

User Experience, Ambient intelligence and Virtual Reality in an Industrial Maintenance domain using Protégé

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Roadmap

Problem Statement

Conceptual basis and background

- Knowledge modeling using ontologies
- SOUPA (Standard Ontology for Ubiquitous and Pervasive Applications)
- Virtual Reality and Augmented Reality in the Industrial Maintenance Environment
- The Set of Experience Knowledge Structure

The UDKE System

Application scenario

- Implementation issues

Conclusions and Acknowledgements

Problem statement

Industrial Maintenance can be defined as the combination of all technical and administrative actions, including supervision actions, intended to retain an entity in, or restore it to, a state in which it can perform a required function.

According to Honkanen, machines have to be maintained in order to increase reliability and thereby avoid production disturbances. It is, therefore, assumed that the purpose of a single maintenance action is to increase reliability

Problem statement

Some research involving the implementation of **Virtual and Augmented Reality** to extend the user's understanding of the maintenance system have been presented.

Most of these approaches, miss the potential of using knowledge based theories in the domain that might enhance the **user's experience**.

This **user**, in our case, is the maintenance worker, whose special needs include mobility, fast response and immediate access to the relevant data, like specifications, historical records, etc.

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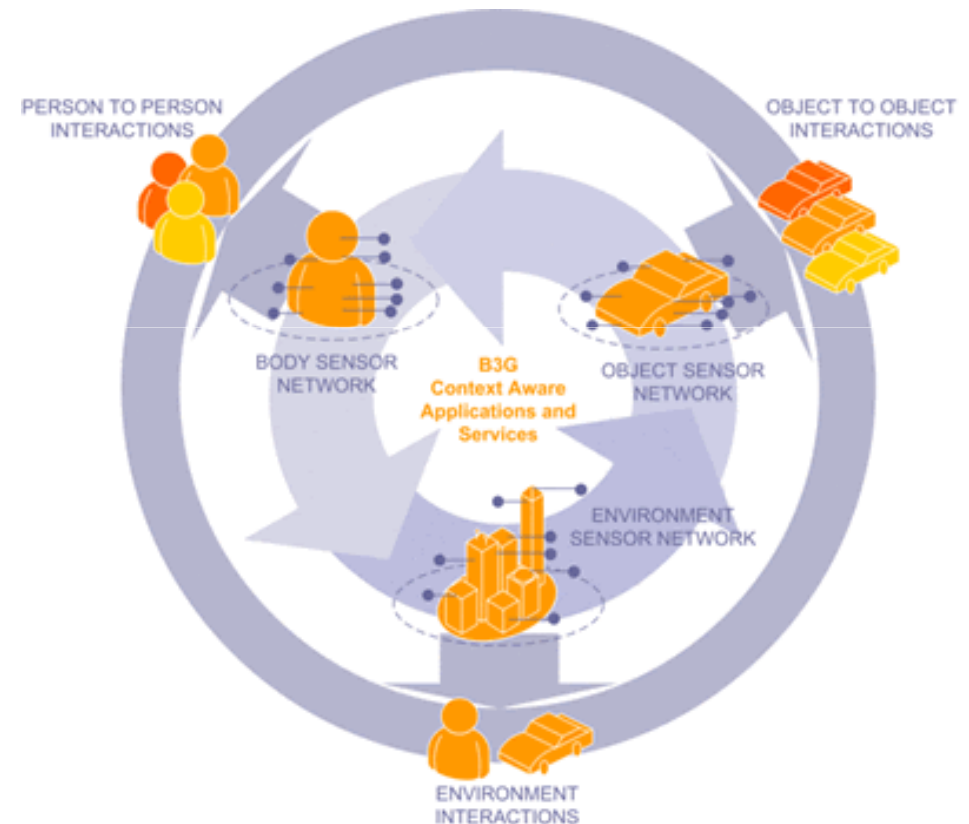
Conclusions and Acknowledgements

Conceptual basis and background

SOUPA (Standard Ontology for Ubiquitous and Pervasive Applications)

