
I-X and <I-N-C-A>

An Architecture and Related Ontology for Mixed-initiative Synthesis Tasks

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What does I-X Stand For?



- **Intelligent** – I-X supports the construction of intelligent systems and intelligent agents
- **Intelligible** - I-X supports the construction of systems which are intelligible to their users and to other systems and agents.
- **Integrated** – I-X is a systems integration architecture.
- **Issue-based** – I-X is an issue-based and issue handling architecture.

I-X Approach

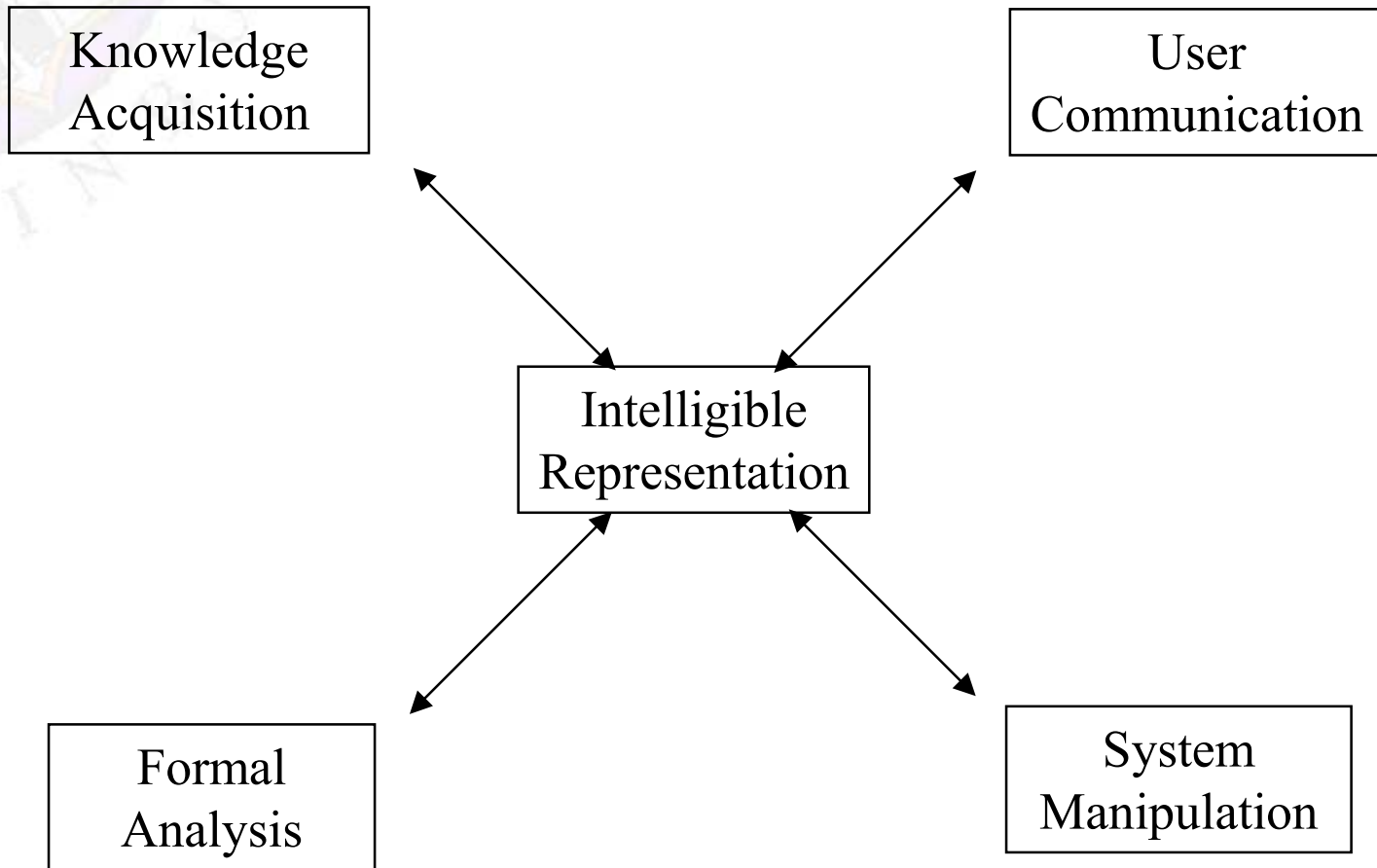
- The I-X approach involves the use of shared models for task-directed communication between human and computer agents who are jointly exploring (via some process(es)) a range of alternative options for the synthesis of an artifact such as a design or a plan (termed a product).
- I-X system or agent has two cycles:
 - Handle Issues
 - Manage Domain Constraints
- I-X system or agent carries out a (perhaps dynamically determined) process which leads to the production of (one or more alternative options for) a synthesised artifact.
- I-X system or agent views the synthesised artifact as being represented by a set of constraints on the space of all possible artifacts in the domain.

