Eighth International Planning Competition: Deterministic Part

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Disclaimer

From the IPCs 2006-11

Please note that with our evaluation by no means we intend to imply that one particular planner is better than the other ones in general. There can be other evaluation criteria that give different results.

Results of IPC 2014 will be available soon. You are strongly encouraged to analyse them and derive your own conclusion.

Apology

- IPC website:

        http://helios.hud.ac.uk/scommv/IPC-14/

- All information regarding domains, planners, data and documentation.

Acknowledgements

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- To the HPC group

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- Héctor Palacios
- Tomàs de la Rosa
- Raquel Fuentetaja

Outline

- Before we start...
- **Setting**
- Planners
- Results
- Conclusion

Competition Setting

Providing continuity with the previous competitions:

- All tracks clearly defined **before the competition**
- The scoring rules clearly stated **before the competition**
- **Blind** planner submission
- Explicit requirement to **publish source code and papers**
- **No** language extensions at all!

Planners submission

As in IPCs 2008-11:

- Planners submitted before knowing the domains
- All experiments run by the organisers
- Domains have been kept secret
- Bug fixes were possible

New in the IPC 2014:

- The **DES** system. Participants had to configure, compile and submit their system on the same premises used to run the competition.
- A special award for innovative planning techniques

The PDDL language

As in IPC 2011:

- No extensions have been introduced

But ...

- In Sequential tracks the core features that planners have to support have been extended.
- Fostering features support and promoting planners that can be easily exploited in real-world applications.

The IPC 2014 Competition tracks

Four different tracks were announced, but only three took place:

- Sequential
  - ▶ Features: action costs, negative preconditions, conditional effects
  - ▶ Objective: minimise action cost (sum of action costs)
- Agile
  - ▶ Features: action costs, negative preconditions, conditional effects
  - ▶ Objective: minimise CPU time
- Temporal
  - ▶ Features: durative actions, metric quantities
  - ▶ Objective: minimise total time (makespan)

A satisficing, optimal and multi-core subtrack were arranged for the Sequential track.

Planners

- Sequential satisficing: 43 registered, 21 submitted, 1 withdrawn
- Sequential optimal: 34 registered, 17 submitted
- Sequential multi-core: 17 registered, 9 submitted
- Agile: 21 registered, 15 submitted
- Temporal satisficing: 9 registered, 6 submitted
- Temporal optimal: 6 registered, 1 submitted, cancelled
- Preferences satisficing: 5 registered, 2 submitted, cancelled
- Preferences optimisation: 4 registered, 0 submitted, cancelled

67 planners in total from 66 people from 15 countries. Australia, Canada, Czech Republic, Finland, France, Germany, Iran, Israel, New Zealand, Spain, Switzerland, United Kingdom, Venezuela, USA.

Ranking the planners

- 10–14 domains per tracks, 20 tasks each.
- Each planner gets a score 0.00–1.00 for each solved task in every domain.
- The scoring functions (speed and quality) are the same of IPC-2011.
- Highest aggregate score wins.
- Score depends on plan quality in all the tracks but Agile, in which only CPU time is considered.
- Bounds per tracks: 30 minutes (Agile: 5 minutes), 4 Gb RAM, 200 Gb HD.

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Sequential Satisficing track (I)

- ArvandHerd: Richard Valenzano, Hootan Nakhost, Martin Müller, Jonathan Schaeffer, Nathan R. Sturtevant
- BFS(f): Nir Lipovetzky, Miquel Ramirez, Christian Muise, Hector Geffner
- BiFD: Vidal Alcázar, Susana Fernández, Daniel Borrajo
- DAE-YAHSP: Johann Dreo, Pierre Savéant, Marc Schoenauer, Vincent Vidal
- DPMPlan: Sergio Núñez, Daniel Borrajo, Carlos Linares López
- Fast Downward Cedalion: Jendrik Seipp, Silvan Sievers, Frank Hutter

Sequential Satisficing track (II)

- **Fast Downward Stone Soup 2014**: Gabriele Röger, Florian Pommerening, Jendrik Seipp
- **Fast Downward Uniform**: Jendrik Seipp, Manuel Braun, Johannes Garimort
- **Freelunch**: Tomáš Balyo
- **IBaCoP** and **IBaCoP2**: Isabel Cenamor, Tomás de la Rosa, Fernando Fernández
- **Jasper**: Fan Xie, Martin Müller, Robert Holte
- **Mercury**: Michael Katz, Jörg Hoffmann

