Reasoning on Contextual Hierarchies via ASP with Algebraic Measures

L. Bozzato[1], T. Eiter[2], R. Kiesel[2], L. Serafini[1], P. Schueller[2]
[1] Fondazione Bruno Kessler, [2] Technical University of Vienna
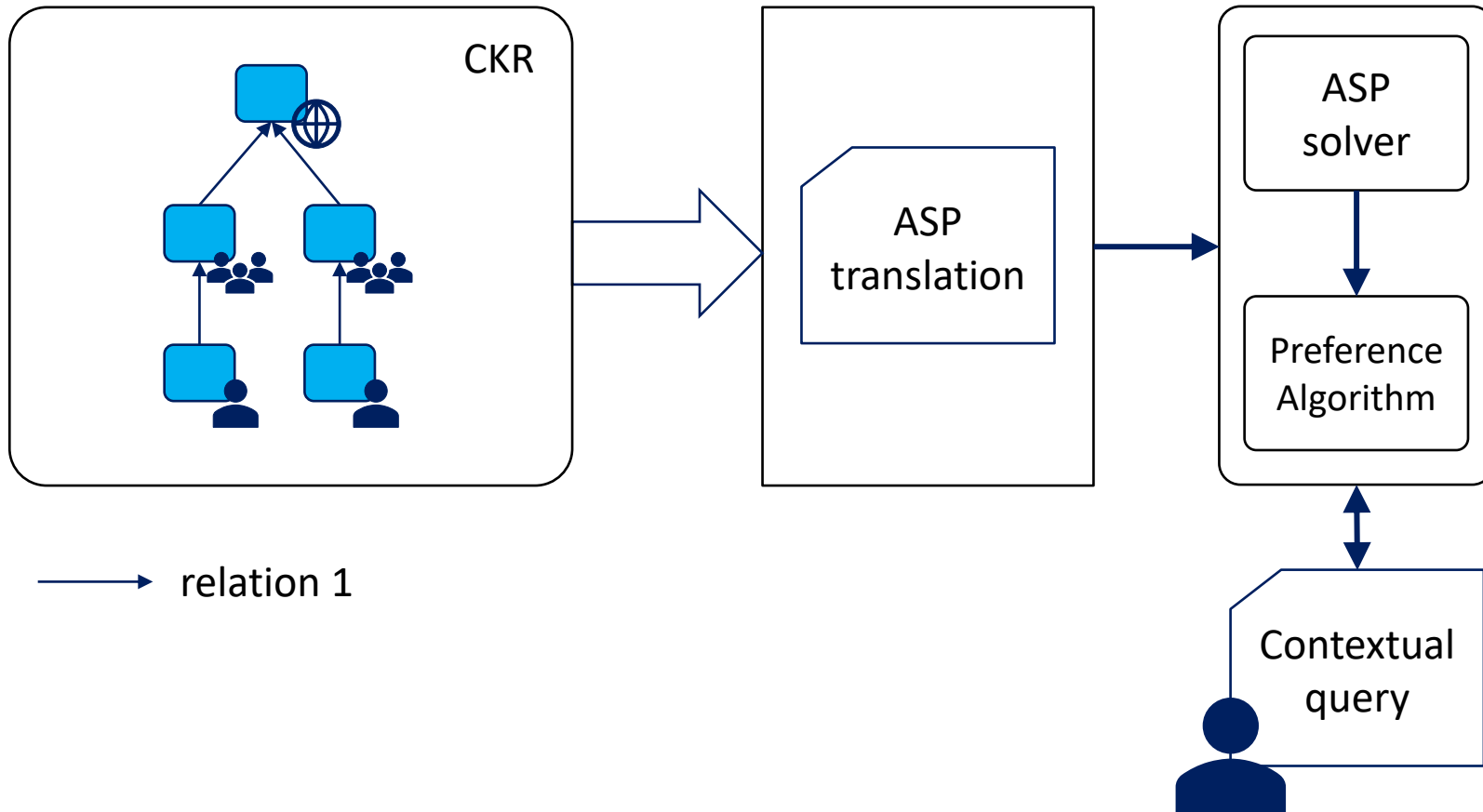HumanE-AI-Net, Work Package 1 Micro-Project

