

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 Categorical 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.

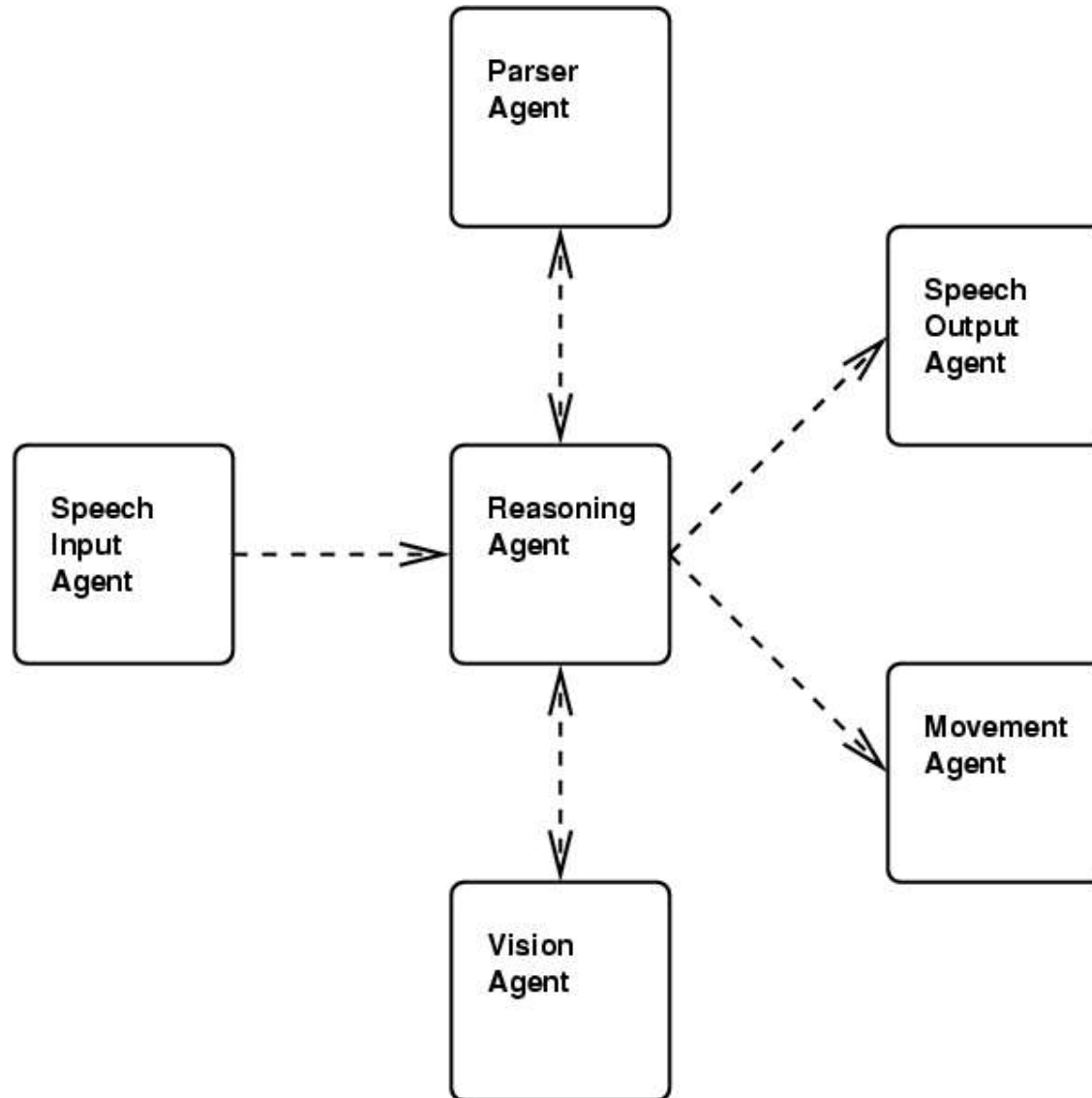
Some Options...

- 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.

Mr. Chips: Information Flow 2

- 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...