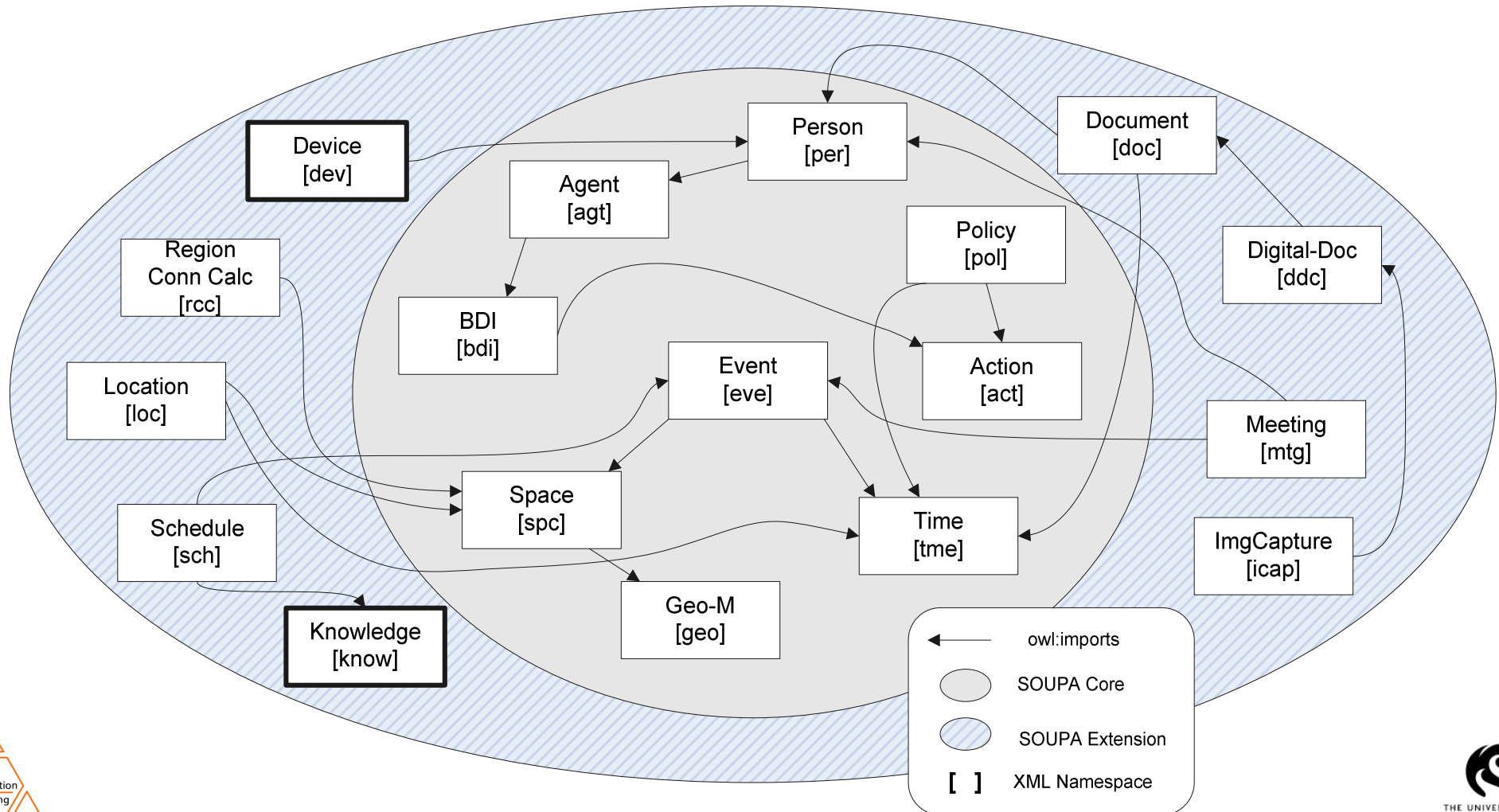
SOUPA is a shared ontology designed to model and support pervasive computing applications (ambient intelligence).