Objectives

- Reasoning on complex Contextualized Knowledge Bases

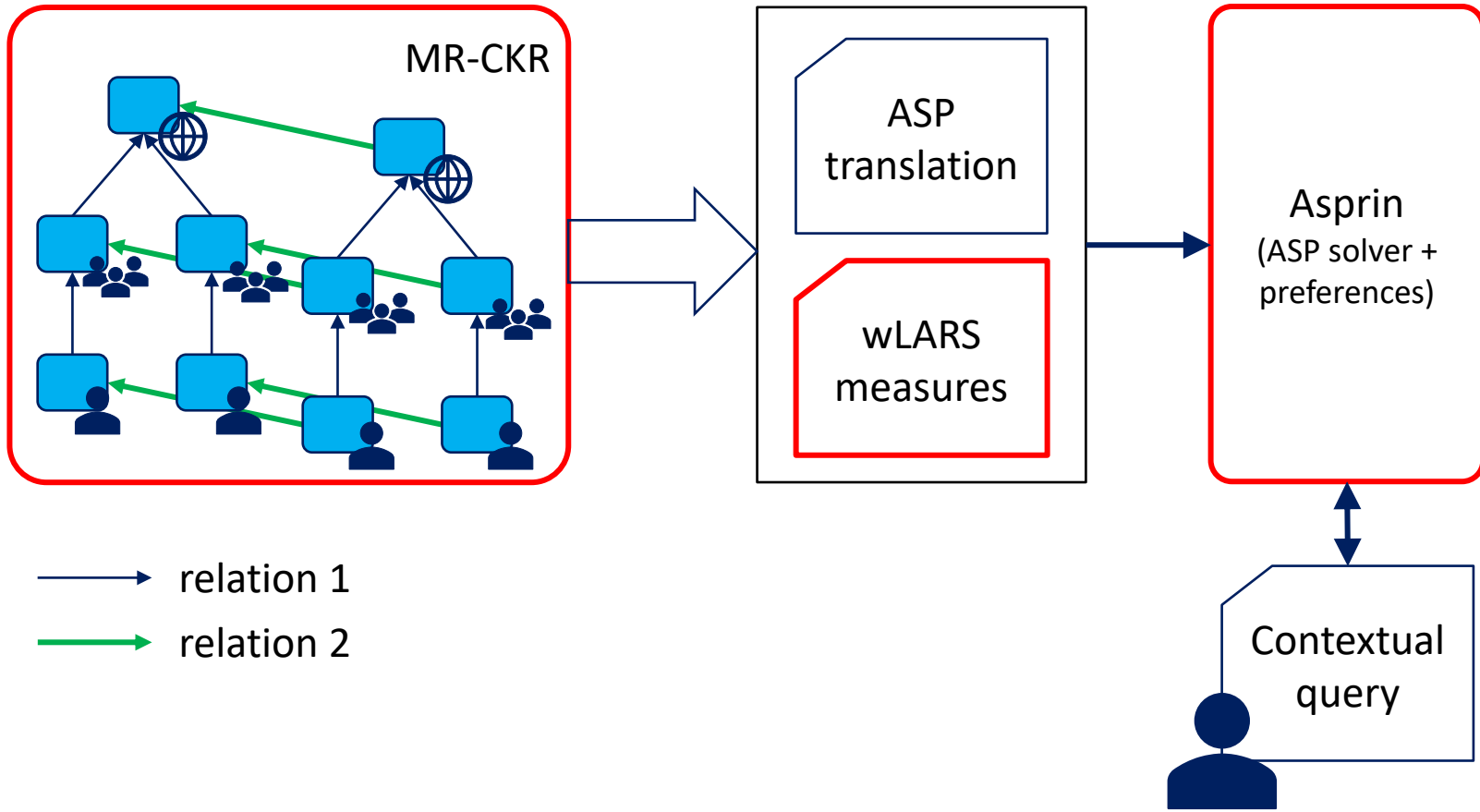- Show capabilities of ASP with Algebraic Measures

https://www.humane-ai.eu

Relevance of the problem

- AI in general: combination of
  - reasoning on contextualized DL Knowledge Bases (CKR)
  - extensions of Logic Programming for numerical measures (wLARS)

- The HumanE AI vision:
  - Adaptable AI system for reasoning in complex (social) settings
  - Shows interface across ontological and rule-based resoning areas of AI

- WP1: Human-in-the-Loop ML, Reasoning and Planning
  - Combination of symbolic and numeric methods for complex scenarios
  - Uncertainty modelling, data can "override" initial symbolic definition

Preliminary Work

CKR

ASP translation

ASP solver

Preference Algorithm

Contextual query

relation 1

https://www.humane-ai-net.eu

Contributions

https://www.humane-ai-net.eu

Contributions

- Main goal: reasoning on multi-relational CKR with numeric/algebraic measure expressions

- Advances:

  - Multi-relational CKR with justifiable exceptions
    Different contextual relations and interpretations of defeasibility

  - Extension of datalog translation with wLARS
    Combination of model preference via algebraic measure expressions

  - Asprin-based implementation of query answering
    Instance of multi-relational CKR with combination of simple preferences

  - Aggregated queries based on wLARS
    Shows capabilities of wLARS of reasoning on model aggregation

Envisioned results

- **MP expected output:**

1) **Prototype implementation:** reasoning service over MR-CKR

2) **Report on formalization:** report and paper on formalism and prototype

- **Users:** KR community, KG and ASP applications

- **Distributed on:** AI4EU platform, publications

- **MP development steps:**

1) Formalization of MR-CKR

2) Realization of wLARS reasoning tasks

3) PoC Prototype implementation