

กรอบแนวคิดสำหรับระบบผู้เชี่ยวชาญแบบกฎเชิงอุปนัย

A Framework for Inductive Rule-Based Expert Systems

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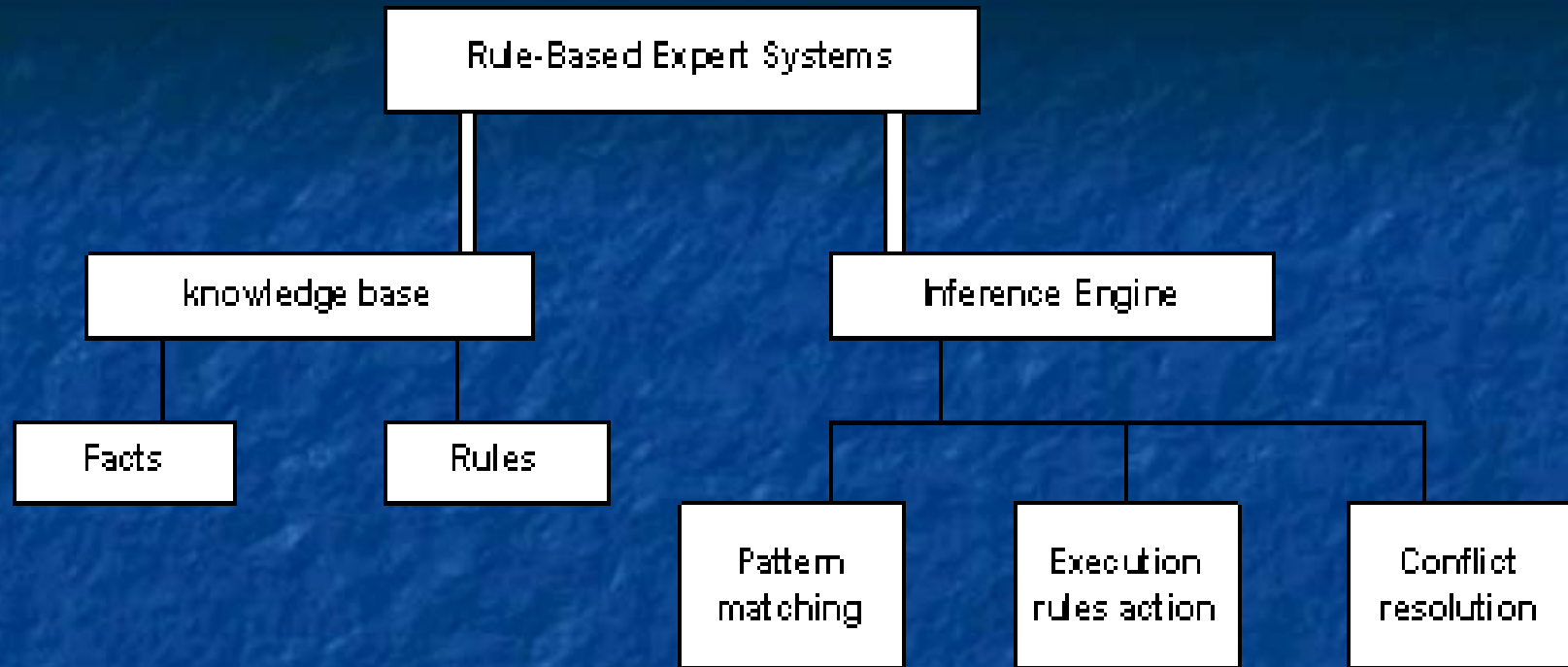
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Abstract

- New methodology for the design and implementation of the next generation rule-based expert systems.
- Include the rules that are automatically induced from the data repositories.
- Propose a filter operator for useful-rule selection.

20TH CENTURY

- Artificial intelligence, AI
 - Robotics
 - Machine learning
 - Expert systems



IF <condition> THEN <action>

IF car won't start THEN check battery.

IF car won't start THEN check gas.

IF check battery AND battery bad THEN replace battery.

IF check gas AND no gas THEN fill gas tank.