It consists of two distinctive but related set of ontologies, called SOUPA Core and SOUPA Extension



Conceptual basis and background

SOUPA schema



Conceptual basis and background

Virtual Reality and Augmented Reality in the Industrial Maintenance Environment

Virtual Reality (VR) is a virtual environment where the user is immersed in a virtual world in which the elements hold the physical resemblance to possible objects belonging to the real world.

Augmented Reality (AR) combines real and virtual objects in a real environment enhanced with computer generated graphics, running interactively, in real time, and aligns real and virtual objects with each other.

Conceptual basis and background

Virtual Reality and Augmented Reality in the Industrial Maintenance Environment



Conceptual basis and background

The Set of Experience Knowledge Structure

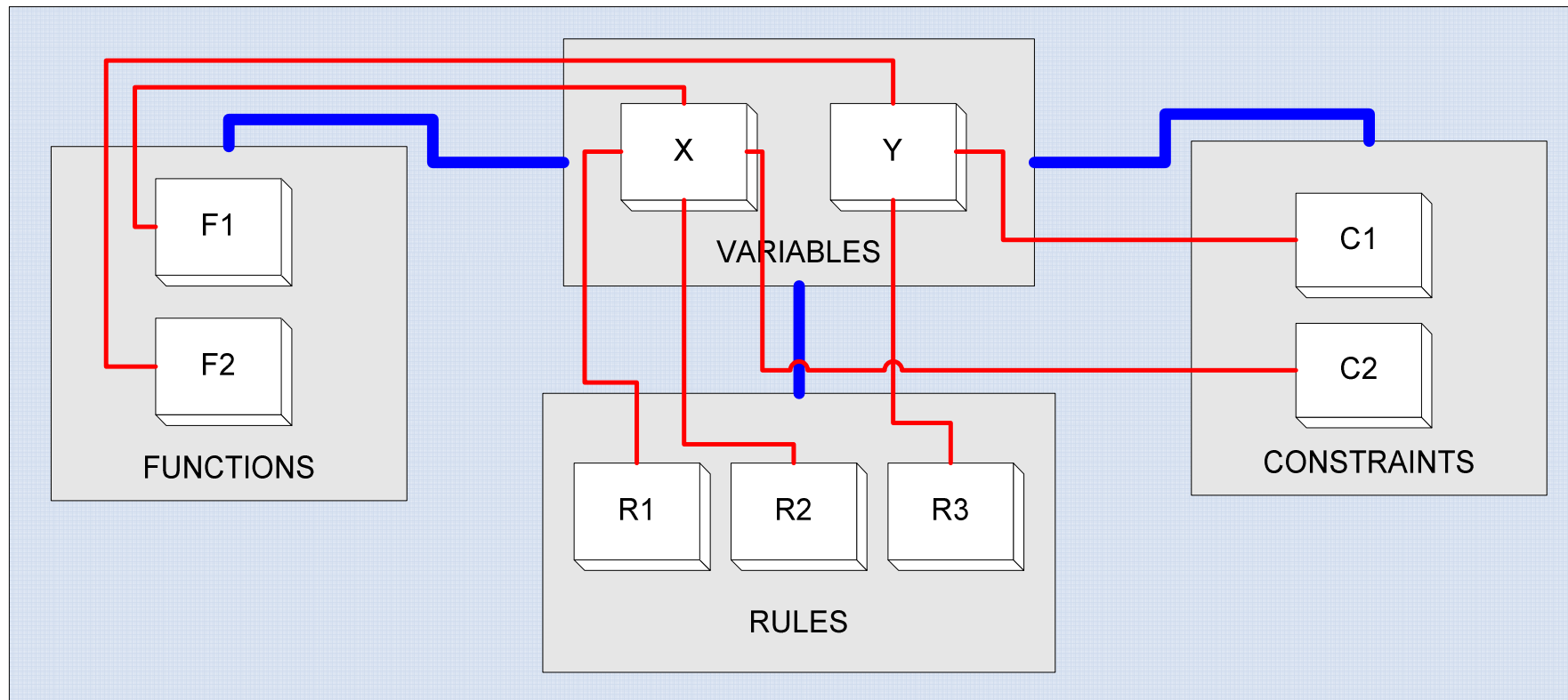
The Set of Experience Knowledge Structure (SOEKS) is an experience tool able to collect and manage explicit knowledge of different forms of formal decision events.

