Intelligent Monitoring of Software Components

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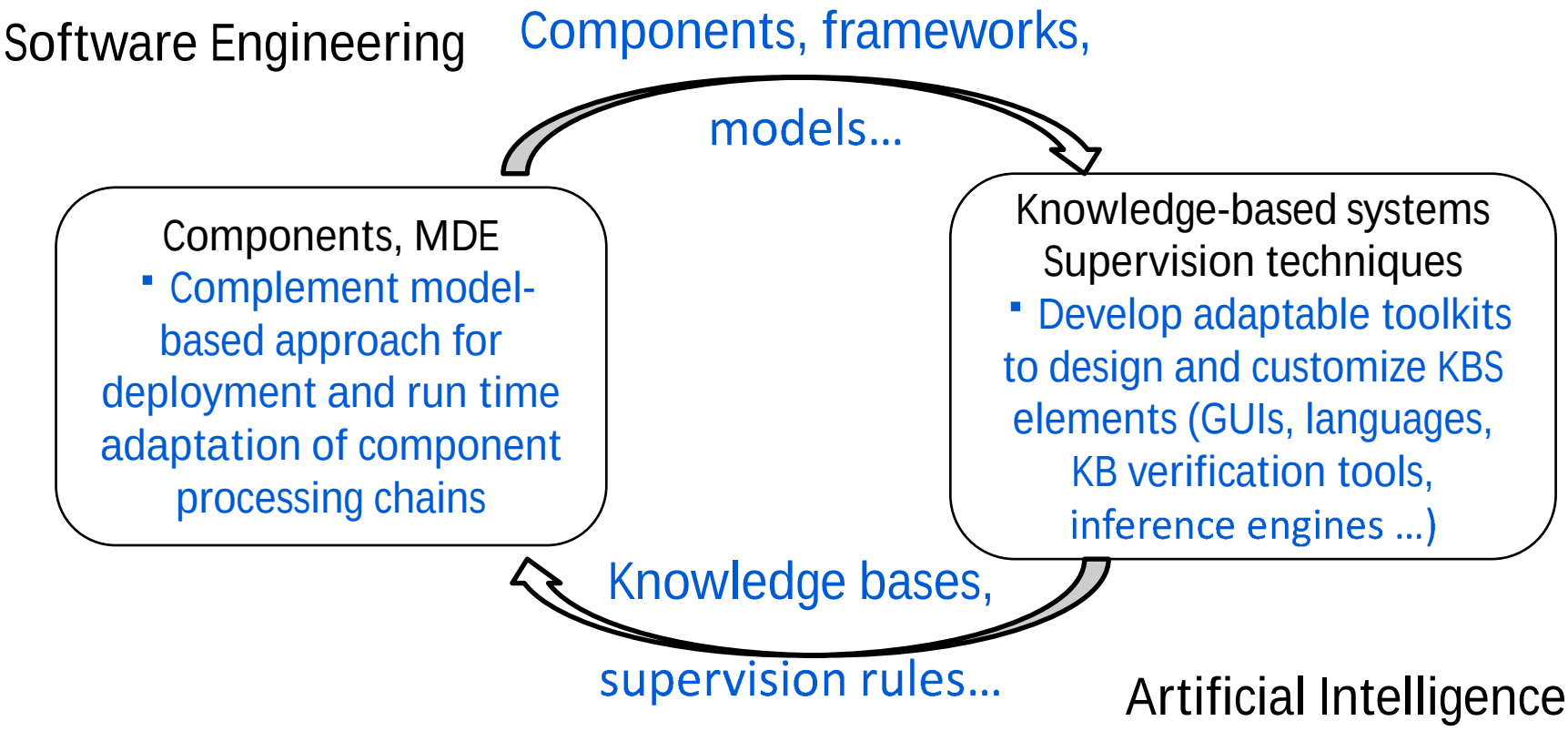
Artificial Intelligence ↔ Software Engineering

Cross disciplinary approach in two directions



Supervision for (dynamic) software component adaptation

Knowledge-based approach to component configuration (select, assemble, tune...) at deployment and at run time