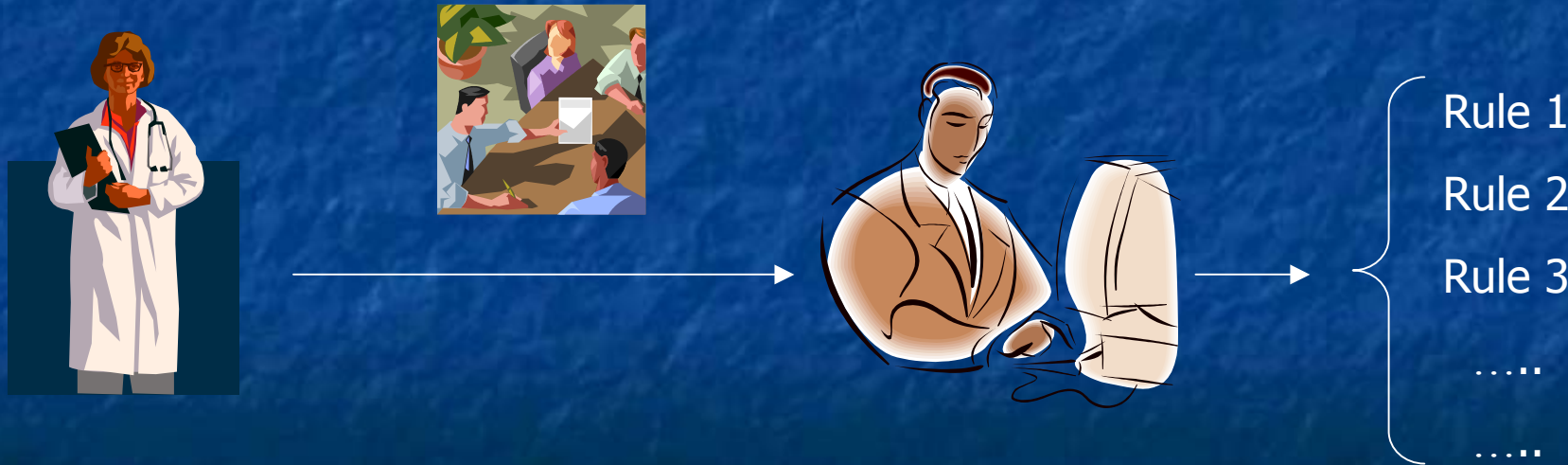
First Generation

- MYCIN
- DENDRAL
- DIPMETER
- PROSPECTOR

EXPERT SYSTEM (1st Generation)

KNOWLEDGE ACQUISITION

expert human $\xleftarrow{\text{interview}}$ knowledge engineer $\xrightarrow{\text{rule}}$ IF-THEN



INDUCTIVE EXPERT SYSTEM (2nd Generation)

