Scheduling and Planning Applications woRKshop (SPARK)

http://icaps17.icaps-conference.org/workshops/SPARK/
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Remarks

1. Breadth of applications (e.g., space, Logistics Transportation, Manufacturing, Robotics and Motion Planning, E-Learning, Web service composition, Story building, Military Training ,…)

2. SPARK as a feeder for many of the other workshops at ICAPS:
   - User Interfaces and Scheduling and Planning (UISP)
   - Knowledge Engineering workshop (KEPS)
   - Planning and Robotics (PlanRob)
   - Integrated Execution of Planning and Acting (IntEx)

SPARK Topics

- Novel domains and benchmark or challenge problems
- Experiences in deploying P&S systems
- Comparison with previously existing technologies and/or systems
- Integration of multiple sources of knowledge and reasoning schemes
- Modeling and domain model acquisition
- Handling dynamic and uncertain sources of knowledge
- Algorithmic and technological issues
- Plan execution and replanning
- Mixed initiative approaches
- User interface design, visualization and explanation
- Machine learning methodologies applied to P&S systems
- Engineering, deployment, and maintenance
- Evaluation, testing, and validation
- Assessment of impact on end users

Accepted Papers

Accepted Papers as a long presentation (25 min)

- John Bresina, Paul Morris, Matt Deans, Tamar Cohen and David Lees. Traverse Planning with Temporal-Spatial Constraints
- Sandhya Saisubramanian, Shlomo Zilberstein and Prashant Shenoy. Optimizing Electric Vehicle Charging Through Determinization.
- Shirin Sohrabi, Anton Riabov and Octavian Udrea. Planning-based Scenario Generation for Enterprise Risk Management.
- Sachini Weerawardhana and Mark Roberts. Domain-independent Metrics for Deciding When to Intervene.
- Davide Venturelli, Minh Do, Eleanor Rieffel and Jeremy Frank. Temporal Planning for Compilation of Quantum Approximate Optimization Algorithm Circuits.

Accepted Papers as a short presentation (15 min)

- Sven Koenig and T. K. Satish Kumar. A Case for Collaborative Construction as Testbed for Cooperative Multi-Agent Planning.
- Saad Khan and Simon Parkinson. Towards Automated Vulnerability Assessment.
- Evridiki Ntagiou, Claudio Iacopino, Nicola Policella, Roberto Armellin and Alessandro Donati. Coverage Planning for Earth Observation Constellations.

Applications Presented in SPARK 2017

- Traverse planning, earth observation satellite – space application
- Cooperative multi-agent planning – robotics application
- Vulnerability assessment, deciding when to intervene - security application
- Optimizing electric vehicle charging
- Planning in enterprise risk management
- Quantum computing

P&S Community

1. NASA:
   - Cockpit Hierarchical Activity Planning and Execution (CHAP-E)
   - Traverse planning
2. CESNET, Masaryk University, Czech Republic
   - Batch Job Scheduling with Local Search
   - UniTime, comprehensive academic scheduling solutions
3. The University of Auckland
   - Robots Collaborating with Humans
4. Univ. Carlos III de Madrid
   - Planning for operations of an ESA Mars rover
   - Planning for Children rehabilitation with NAOs
   - Planning for social robots applied to geriatric tests
   - Planning for traffic control
   - Planning for conversational bots
5. Purdue University
   - UniTime, comprehensive academic scheduling solutions

Cockpit Hierarchical Activity Planning and Execution (CHAP-E)

J. Benton, David E Smith, John Kaneshige, Leslie Keely, Thomas Stucky
NASA Ames Research Center

Objective: Decision support and procedure execution for airliner cockpits

Capabilities:

- Monitoring pilot/co-pilot activities during approach and landing
- Performing pilot/co-pilot activities
- Displaying procedures on Gantt-like display below the vertical profile

Current challenges:

- Continuous nonlinear – requires constant simulation to verify viability of plan
- Event driven – actions are triggered by indirectly controllable events (altitudes, airspeeds, waypoints)
- Difficult monitoring – sampling is required to determine allowed and preferred time windows

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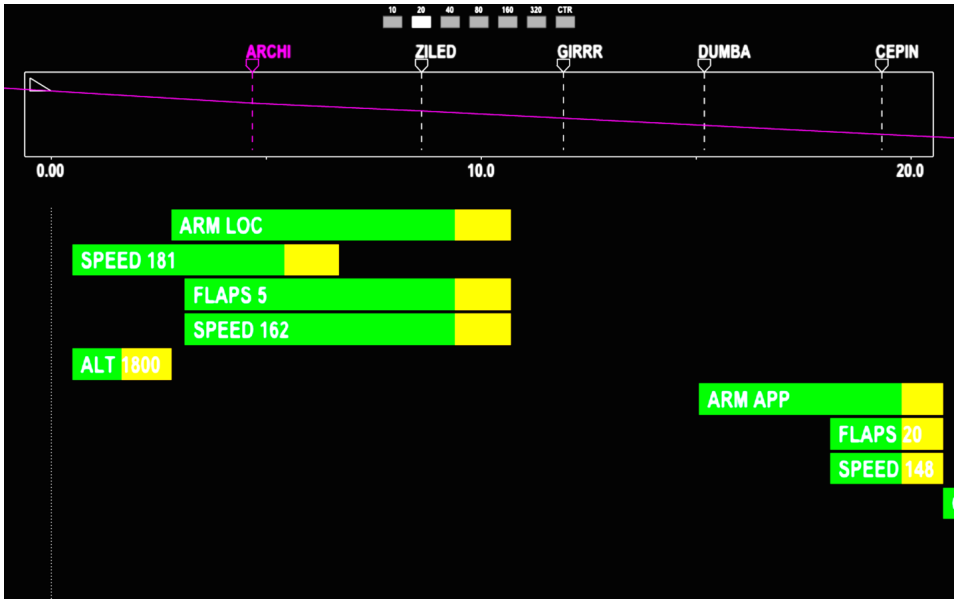
Example tasks:

- Flap & gear deployment, arming approach
- Setting autopilot mode, altitudes, airspeed
- Settings autobrakes
- Engaging speedbrakes
- Entering transitions/approaches in Flight Management System (FMS)
- Verifying speed & profile compliance



Application: RP Mission

- *Team:* J.L. Bresina[*] (lead), P.H. Morris[*], M.C. Deans[*], T.E. Cohen[+], D.S. Lees[+] ([*]NASA / [+]SGT, Inc.)
- *Problem Investigated:* Planning rover traverses in a domain with temporal-spatial constraints
- *Reference Mission:* Resource Prospector (RP)
  - NASA rover mission to assess feasibility of in-situ resource utilization on the lunar surface
  - Characterize distribution of water and other volatiles at the poles of the moon
  - Mission Constraints:
    - *Sun:* Stay in sunlight for solar power (temporal-spatial)
    - *DTE:* Stay in direct-line-of-site of Earth for communication (temporal-spatial)
    - *Slope:* Avoid slopes greater than 15 degrees (spatial)

Batch Job Scheduling with Local Search

Dalibor Klusáček[1], Hana Rudová[2], Václav Chlumský[1]
[1]CESNET, Czech Republic [2]Masaryk University, Czech Republic

- **Advanced batch job scheduler** for HPC clusters
  - **Job schedule replaces traditional job queues**
  - **Optimization** using time-efficient **local search**
- **Multi-criteria optimization**
  - **System performance** (utilization, job slowdown, job wait time)
  - **User-oriented metrics** (user-to-user fairness)
- **Goal: to improve predictability and system performance**
  - with respect to the **previously used queue-based scheduler**
- Research started in 2007
- **In production since 2014 in *CERIT-SC* system**
  - *CERIT-SC* is the largest partition of the Czech national distributed computing infrastructure (~5,200 CPUs in 8 clusters)