The SOEKS has been developed as part of a platform for transforming information into knowledge named Knowledge Supply Chain System.

In the SOEKS, there are four basic components: variables, functions, constraints and rules associated and stored in a combined dynamic structure.

Conceptual basis and background

The Set of Experience Knowledge Structure



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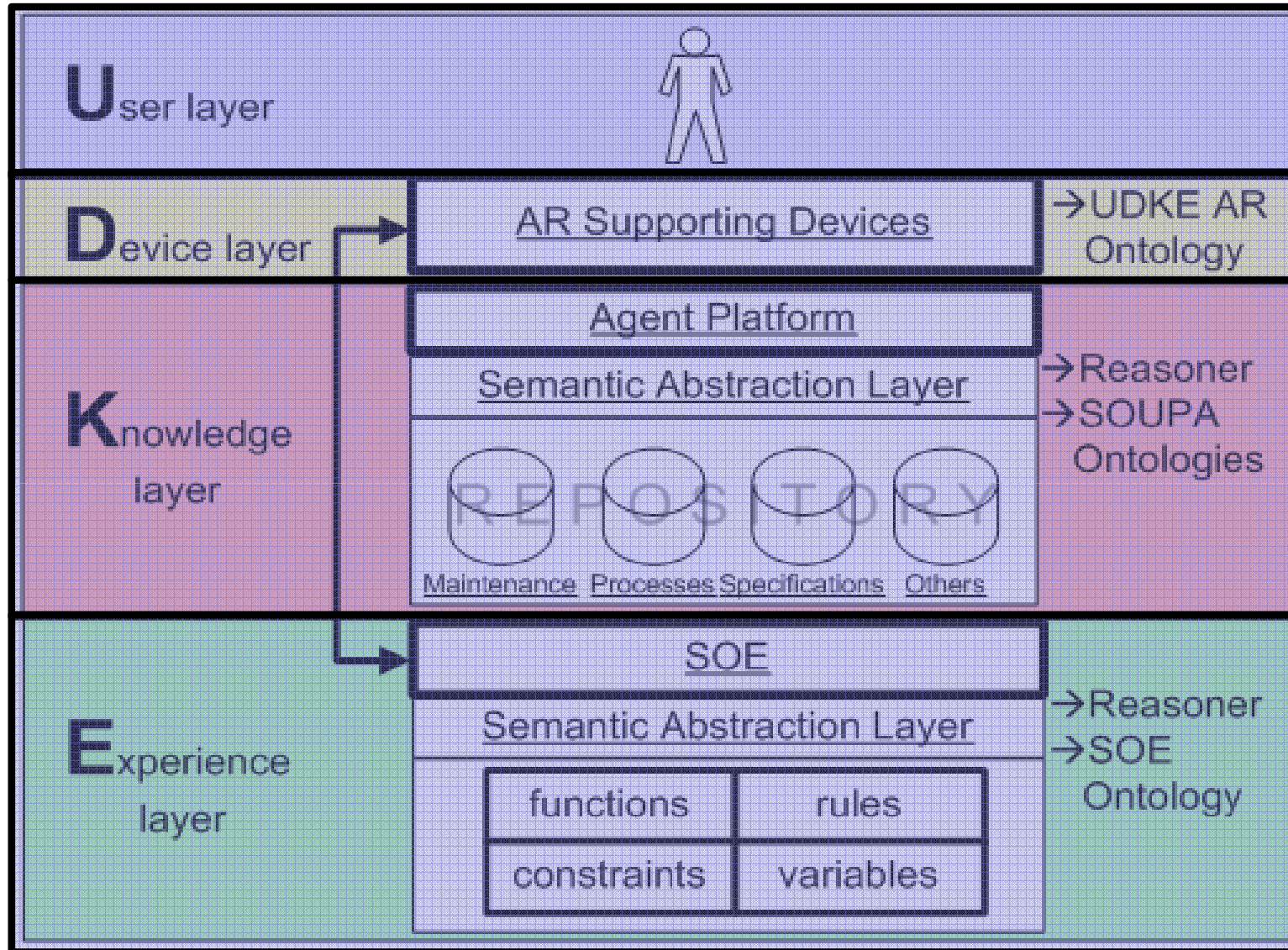