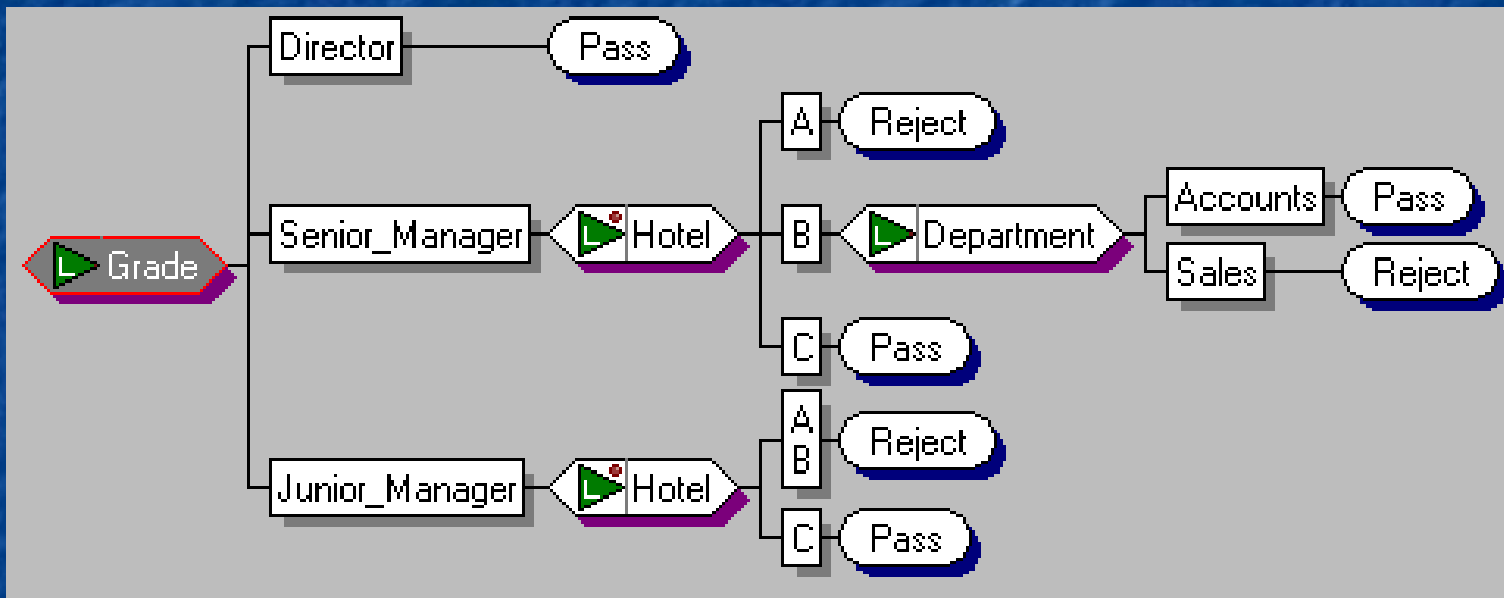
KNOWLEDGE ACQUISITION

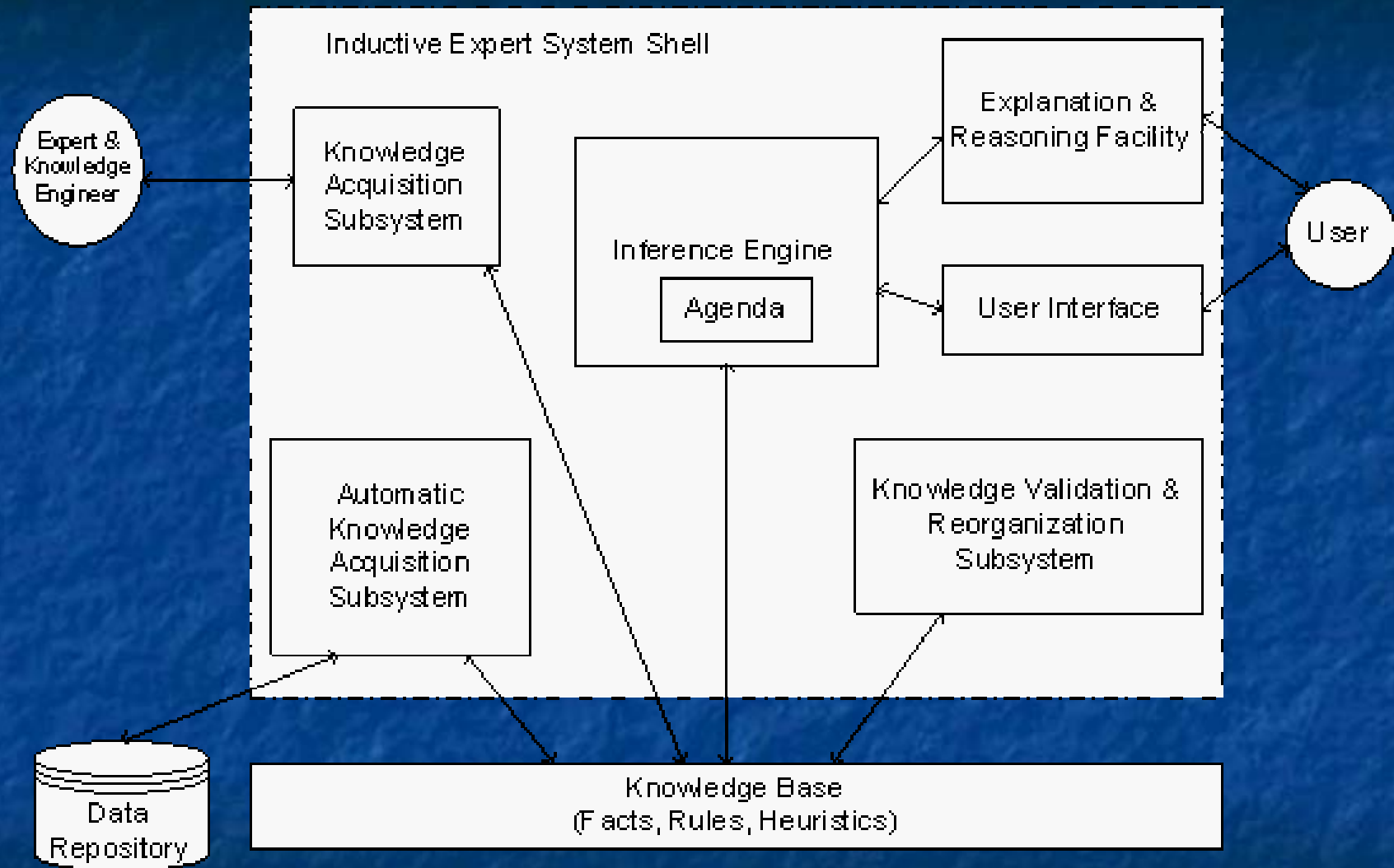
expert human $\xleftarrow{\text{interview}}$ knowledge engineer $\xrightarrow{\text{rule}}$ IF-THEN