Components of I-X Research



1. I-Core, which is the core architecture, the underlying ontology of activity and processes termed <I-N-C-A>, and the terminology used to describe applications, systems or agents built in the I-X framework.
2. I-DE, which is the I-X Domain Editor, which is itself an I-X application but also is used to create and maintain the process models and activity specifications used elsewhere.
3. I-P², which are I-X Process Panels used to support user tasks and cooperation.
4. I-Plan, which is the I-X Planning System. This is also used within I-P² and other applications as it provides generic facilities for supporting planning, process refinement, dynamic response to changing needs, etc.
5. I-Views, which are viewers for processes and products, and which are employed in other applications of I-X. I-Views can be for a wide range of modalities and types of user.
6. I-Faces, which are underlying support utilities to allow for the creation of user interfaces (User I-Faces), repository access (Repository I-Faces), and communication with other systems and agents (Communication I-Faces).
7. I-X Applications of the above threads in a variety of areas depending on our current collaborations. These currently include:
 - Coalition Operations (CoAX, CoSAR-TS)
 - Emergency, Unusual Procedure and Help Desk Assistance (I-Help and I-Rescue)
 - Multi-Perspective Knowledge Modelling and Management (I-AKT)
 - Natural Language Presentations of Procedures and Plans (I-Tell)
 - Collaborative meeting and task support (I-Room, CoAKTinG)

Uses of a Shared Model



<I-N-C-A> Generic Ontology



Issues

Nodes

Constraints

Node Constraints

Include Node Constraints

Other Node Constraints

Critical Constraints

Critical Variable/Object Constraints (e.g. =, ≠)

Auxiliary Constraints

Auxiliary Variable/Object Constraints

Other Auxiliary Constraints

Annotations

<I-N-OVA> Activity Ontology



Issues

Nodes (Activities)

