Processing Narratives by Means of Action Languages

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Narratives and Action Verbs

• **Narrative**: A sequence of sentences retelling a story in past tense.
• **Action Verbs**: Verbs that express either physical or mental acts performed by a sentence’s subject or clause.

1. John *travelled* to the hallway.
2. Sandra *journeyed* to the hallway.
3. John *got* the ball there.
The ability to combine facts from the narrative with a human’s commonsense knowledge about actions and their effects convert narrative-based Question Answering from a simple human task to a difficult task for modern AI agents.
What Are We Doing About It?

• **Knowledge Representation and Reasoning (KRR):** A subfield of artificial intelligence dedicated to representing information about the world in a format usable by an AI agent to reason about and solve complex tasks.

• **Natural Language Processing (NLP):** A branch of artificial intelligence that helps computers understand, interpret, and manipulate human language.
System Text2ALM

Text2DRS Processing
- Narrative Text
  - Text2DRS
  - DRS

DRS2ALM Processing
- CoreCALMLib
- ALM Logic Program
  - DRS2ALM
- CALM
  - Model
  - CALM
  - Interpreter
  - Revised Model
  - Sphinx

QA Processing
- Result

4/12/2019
Evaluation

• Narratives and questions from the QA bAbI tasks (Weston et al., 2015)
  • Standard benchmark for QA systems

Task 2: Two Supporting Facts Example
1 Mary moved to the bathroom.
2 Sandra journeyed to the bedroom.
3 Mary got the football there.
4 John went to the kitchen.
5 Mary went back to the kitchen.
6 Mary went back to the garden.
7 Where is the football? garden 3 6
<table>
<thead>
<tr>
<th>bAbl Task</th>
<th>AM+NG+NL MemNN (Weston et al., 2015)</th>
<th>Text2ALM</th>
<th>Size of Training Set for AM+NG+NL MemNN</th>
<th>Size of Training Set for Text2ALM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Single Supporting Facts</td>
<td>100.0</td>
<td>100.0</td>
<td>250</td>
<td>100</td>
</tr>
<tr>
<td>2 – Two Supporting Facts</td>
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<td>100.0</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>3 – Three Supporting Facts</td>
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<td>500</td>
<td>100</td>
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<tr>
<td>5 – Three Argument Relations</td>
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<td>22.0</td>
<td>1000</td>
<td>100</td>
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<tr>
<td>6 – Yes/No Questions</td>
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<td>500</td>
<td>100</td>
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<td>7 – Counting</td>
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<td>96.1</td>
<td>1000</td>
<td>100</td>
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<td>8 – Lists/Sets</td>
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<td>100.0</td>
<td>1000</td>
<td>100</td>
</tr>
</tbody>
</table>
Conclusion

• Combine advancements in NLP and KR to build Text2ALM system
  • Take an action-based narrative as input and output a model encoding the narrative’s facts
  • Conduct QA ability on the model
• Matched or exceeded state-of-the-art machine learning approach in 6/7 of the tested bAbI tasks
  • Used far fewer training questions
Future Work

• Web Interface
• Expand Text2ALM’s narrative processing capabilities
• Expand Text2ALM’s question answering ability
Thesis Defense

• Processing Narratives by Means of Action Languages
• Tuesday, April 9: 11am – 12pm
• PKI Room 279

• [https://github.com/cdolson19/Text2ALM](https://github.com/cdolson19/Text2ALM)
References


Questions?