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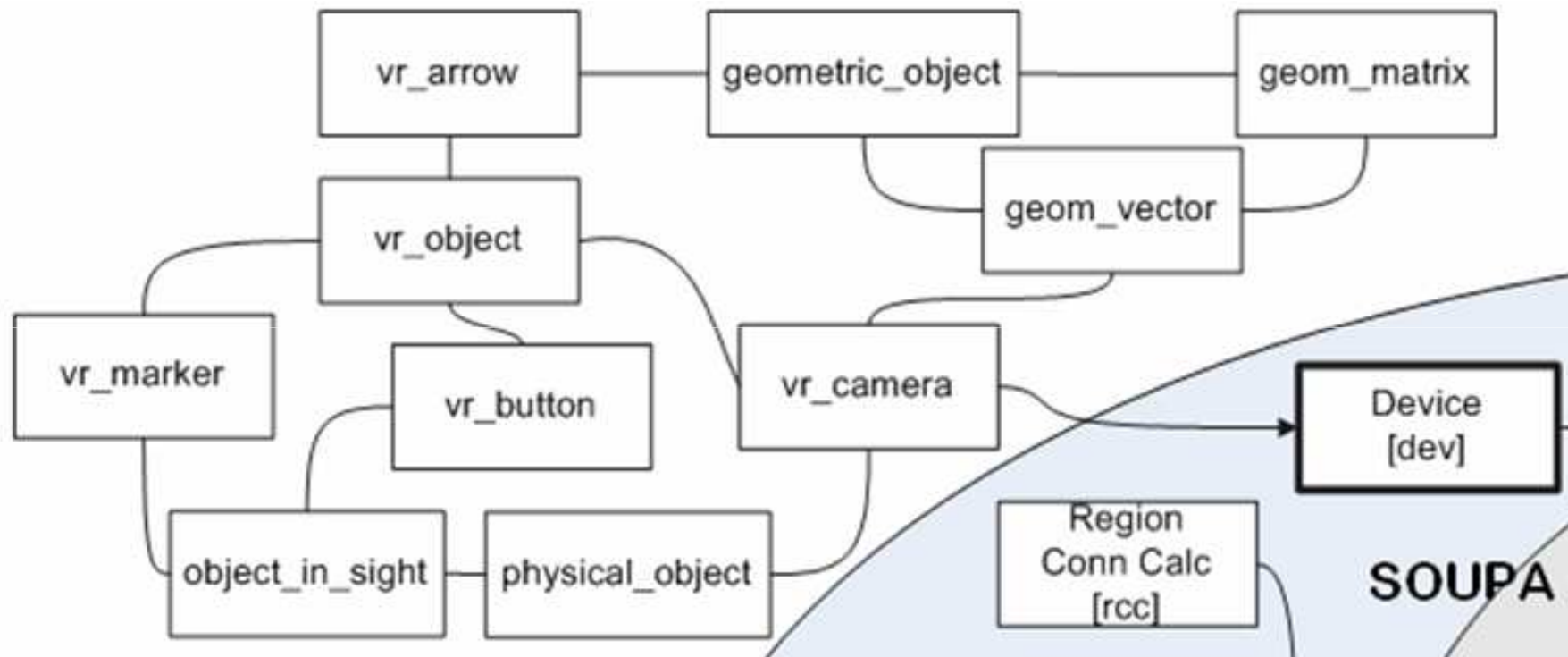
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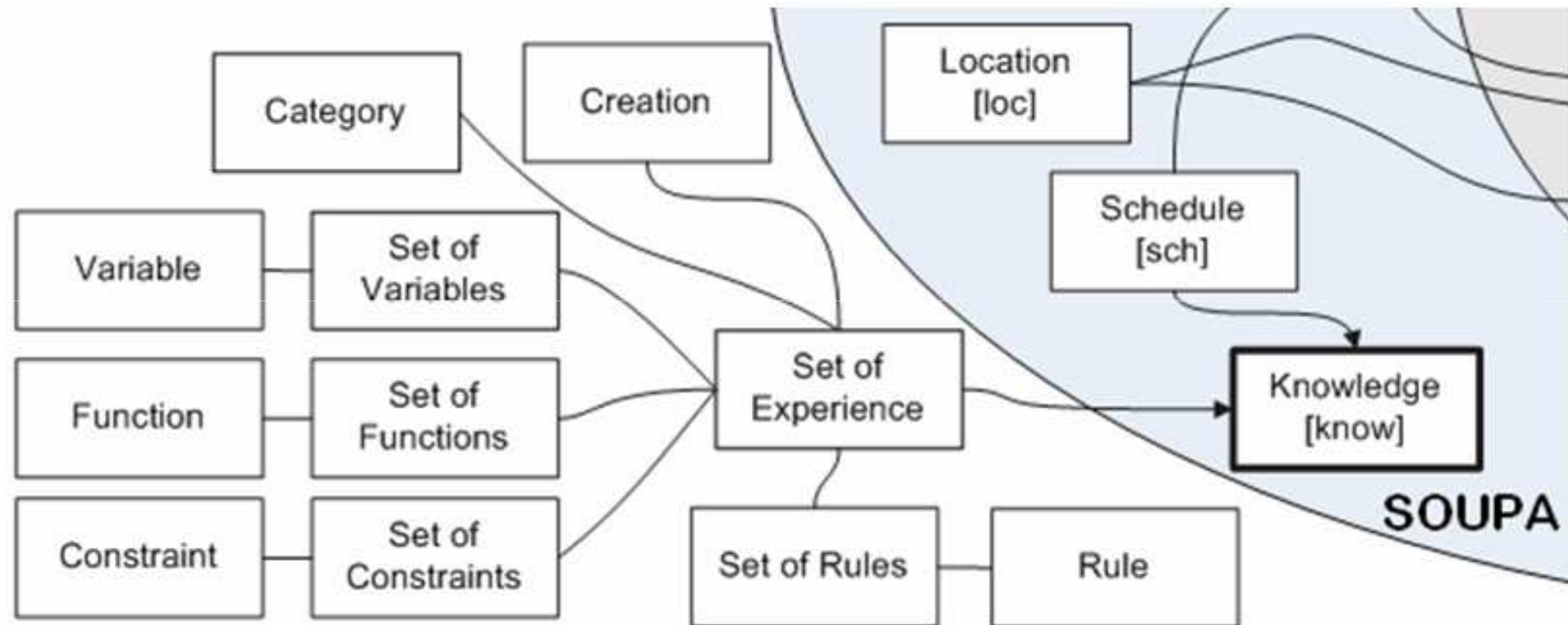