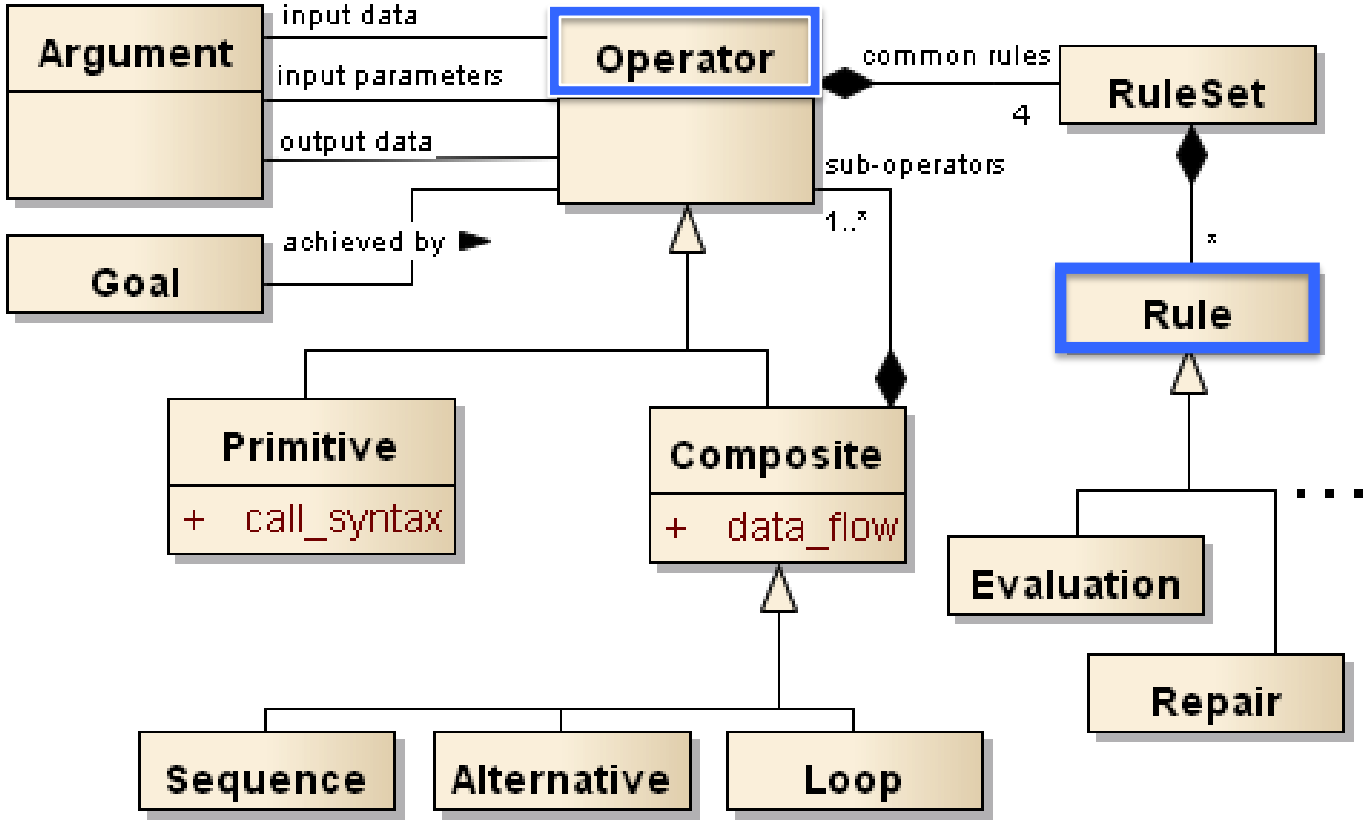
→At runtime: Changing environment

- Control execution of running components
- Adapt configuration in case of changes
- Handle failures: detect and fix

- Provide maximum autonomy (embedded systems)