Sequential Satisficing track (III)

- MIPlan: Sergio Núñez, Daniel Borrajo, Carlos Linares López
- NuCeLaR: Sergio Núñez, Isabel Cenamor, Jesús Virseda
- Planets: Jonathan Teutenberg
- RPT: Vidal Alcázar, Susana Fernández, Daniel Borrajo, Manuela Veloso
- USE: Reza Sadraei, Atefeh Ahmadi
- YAHSP3 and YAHSP3-MT: Vincent Vidal

Sequential Optimal track (I)

- AllPACA: Yuri Malitsky, David Wang, Erez Karpas
- cGamer: Álvaro Torralba, Vidal Alcázar, Peter Kissmann, Stefan Edelkamp
- DPMPlan: Sergio Núñez, Daniel Borrajo, Carlos Linares López
- Dynamic-Gamer and Gamer: Peter Kissmann, Stefan Edelkamp, Jörg Hoffmann
- Fast Downward Cedalion: Jendrik Seipp, Silvan Sievers, Frank Hutter
- hflow: Blai Bonet, Menkes van den Briel
- h^{++} and h_{ce}^{++}: Patrik Haslum

Sequential Optimal track (II)

- Metis: Yusra Alkhazraji, Michael Katz, Robert Mattmüller, Florian Pommerening, Alexander Shleyfman, Martin Wehrle
- MIPlan: Sergio Núñez, Daniel Borrajo, Carlos Linares López
- NuCeLaR: Sergio Núñez, Isabel Cenamor, Jesús Virseda
- RIDA: Santiago Franco, Mike Barley, Pat Riddle
- Rational Lazy A*: Erez Karpas, David Tolpin, Tal Beja, Solomon Eyal Shimony, Ariel Felner
- SPM&S: Álvaro Torralba, Vidal Alcázar, Carlos Linares López, Daniel Borrajo, Peter Kissmann, Stefan Edelkamp
- SymBA*-1 and SymBA*-2: Álvaro Torralba, Vidal Alcázar, Daniel Borrajo, Peter Kissmann, Stefan Edelkamp

Sequential Satisficing Multi-core

- **ArvandHerd**: Richard Valenzano, Hootan Nakhost, Martin Müller, Jonathan Schaeffer, Nathan R. Sturtevant
- **DAE-YAHSP**: Johann Dreo, Pierre Savéant, Marc Schoenauer, Vincent Vidal
- **IBaCoP** and **IBaCoP2**: Isabel Cenamor, Tomás de la Rosa, Fernando Fernández
- **MIPlan**: Sergio Núñez, Daniel Borrajo, Carlos Linares López
- **NuCeLaR**: Sergio Núñez, Isabel Cenamor, Jesús Virseda
- **Planets**: Jonathan Teutenberg
- **USE**: Reza Sadraei, Atefeh Ahmadi
- **YAHSP3-MT**: Vincent Vidal

Agile track (I)

- ArvandHerd: Richard Valenzano, Hootan Nakhost, Martin Müller, Jonathan Schaeffer, Nathan R. Sturtevant
- BFS(f): Nir Lipovetzky, Miquel Ramirez, Christian Muise, Hector Geffner
- Fast Downward Cedalion: Jendrik Seipp, Silvan Sievers, Frank Hutter
- Freelunch: Tomáš Balyo
- IBaCoP and IBaCoP2: Isabel Cenamor, Tomás de la Rosa, Fernando Fernández

Agile track (II)

- Jasper: Fan Xie, Martin Müller, Robert Holte
- Madagascar and Madagascar-pC: Jussi Rintanen
- Mercury: Michael Katz, Jörg Hoffmann
- PROBE and SIW: Nir Lipovetzky, Miquel Ramirez, Christian Muise, Hector Geffner
- USE: Reza Sadraei, Atefeh Ahmadi
- YAHSP3 and YAHSP3-MT: Vincent Vidal

Temporal Satisficing

- DAE-YAHSP: Johann Dreo, Pierre Savéant, Marc Schoenauer, Vincent Vidal
- ITSAT: Masood Feyzbakhsh Rankooh, Gholamreza Ghassem-Sani
- tBURTON: David Wang, Brian Williams
- Temporal Fast Downward: Patrick Eyerich, Thomas Keller, Johannes Aldinger, Christian Dornhege
- YAHSP3 and YAHSP3-MT: Vincent Vidal

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Overview

- New and old domains for previous IPCs
  - Sequential and Agile tracks: seven new domains. 14 domains
  - Temporal track: two new domains. 10 domains
- No baseline planner has been used
- Hard testing problems

  23 domains in total!

