	6	3	0	0.5
Rover-GTOHP	30	30	21.3	27.5	12.8	15	3
Satellite-GTOHP	20	20	15	20	5	0	3.5
Snake	20	20	17.1	20	10	3.5	1
Towers	20	17	10	16	7.5	5.5	1
Transport	40	40	35	33.2	16.5	0.5	8.6
Woodworking	30	7	30	6	3	1.5	2
	892	544.1	537.9	270.2	126.9	92.8	22.5

Results - Partial Order (Barman-BDI was missing in initial results)

			pyHiPOP	PDDL4J-PO
Barman-BDI	20	0.92	0.00	DSQ
Monroe-Fully-Observable	25	0.24	0.00	DSQ
Monroe-Partially-Observable	25	0.05	0.00	DSQ
PCP	17	0.00	0.00	DSQ
Rover	20	0.70	0.05	DSQ
Satellite	25	1.00	0.21	DSQ
Transport	40	0.03	0.05	DSQ
UM-Translog	22	1.00	0.79	DSQ
Woodworking	30	0.10	0.13	DSQ
	224	4.04692	1.24336	DSQ

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			pyHiPOP	PDDL4J-PO
Barman-BDI	20	0.92	0.00	DSQ
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Transport	40	0.03	0.05	DSQ
UM-Translog	22	1.00	0.79	DSQ
Woodworking	30	0.10	0.13	DSQ
	224	4.04692	1.24336	DSQ

Partial Order – Runner Up

pyHiPOP

Charles Lesire, Alexandre Albore

Results - Partial Order (Barman-BDI was missing in initial results)

			pyHiPOP	PDDL4J-PO
Barman-BDI	20	0.92	0.00	DSQ
Monroe-Fully-Observable	25	0.24	0.00	DSQ
Monroe-Partially-Observable	25	0.05	0.00	DSQ
PCP	17	0.00	0.00	DSQ
Rover	20	0.70	0.05	DSQ
Satellite	25	1.00	0.21	DSQ
Transport	40	0.03	0.05	DSQ
UM-Translog	22	1.00	0.79	DSQ
Woodworking	30	0.10	0.13	DSQ
	224	4.04692	1.24336	DSQ

Results - Partial Order (Barman-BDI was missing in initial results)

		SIADEx	pyHiPOP	PDDL4J-PO
Barman-BDI	20	0.92	0.00	DSQ
Monroe-Fully-Observable	25	0.24	0.00	DSQ
Monroe-Partially-Observable	25	0.05	0.00	DSQ
PCP	17	0.00	0.00	DSQ
Rover	20	0.70	0.05	DSQ
Satellite	25	1.00	0.21	DSQ
Transport	40	0.03	0.05	DSQ
UM-Translog	22	1.00	0.79	DSQ
Woodworking	30	0.10	0.13	DSQ
	224	4.04692	1.24336	DSQ

Partial Order – Winner

SIADEx

Juan Fernández-Olivares, Ignacio Vellido Expósito

Results - Partial Order - Coverage

		HPDL	pyHiPOP	PDDL4J-PO
Barman-BDI	20	20	0	DSQ
Monroe-Fully-Observable	25	8	0	DSQ
Monroe-Partially-Observable	25	2	0	DSQ
PCP	17	0	0	DSQ
Rover	20	14	2	DSQ
Satellite	25	25	6	DSQ
Transport	40	1	3	DSQ
UM-Translog	22	22	21	DSQ
Woodworking	30	3	6	DSQ
	224	95	38	DSQ

What we offer

- Runnable singularity containers for all participating planners
- Large repository of benchmark instances (1543; IPC + further instances, not used for IPC ranking)
- Library of valid and invalid plans (to be counted)
- Unified input language (HDDL) that is understood by all planners (either directly or via translators)
- HTN plan verifier

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- Everyone who submitted domains
- All participants for their patience with us
- Thorsten Engesser and Uli Jakob (especially) for help with the GKI Cluster after Gregor broke it ... multiple times