Supervision => means to express and operationalize this knowledge

Supervision Ontology



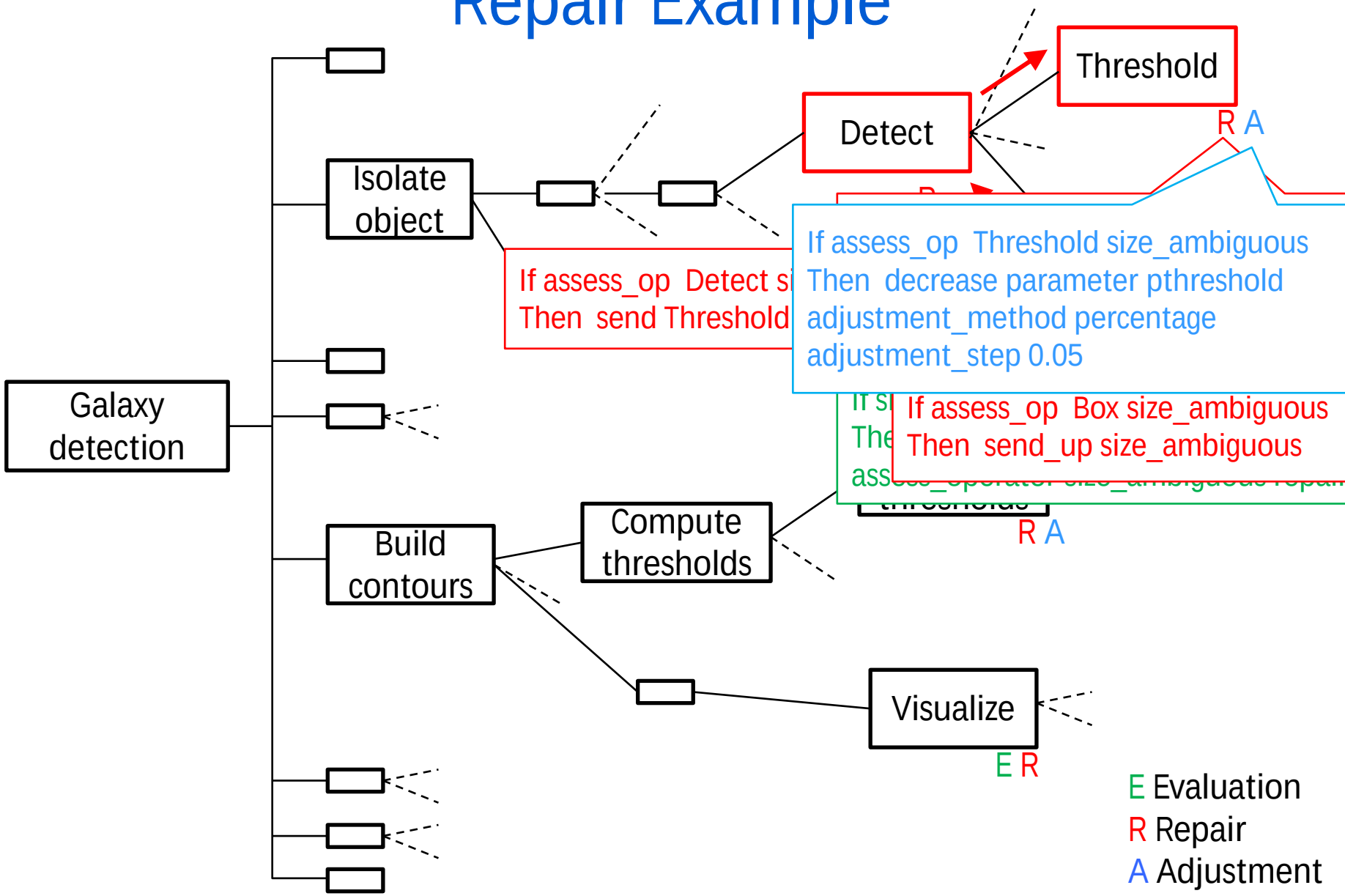
- Generic concepts & relations necessary to select, assemble, monitor, control... components
- Knowledge Representation Language

Policy Rules - Evaluation &Repair

- Know-how to take (run time) decisions
  - Involves different categories of rules
  - Translated into executable code: part of the run time system
- For dynamic adaptation
  - Evaluation: assess results, detect problems
  - Repair/adjustment: propagate problems, fix problems (tune parameters, reorganize configuration plan)

Choice	If object attribute a has value v Then use operator op_1
Initialization	If object attribute a has value v Then set parameter p to value v_1
Evaluation	If result r has property p //detected automatically or manually Then declare problem pb for op_1 and call repair
Repair/ Adjustment	If operator op_1 has problem pb Then transmit pb to op_2 or increase/decrease parameter p_1 or choose another sub-operator op_3 … for future execution