Domains

Barman	Sequential	Parking	Sequential, Temporal
Cave Diving	Sequential	RTAM	Temporal
Childsnack	Sequential	Satellite	Temporal
Citycar	Sequential	Storage	Temporal
Driverlog	Temporal	Tetris	Sequential
Floortile	Sequential, Temporal	Thoughtful	Sequential
GED	Sequential	Tidybot	Sequential
Hiking	Sequential	Tms	Temporal
Maintenance	Sequential	Transport	Sequential
Mapanalyser	Temporal	TurnandOpen	Temporal
Matchcellar	Temporal	Visitall	Sequential
Openstacks	Sequential		

(Reused domains in blue and new ones in red)

Sequential Optimal track: Results

17 planners submitted. Showing the top FIVE

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		1st
		2nd
		3rd
		4th
Dynamic-Gamer	99/280	5th

Sequential Optimal track: Results

17 planners submitted. Showing the top FIVE

		1st
		2nd
		3rd
RIDA	113/280	4th
Dynamic-Gamer	99/280	5th

Sequential Optimal track: Results

17 planners submitted. Showing the top FIVE

		1st
		2nd
SPM&S	114/280	3rd
RIDA	113/280	4th
Dynamic-Gamer	99/280	5th

Sequential Optimal track: Results

17 planners submitted. Showing the top FIVE

		1st
cGamer	120/280	**2nd**
SPM&S	114/280	3rd
RIDA	113/280	4th
Dynamic-Gamer	99/280	5th

Sequential Optimal track: Results

17 planners submitted. Showing the top FIVE

SymBA*-2	151/280	**1st**
SymBA*-1	143/280	**1st**
cGamer	120/280	**2nd**
SPM&S	114/280	3rd
RIDA	113/280	4th
Dynamic-Gamer	99/280	5th

Sequential Optimal track: Awards

Winner

SymBA*-2: Álvaro Torralba, Vidal Alcázar, Daniel Borrajo, Peter Kissmann, Stefan Edelkamp

Runner-up

cGamer: Álvaro Torralba, Vidal Alcázar, Peter Kissmann, Stefan Edelkamp

Sequential Multi-core track: Results

9 planners submitted. Showing the top FIVE

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		1st
		2nd
		3rd
		4th
NuCeLaR	83.40/280	5th

Sequential Multi-core track: Results

9 planners submitted. Showing the top FIVE

		1st
		2nd
		3rd
IBaCoP2	90.29/280	4th
NuCeLaR	83.40/280	5th

Sequential Multi-core track: Results

9 planners submitted. Showing the top FIVE

		1st
		2nd
USE	108.55/280	3rd
IBaCoP2	90.29/280	4th
NuCeLaR	83.40/280	5th

Sequential Multi-core track: Results

9 planners submitted. Showing the top FIVE

		1st
IBaCoP	121.92/280	**2nd**
USE	108.55/280	3rd
IBaCoP2	90.29/280	4th
NuCeLaR	83.40/280	5th

Sequential Multi-core track: Results

9 planners submitted. Showing the top FIVE

ArvandHerd	153.30/280	**1st**
IBaCoP	121.92/280	**2nd**
USE	108.55/280	3rd
IBaCoP2	90.29/280	4th
NuCeLaR	83.40/280	5th

Sequential Multi-core track: Awards

Winner

ArvandHerd: Richard Valenzano, Hootan Nakhost, Martin Müller, Jonathan Schaeffer, Nathan R. Sturtevant

Runner-up

IBaCoP: Isabel Cenamor, Tomás de la Rosa, Fernando Fernández

Agile track: Results

15 planners submitted. Showing the top FIVE

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		1st
		2nd
		3rd
		4th
BFS(f)	62.87/280	5th

Agile track: Results

15 planners submitted. Showing the top FIVE

		1st
		2nd
		3rd
PROBE	66.70/280	4th
BFS(f)	62.87/280	5th

Agile track: Results

15 planners submitted. Showing the top FIVE

		1st 2nd
Madagascar	67.63/280	3rd
PROBE	66.70/280	4th
BFS(f)	62.87/280	5th

Agile track: Results

15 planners submitted. Showing the top FIVE

		1st
Madagascar-pC	69.96/280	**2nd**
Madagascar	67.63/280	3rd
PROBE	66.70/280	4th
BFS(f)	62.87/280	5th