Applications at PLG (Planning and Learning Group) Univ. Carlos III de Madrid)

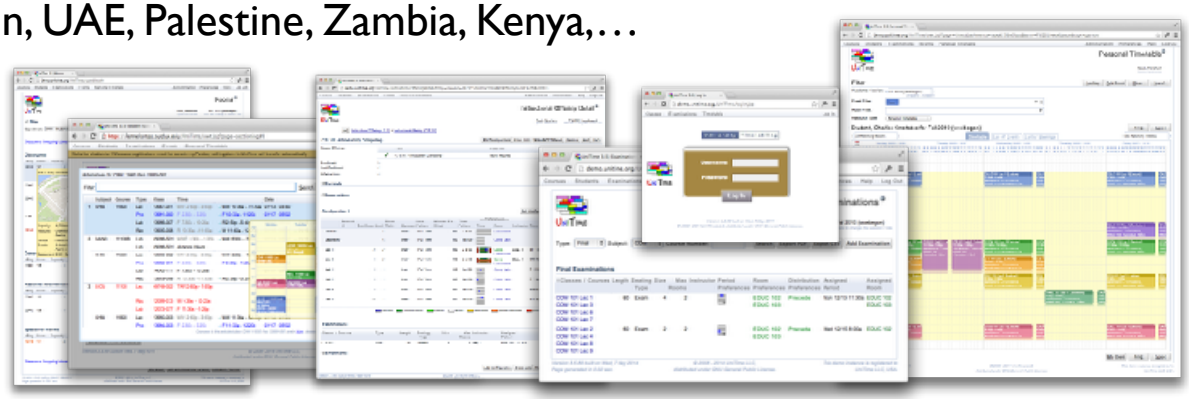
- Planning operations of an ESA Mars rover
- Planning for Children rehabilitation with NAOs
- Planning for social robots applied to geriatric tests
- Planning for traffic control
- Planning for conversational bots

uc3m

[plg]

UniTime

- Comprehensive academic scheduling solution
- Four components: course timetabling, examination timetabling, student scheduling, and event management
- Open source, web-based, written in Java using modern technologies
- Constraint-based model with hybrid search heuristics
- Research started in 2001, first used at Purdue University in 2005, Apereo Foundation project since 2015
- 55 institutions from 40 countries use UniTime in production
  - USA, Czech Republic, Pakistan, Croatia, Poland, Turkey, Peru, Kuwait, Canada, Malaysia, Spain, UAE, Palestine, Zambia, Kenya,…



www.unitime.org

SiGAPS

Main » Contacts

Contacts

Administrators of this wiki

- Minh Do (SGT & NASA ARC)
- Cesar Guzman (UPV & NASA ARC Collabor
- Patrik Haslum (ANU & NICTA)
- Michael Katz

users.cecs.anu.edu.au/~patrik/sigaps/index.php?n=Main.HomePage

SiGAPS

SIGAPS Home
People/Contact

Application Developers
What is AI P&S?
Deployed Applications

Planning Researchers
Real Planning Domains
SPARK Workshop Series

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Main » HomePage

SIGAPS Home

The Special Interest Group for Applications of AI Planning and Scheduling (SIGAPS) aims to widen awareness of AI P&S technology, tackling application problems. This web site is our first initiative.

Application Developers

Interested in finding out if (and how) AI planning and scheduling can help to solve your problem?

- A short introduction to AI P&S
- Success stories: Examples of deployed applications using AI P&S
- Tips and tutorials on modelling for planning?
- Planning systems?: Links, usage hints, etc.

Planning Researchers

Resources for planning researchers who wish to find out more about how their solutions can be applied.

- Real (or at least realistic) Planning Domains
- The SPARK series of workshops is a good forum for publishing applied work.