Repair Example



Conclusion & Future Work

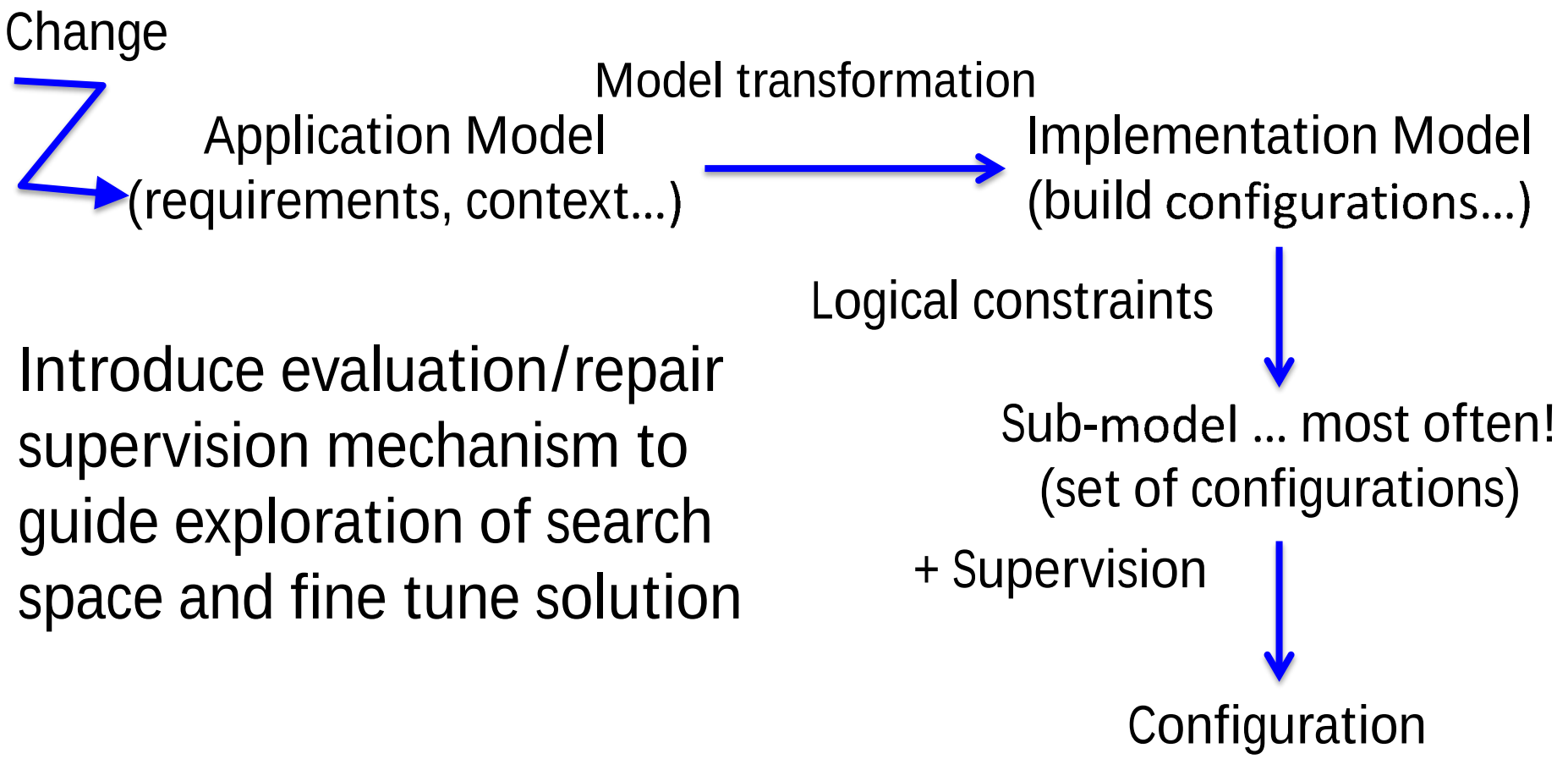
Used in AI applications

- Customizable mechanism
- Explicit way to express evaluation/repair policies
- Performance: Limited overhead

But… evaluation/repair rules and policies difficult to specify… and to automate

Now: Complement more formal/but limited methods (logical constraints)

Models@Runtime + Supervision



Introduce evaluation/repair supervision mechanism to guide exploration of search space and fine tune solution

Any question?