

**POMDP Practitioners workshop: solving
real-world POMDP problems**

DISCUSSION

Workshop at ICAPS 2010,
May 12, 2010
Toronto, Canada

Discussion points

1. What are the key computational challenges?
2. What are the key application challenges?
3. Many practical problems are well-stated as POMDPs, but do not lend themselves to POMDP-type solutions. Why?
4. With what types of applications can we have the most impact?
5. List of available software packages.
6. Suggestions of future events for the community

Computational challenges

- Approximate tracking / planning
- “Lifted” (first-order) representations
 - See Scott Sanner’s work
- Non-Gaussian continuous domains
- More tools for visualizing policies

Applications challenges

- Tools for specifying / designing the model
- Preference/reward elicitation
- Selecting the appropriate time granularity
- Explain the action (to convince someone)
- Whether and how to discretize

Jason's comment

- Many practical problems are well-stated as POMDPs, but do not lend themselves to POMDP-type solutions. Why?

Impractical because of global solutions

Even non-POMDP solutions to POMDP should be called POMDP-type solutions (Pascal)

Mausam: POMDP solution should be applicable for a range of domains

Figure out what approximation the non-POMDP solutions use for POMDP domain

Representation is nice per s'e, no matter how we solve it

Doing the belief update already is nice

Types of applications to target

- Healthcare
- Robotics
- Dialogue systems
- SmartGrid/Sustainability
- Tutoring
- Human-machine interactions
- Entertainment or games

Do we have benchmark problems from real applications

-Amin Atrash: dialogue

-Pascal Poupart: handwashing

-Do the domains require the actions to be executed by humans or the system?

Available software packages

Name of package	Creators	Language	Comments
ZMDP	T. Smith	C++	
Symbolic HSVI	KAIST		Factored representation
APPL / Sarsop	Nat.Uni.Singapore	C++	
Perseus	M. Spaan / N. Vlassis	Matlab	
MADP Toolbox	F. Oliehoek / M. Spaan	C++	Multi-agent (DEC-POMDPs) / Perseus
Symbolic Perseus	P. Poupart	Matlab / Java	Factored representation
libPOMDP	D. Maniloff	Java/Matlab	
pomdp-solve	T. Cassandra	C	Exact methods, grid-based approximations
libpg / fpg	O. Buffet	C++	Policy gradient fpg is factored
Carmen / OpenMarkov	M. Arias / F. J. Diez (UNED)	Java	Factored representation

Fileformats:

- Tony's format
- SPUDD format
- POMDPX (singapore)
- XDSL Smile

-Present in table: language, authors, representation, capabilities

Future events

- Tutorials targeted at specific application communities
- Joint meeting with the Bayes Nets (+DBN) community
- Special issue journal on solving real-world POMDP problems

Do we need a home conference

Link with UAI

POMDP Track at ICAPS?

AAAI Spring symposium?

Link with OR community (informs)