Agile track: Results

15 planners submitted. Showing the top FIVE

YAHSP3	81.62/280	**1st**
Madagascar-pC	69.96/280	**2nd**
Madagascar	67.63/280	3rd
PROBE	66.70/280	4th
BFS(f)	62.87/280	5th

Agile track: Awards

Winner

YAHSP3: Vincent Vidal

Runner-up

Madagascar-pC: Jussi Rintanen

Sequential Satisficing track: Results

20 planners. Showing the top FIVE

Sequential Satisficing track: Results

20 planners. Showing the top FIVE

Sequential Satisficing track: Results

20 planners. Showing the top FIVE

		1st
		2nd
		3rd
Jasper	144.89/280	4th
FD-Uniform	143.25/280	5th

Sequential Satisficing track: Results

20 planners. Showing the top FIVE

		1st
		2nd
MIPlan	150.00/280	3rd
Jasper	144.89/280	4th
FD-Uniform	143.25/280	5th

Sequential Satisficing track: Results

20 planners. Showing the top FIVE

		1st
Mercury	153.04/280	**2nd**
MIPlan	150.00/280	3rd
Jasper	144.89/280	4th
FD-Uniform	143.25/280	5th

Sequential Satisficing track: Results

20 planners. Showing the top FIVE

IBaCoP2	166.21/280	**1st**
IBaCoP	162.73/280	**1st**
Mercury	153.04/280	**2nd**
MIPlan	150.00/280	3rd
Jasper	144.89/280	4th
FD-Uniform	143.25/280	5th

Sequential Satisficing track: Awards

Winner

IBaCoP2: Isabel Cenamor, Tomás de la Rosa, Fernando Fernández

Runner-up

Mercury: Michael Katz, Jörg Hoffmann

Temporal Satisficing track: Results

6 submitted planners. Showing the top THREE

Temporal Satisficing track: Results

6 submitted planners. Showing the top THREE

		1st
		2nd
YAHSP3	66.6/200	3rd

Temporal Satisficing track: Results

6 submitted planners. Showing the top THREE

		1st
Temporal-FD	79.2/200	**2nd**
YAHSP3	66.6/200	3rd

Temporal Satisficing track: Results

6 submitted planners. Showing the top THREE

YAHSP3-MT	86.5/200	**1st**
Temporal-FD	79.2/200	**2nd**
YAHSP3	66.6/200	3rd

Temporal Satisficing track: Awards

Winner

YAHSP3-MT: Vincent Vidal

Runner-up

Temporal Fast Downward: Patrick Eyerich, Thomas Keller, Johannes Aldinger, Christian Dornhege

Innovative Planner Award

Two main criteria:

- Planner exploits techniques that are "new" for deterministic AI Planning.
- Planner performed reasonably well in the competition.

Innovative Planner Awards

RPT: Vidal Alcázar, Susana Fernández, Daniel Borrajo, Manuela Veloso

Mercury: Michael Katz, Jörg Hoffmann

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How far have we got?

How planners from past IPCs would have performed in IPC-8?

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How planners from past IPCs would have performed in IPC-8?

- In Sequential Satisficing track, LAMA-11 (winner of Sequential Satisficing track of IPC-7) would have been **12th** out of 21.
- In Agile track, LPG and FF would have been, respectively, **13th** and **17th** out of 17.

The take-home messsage

- A large number of high-performance planners is available, mainly because of the availability of well documented and supported platforms (FD, FF, ..)
  - ▶ 29 planners out of 67 built on top of FD.
- Portfolio-based systems are now a concrete reality.
  - ▶ 29 portfolios in IPC-8; 3 awarded.

On the other hand...

The take-home messsage

- A large number of high-performance planners is available, mainly because of the availability of well documented and supported platforms (FD, FF, ..)
  - ▶ 29 planners out of 67 built on top of FD.
- Portfolio-based systems are now a concrete reality.
  - ▶ 29 portfolios in IPC-8; 3 awarded.

On the other hand...

- We observed a worrying small number of planners able to deal with preferences and temporal models.

Our two cents for the next IPC

- Organising the IPC is an enriching experience. (Sometimes we also had time to sleep).
- Increase testing instances complexity:
  - Extend the set of required core features
  - Use real-world problems
- Allow participants to test and compile their systems on the competition premises.
- Relate to other competitions (ICKEPS?)
- Do not allow another three years gap!

Congratulations to the winners!