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

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