CoSy Project Overview
Birmingham, January 2005

Integration: Tools and an example

CoSy: Cognitive Systems for Cognitive Assistants
CoSy's First Steps...

• A first-pass integration project was needed to give us a starting point for the CoSy project.

• Almost every part of the effort was necessarily limited in some way (time, resources, knowledge etc.).

• The whole process has been very instructive (particularly in the nature of European projects!).
Hardware Restrictions

• B21r robot
  – Twin cameras (no synchronisation).
  – Pan–tilt head.
  – Speech synthesis.

• We also couldn't exceed our partner's hardware capabilities.
  – So no movement (and we're too scared!).
(Open Source) Software Resources

• OpenCCG
  – Parser based on the Combinatory Categorial Grammar formalism.

• Sphinx 4
  – CMU's speech recognition package.

• OpenCV
  – Intel's vision language.
Putting It All Together

• One of the tasks of CoSy is to investigate integration. But this exists at many levels:
  – Hardware architecture.
  – Software architecture.
  • Virtual machine architectures
  – Cognitive architecture.
  – ...

• And each have possibly infinite (?) variations on data integration, the flow of information, etc.
Component-Based Cognitive Architectures

- Given a bunch of components (parser, reasoner etc.), how can we get them to communicate.
  - What *infrastructure* should we use?
- This is a different, yet strongly related, problem to building a cognitive architecture.
- Also, this isn't the only way of considering the problem.
Software Infrastructure Restrictions

- Language independent
- Distributed processing.
- (Cognitive) architecture neutral.
- Acceptably low overhead.
Some Options...

• The Open Agent Architecture (OAA):
  – Well developed, although it possibly imposes some architecture of its own.

• The XML Communication Framework (XCF):
  – Lightweight, but with limited support for languages.
Some Options...

- **MARIE:**
  - Early in development, supports many existing robotics packages, is very general with no central communications bottleneck.

- **ORCA:**
  - Similar to MARIE, but uses CORBA for transport. This adds to its complexity and overhead.
Mr. Chips: The Prototype System

- For ease of use we are using OAA for the software substrate.
- The domain is a massively simplified version of the Playmate scenario:
  - Coloured balls + projective prepositions.
- The user asserts something about the scene, then Mr. Chips either agrees or disagrees.
Mr. Chips: High-Level Software Architecture
Mr. Chips: Information Flow 1

• Activity is triggered by speech input.
• Linguistic input is parsed using OpenCCG.
• The resulting relational structure is transformed into a (much simpler) propositional representation.
• The visual system is then queried for a representation of the scene.
• This is also converted into a propositional form.
The visual information is treated as “the truth”.

It is compared to (aligned with) the linguistic input.

If they don't disagree then Mr. Chips agrees with the assertion.

Else he disagrees.
Over to Jeremy...