The UDKE System – SOUPA Extensions



Vr_Ontology

The UDKE System – SOUPA Extensions



SOEKS_Ontology

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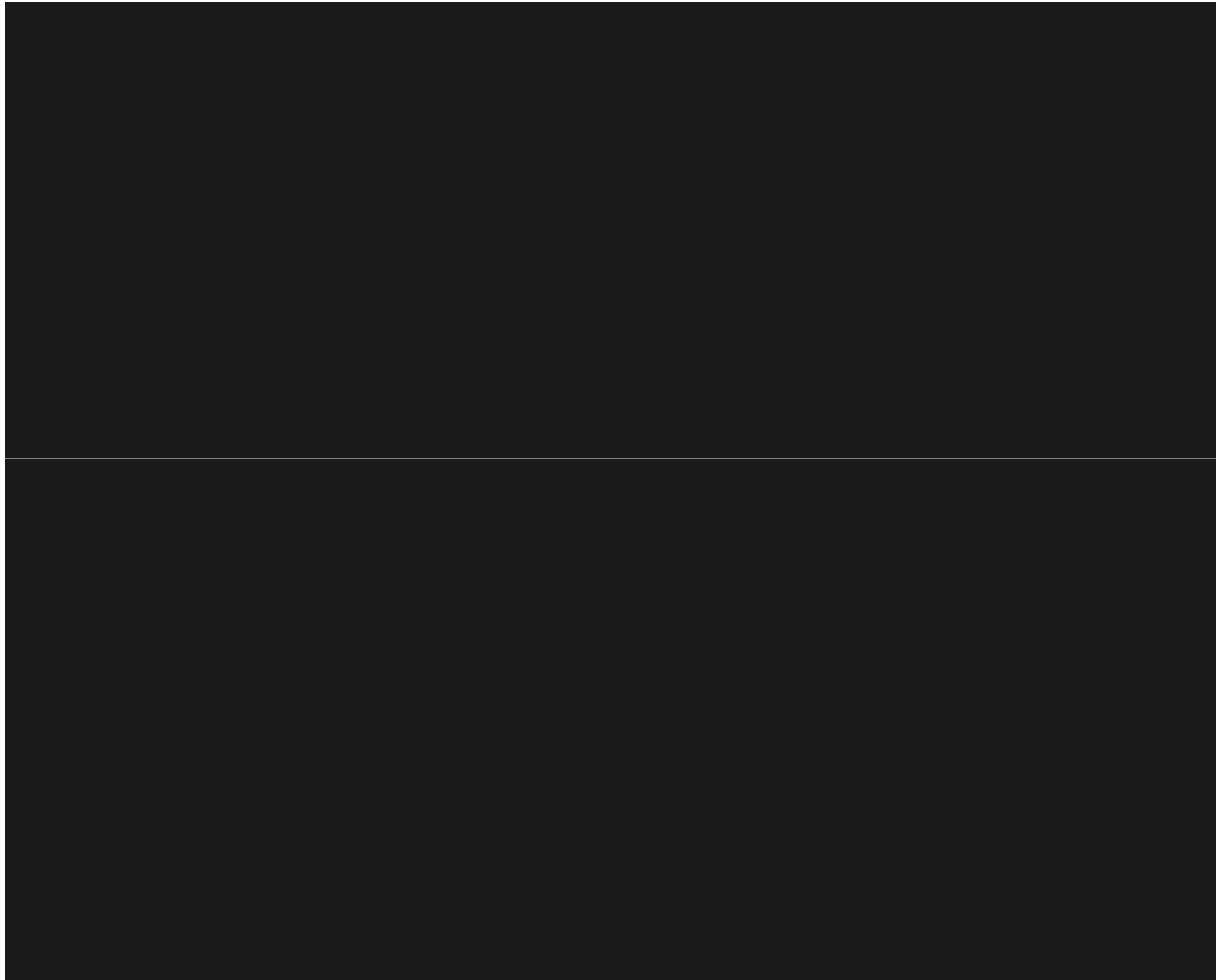
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Application Scenario



Application Scenario – Implementation issues

Target devices : PDA, UMPC and Tablet PC

Programming language : JAVA

APIS USED : Protégé OWL API, GL4Java and JARToolkit

AGENT PLATFORM USED : JADE

ONTOLOGIES: SOUPA and our extensions

REASONER: RACER

Protégé within the scope of this research

Using Protégé was the right choice for this project!!!

- Easiness of implementation when modelling the ontologies
- The Protégé OWL API is easy to learn (fast learning curve)
- Portability between different platforms (Mac, WIN, etc)
- Everything was Java based
- Scalability of the system is an easy task
- Good documentation and a very productive environment

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- We presented a framework and a system implementation for the exploitation of embedded knowledge in the domain of industrial maintenance in a mobile context, using AR techniques.
- An extension to SOUPA was presented with two Ontologies: the Set of Experience Knowledge Structure
- The framework was implemented in different portable devices and is being tested in a real world application.

Thanks, any questions?