SiGAPS: Deployed Applications

1. SPACE Applications (e.g., Remote Agent, NASA)
2. Logistics Transportation (e.g., TIMIPLAN, Universidad Carlos III de Madrid)
3. Manufacturing (e.g., PARC printer, PARC)
4. Robotics and Motion Planning
5. E-Learning (e.g., mPTutor)
6. Web service composition (e.g., MARIO, IBM)
7. Story building (Julie Porteous)
8. Military Training (Carmel & Erez)
9. Petrobas pipeline (Daniel Ferber @ ICAPS'12)

….

http://users.cecs.anu.edu.au/~patrik/sigaps/index.php?n=Main.DeployedApplications

SiGAPS: Real and Realistic Planning Domains

- Genome Rearrangement
- Machine Tool Calibration Problem
- Liner Shipping Fleet Repositioning Problem
- Home Theatre Assembly Task
- Cell Assembly Planning Problem

http://users.cecs.anu.edu.au/~patrik/sigaps/index.php?n=Main.RealDomains

Schedule

9:00	**Session 1**
	Welcome
	Domain-independent Metrics for Deciding When to Intervene *Sachini Weerawardhana and Mark Roberts*
	Optimizing Electric Vehicle Charging Through Determinization *Sandhya Saisubramanian, Shlomo Zilberstein and Prashant Shenoy*
	Towards Automated Vulnerability Assessment *Saad Khan and Simon Parkinson*
10:30	Coffee Break
11:00	**Session 2**
	Invited Talk: An Architecture for Knowledge Representation and Interactive Learning of Domain Axioms in Robotics ***Mohan Sridharan.***
	Temporal Planning for Compilation of Quantum Approximate Optimization Algorithm Circuits *Davide Venturelli, Minh Do, Eleanor Rieffel and Jeremy Frank*
12:15	Lunch

Schedule

12:15	Lunch
13:50	**Session 3**
	Invited Talk: Human-Planning Teaming in Applications: When Full Autonomy is Too Much! ***Daniele Magazzeni***
	Planning-based Scenario Generation for Enterprise Risk Management *Shirin Sohrabi, Anton Riabov and Octavian Udrea*
	Traverse Planning with Temporal-Spatial Constraints *John Bresina, Paul Morris, Matt Deans, Tamar Cohen and David Lees*
15:30	Coffee Break
16:00	**Session 4**
	Coverage Planning for Earth Observation Constellations *Evridiki Ntagiou, Claudio Iacopino, Nicola Policella, Roberto Armellin and Alessandro Donati*
	A Case for Collaborative Construction as Testbed for Cooperative Multi-Agent Planning *Sven Koenig and T. K. Satish Kumar*
	Panel Discussion

Panel Discussion

- Panelists: Anton Riabov (IBM), David Smith (NASA), Mohan Sridharan (The University of Auckland), Daniele Magazzeni (King's College London)

Sample Questions:

- What are some application areas that haven't been explored yet? Why?
- Most examples of domains that feature successfully deployed P&S applications have very little direct interaction with humans once the plans are generated; are we shying away from including humans in the loop? What are the challenges to accommodate them?
- What are some important plan visualization and explanation features that might improve the integration of P&S techniques with applications?

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Thank you

Program committee

- Chiara Piacentini (University of Toronto)
- Christophe Guettier (SAFRAN)
- Gabriella Cortellessa (CNR-ISTC, National Research Council of Italy)
- Minh Do (NASA Ames Research Center)
- Mark Johnston (JPL/California Inst. of Technology)
- Mauro Vallati (University of Huddersfield)
- Lukas Chrpa (University of Huddersfield)
- Alexandre Albore (Onera & INRA)
- Ramiro Varela (University of Oviedo)
- Simone Fratini (European Space Agency - ESA/ESOC)
- Bram Ridder (King's College London)
- Terry Zimmerman (University of Washington - Bothell)
- Tiago Stegun Vaquero (MIT and Caltech)
- Angelo Oddi (ISTC-CNR, Italian National Research Council)
- Riccardo Rasconi (ISTC-CNR)
- Nicola Policella (ESA/ESOC)
- Patrik Haslum (Australian National University)