Scaling Up, Out, and Understanding
Perspectives from jACT-R

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Scaling Up
Perception, Declarative Memory, Conflict Resolution

Scaling Out
Perceptual Interfaces, Declarative Memory, Runtime

Scaling Understanding
Structure, Information Overload, Audit Trail
Scaling Up

Perception, Declarative Memory, Conflict Resolution

Parallel Perception

Central model thread

Perceptual modules share second thread

- Updating perceptual memories *(e.g. visicon)*
- Precoding percept chunks
- Tracking

Permits realtime* perception
Pluggable Declarative Memory

DM searches are frequent & expensive

Pluggable search strategies

Serial (model thread)
Parallel (shared pool)*

Have a better algorithm?

Pluggable Procedural Memory

Conflict resolution performance varies greatly

Candidate selection?
Large candidate set?
Large conflict set?

Default & specialized delegates
Simple & RETEish assembler
Single & Parallel* instantiators
Threaded Cognition (Salvucci & Taatgen, 2011)
Scaling Up

*Perception, Declarative Memory, Conflict Resolution*

Scaling Out

*Perceptual Interfaces, Declarative Memory, Runtime*
Perceptual Interfaces

CommonReality framework for perceptual interfaces

- Architecture agnostic
- Distributed simulation broker
- Transparent & pluggable communications
- Composatable interfaces
- Afferent percepts & efferent commands

Existing Perceptual Interfaces

Keyboard: provides both simulated and actual keyboard and mouse access.

Speech: provides action and vocalization support. *(pluggable TTS support)*

Aural: generic aural system that detects simulated sounds and generates percepts for connected agents. *(easily integrated with speech recognizers)*

XMLSensor: provides simple perceptual information from xml configuration files. *(programmatically controllable)*

ROS: provides pluggable access to ROS networks. Robotic interfaces and Gazebo. *(pending release)*
Scaling Declarative Memory

Human mind is big data
Use big data solutions
Large Memory Support
Have a large DM?
Let’s talk!
Theoretic DM delegate
Storage DM delegate
Chunk prefetch
Generational garbage collection

Runtime Scaling

How the model executes is independent of how it behaves
Runtime is configured based on modeler, not model, needs
Flexible execution environment
Different pros/cons

Runtime Implementations

- Distributed Perceptual Simulation
- Embedded, Dependent Clocks
- Embedded, Independent Clocks
- Mobile?
Concurrent Performance

Scaling Out

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Have you ever broken ACT-R while getting your model to work?

How easy is it to share complex models and have them run?
Structure

jACT-R projects encourage self-contained structure

- Unit of distribution
- Separation of model from code
- Dependency management
- Persisted run configurations
- Archive of runs

Information Overload

Model inspection generates massive amounts of data

- Run, trace, run, detail-trace, run
- Tracing/logging is all or nothing
- Memory & storage are cheap
- Data management & presentation problem
Audit Trail

“Hmmm, that was strange. Let me rerun that”

Don’t rerun the model, replay it
Archive illustrative or anomalous runs
Self-contained & shareable
Perfect for reporting bugs

Scaling Understanding
Structure, Information Overload, Audit Trail
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http://jact-r.org/

Thank you!

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