Constraints

Node Constraints

Include Node Constraints

Other Node Constraints

Critical Constraints

Critical Ordering Constraints

Critical Variable/Object Constraints

Auxiliary Constraints

Auxiliary Ordering Constraints

Auxiliary Variable/Object Constraints

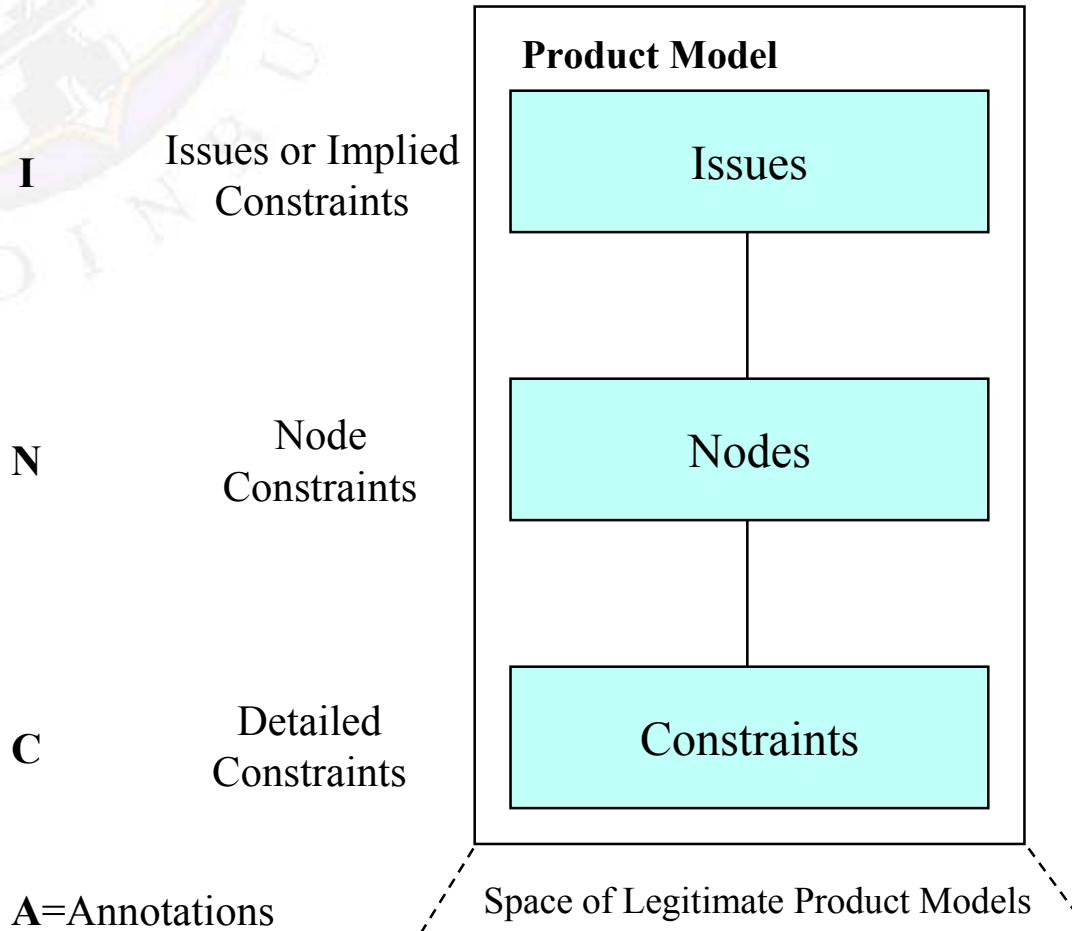
World-State Constraints

Resource Constraints

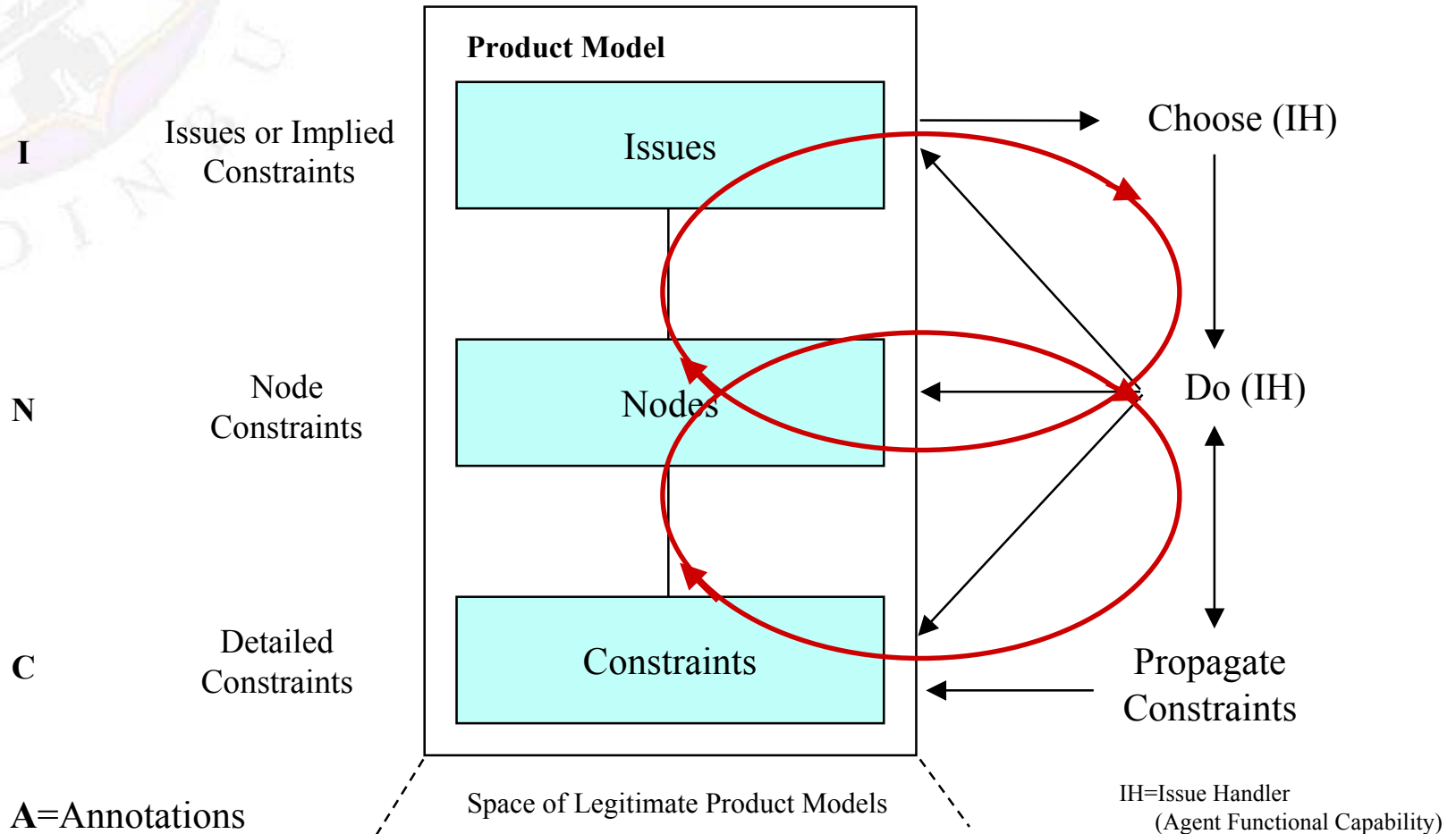
Spatial Constraints

Other Auxiliary Constraints

<I-N-C-A>



I-X and <I-N-C-A>



Shared Models



Shared Task Model - Mixed initiative model of “mutually constraining the space of products”.

Shared Space of Options – for the product.

Shared Model of Agent Capabilities - handlers for issues, functional capabilities and constraint managers.

Shared Understanding of Authority – management of the authority to handle issues and act which may take into account options.

Shared Product Model – using constraints on the space of products (<I-N-C-A>).

Current I-X Related Projects



- **DARPA CoSAR-TS - with Jeff Bradshaw (UWF/IHMC)**
 - Search and Rescue task; DAML-X characterisation of I-X panel services. Follow on to CoAX.
- **I-Rescue - <http://i-rescue.org>**
 - NL and CdS PhD projects: responsibility and capability modelling in I-X.
- **AKT I-AKT**
 - Multi-perspective modelling and collaborative model synthesis.
- **AKT I-X/KRAFT TIE – with Aberdeen University**
 - Collaborative model synthesis, with specialised capabilities at remote sites.

Further Information



- <http://www.aiai.ed.ac.uk/project/ix/>
- <http://i-x.info>