A Logic-based Approach To Multimedia Interpretation

Dissertation Presentation

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Hamburg, 28th of February 2011
Agenda

• Motivation and Research Objectives
• My Approach in Detail
• Case Studies and Evaluation
• Summary and Outlook
Cognitive Robotics

Agent

Sensors

Actuators

Environment

Percepts

Actions
Multimedia Interpretation

Software Agent

Analysis

Interpretation

Multimedia Repository

Documents

Retrieval

r (a, b)
Multimedia Interpretation

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Multimedia Repository

Person, Pole
Pole Vault Trial
Processing Pipeline

1. Surface-level Information Identification
2. Multimedia Interpretation
   - Symbolic descriptions
   - Deep symbolic descriptions
3. Model
Thesis

- Develop a logic-based approach
- Implement & Evaluate
Multimedia Interpretation In Detail
Interpretation through abduction

**Abduction** Reason from observations (evidence) to explanations  \( \Sigma \cup \Delta \models \gamma \)
Abduction: Key problems -> Solutions

• Definition of the space of abducibles
  -> Rules
• Limiting the number of explanations
  -> Preference relation
An Interpretation Example

Yelena Isinbayeva of Russia on her way to victory
(Getty Images)
Interpretation Example Continued

N2: Pole Vault Trial
N1: Person
F1: Face
B1: Body
P1: Pole
Interpretation Example Continued

N1: Person, Pole Vaulter
N2: Pole Vault Trial

F1: Face
B1: Body
P1: Pole
Interpretation Example Continued

Yelena Isinbayeva of Russia on her way to victory
(Getty Images)
Interpretation Example Continued

Yelena Isinbayeva of Russia on her way to victory (Getty Images)

N1: Person, Pole Vaulter
F1: Face
B1: Body
P1: Pole
PN1: Person Name
C1: Country Name

N2: Pole Vault Trial

N3: Person, Pole Vaulter
Personal Contributions

**Abduction** Definition of the preference relation & the strategy parameter

**Interpretation** Development & Implementation

**Fusion** Development & Implementation

Evaluation
Case Studies and Evaluation

**Scenario** Text analysis results (ABoxes) of 500 webpages with athletics news

**Runtime Performance and Scalability**
Time spent $\rightarrow$ runtime performance
Increase in analysis ABox size $\rightarrow$ scalability
Case Studies and Evaluation

\[ x = \text{number of fiat assertions} \]
\[ y = \text{time spent in minutes} \]

\[ x = \text{number of all assertions} \]
\[ y = \text{time spent in minutes} \]
Case Studies and Evaluation

**Scenario** 100 webpages with athletics news

**Quality of Interpretation Results**
Compare human-annotated versus automatically generated ABoxes (precision and recall)

**Results**
High-quality rich semantics descriptions
Summary

• For the MMI Problem: Solution proposed
• Several alternatives: Search space combinatorial
• Proposed solution implemented: Useful results
• Intelligent CMS (PhD Thesis Espinosa 2011)
• CASAM project
• Publications
Publications (Peer-reviewed)

Book Chapters


Journal Articles


Conference Papers

Publications (Peer-reviewed)

Conference Papers


Workshop Papers


Publications (Peer-reviewed)

Workshop Papers


Outlook

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Thank you for your attention