

KEEL Technology Applied to Highly Distributed Loosely Coupled Systems

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HASE Concerns

“When a fail safe system fails, it fails by failing to fail safe.”

“Complex systems usually operate in failure mode.”

“Loose systems last longer and work better.”

“Efficient systems are dangerous to themselves and to others.”

“Systemantics – How systems Work and Especially How They Fail” – John Gall

Loose Systems

- Objective:
 - Distribute failures across a number of devices or elements.
 - Create systems that can adapt to failure modes.
- Requires:
 - Mechanisms for interoperation
 - Mechanisms to support autonomous operation

Reason

1. “A ground or cause, as for a belief, action, fact, event, etc.: *the reason for declaring war.*”
2. “A statement in justification or explanation of belief or action.”
3. “The mental powers concerned with drawing conclusions or inferences.”

“American College Dictionary”

Problem Solving

- Logical Domain
 - Language
 - Formulas
 - Signal Conditioning
 - Signal Transformation
- Judgmental Domain
 - Interpretation
 - Determining the Importance of Information
 - Combination
 - Identifying how each piece of information impacts other parts of the problem
 - Balancing

Tame Problems

Formulas (IF | THEN | ELSE)

Wicked Problems

Neural, Fuzzy, KEEL

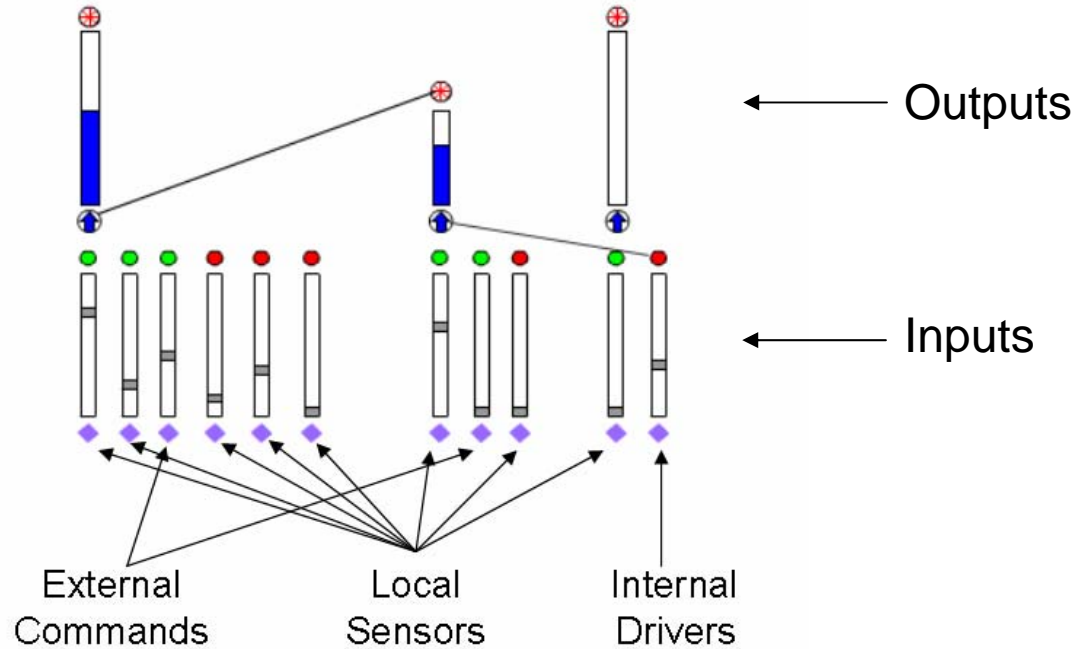
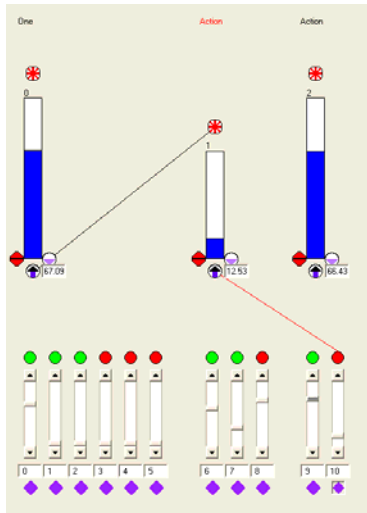
set of actions

overall

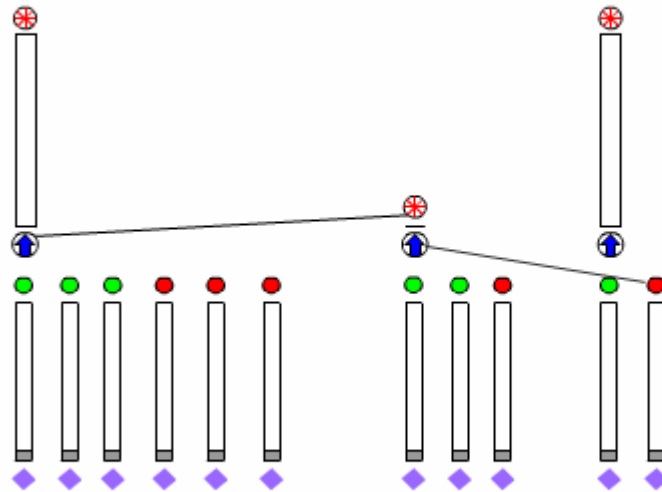
Knowledge Enhanced Electronic Logic (KEEL)

- Graphical Language & Execution Engine
 - Describes
 - Importance of Information
 - Relationships between Information Items
 - Supports
 - Dynamic changing Importance of Information
 - Rule Based (Expert System)
 - Creates fully explainable actions
 - Auditable results
 - Extensible

KEEL Source Code



KEEL Source Code



Embedded KEEL Engine

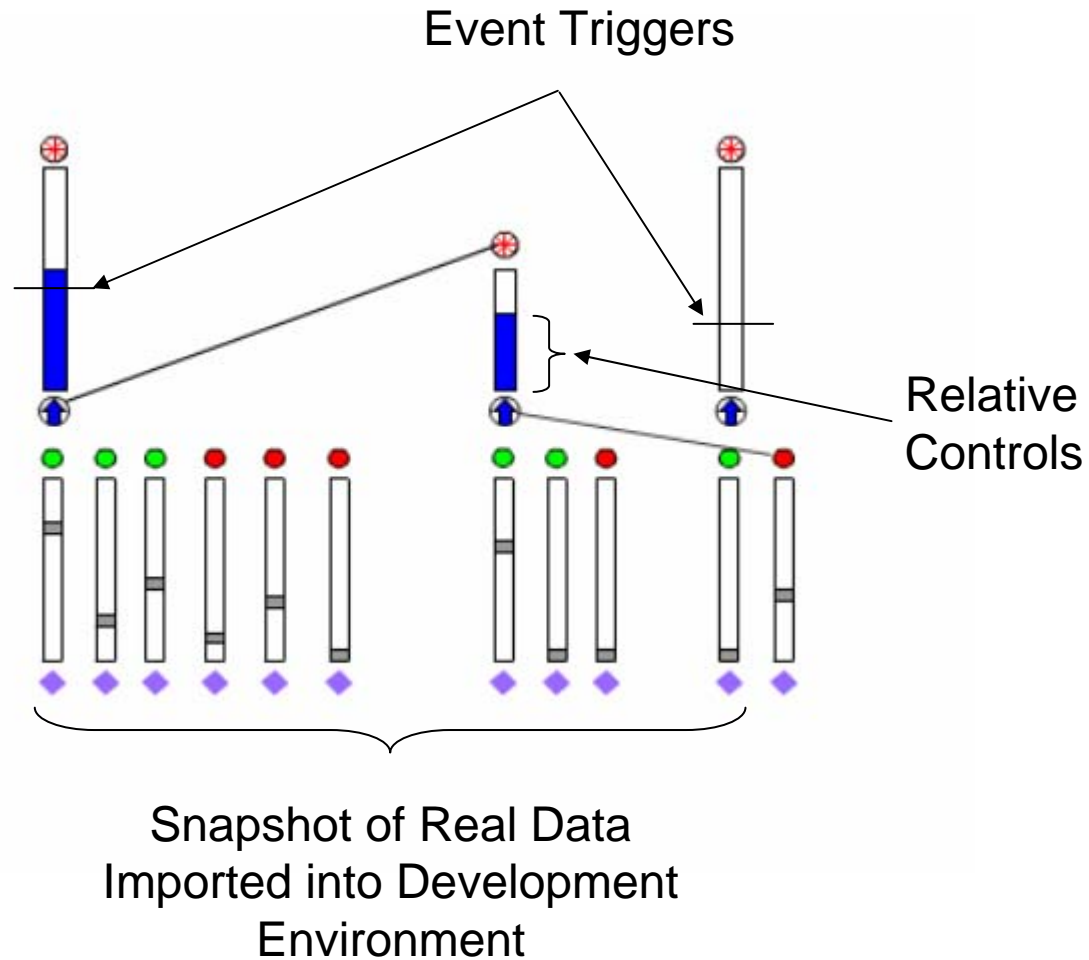
Process Improvement

“If you cannot measure it, you cannot improve it.”

William Thomson Lord Kelvin

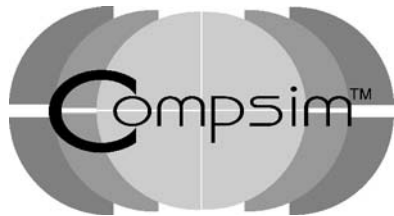
1895

Event Recovery



HASE Benefits

- Loosely coupled systems fail “soft”
- High availability systems must be explainable and auditable
- To make the most effective use of distributed agent-based systems, commands must allow agents some latitude in the decision-making process, while still allowing command unit complete control if necessary.



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