Data repository \longrightarrow Automatic knowledge Acquisition

- Rule1: **IF** Grade is Director **THEN** decision is Pass.
- Rule2: **IF** Grade is Senior Manager **AND** Hotel is A **THEN** decision is Reject.
- Rule3: **IF** Grade is Senior Manager **AND** Hotel is B **AND** Department is Accounts **THEN** decision is Pass.
- Rule4: **IF** Grade is Senior Manager **AND** Hotel is B **AND** Department is Sales **THEN** decision is Reject.
- Rule5: **IF** Grade is Senior Manager **AND** Hotel is C **THEN** decision is Pass.
- Rule6: **IF** Grade Junior Manager **AND** Hotel is A or B **THEN** decision is Reject.
- Rule7: **IF** Grade is Junior Manager **AND** Hotel is C **THEN** decision is Pass.

DECISION TREE INDUCTION





Automatic Knowledge Acquisition Subsystem

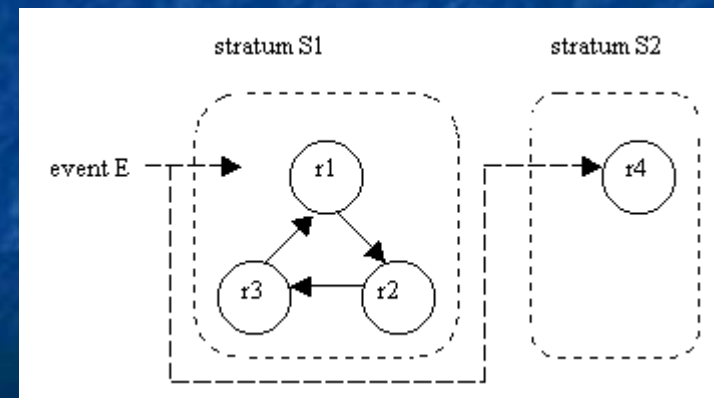
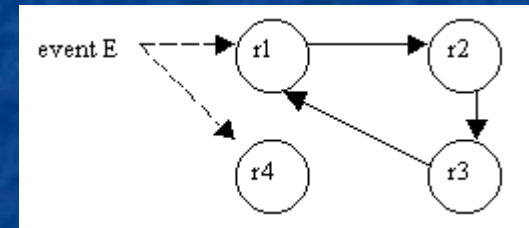
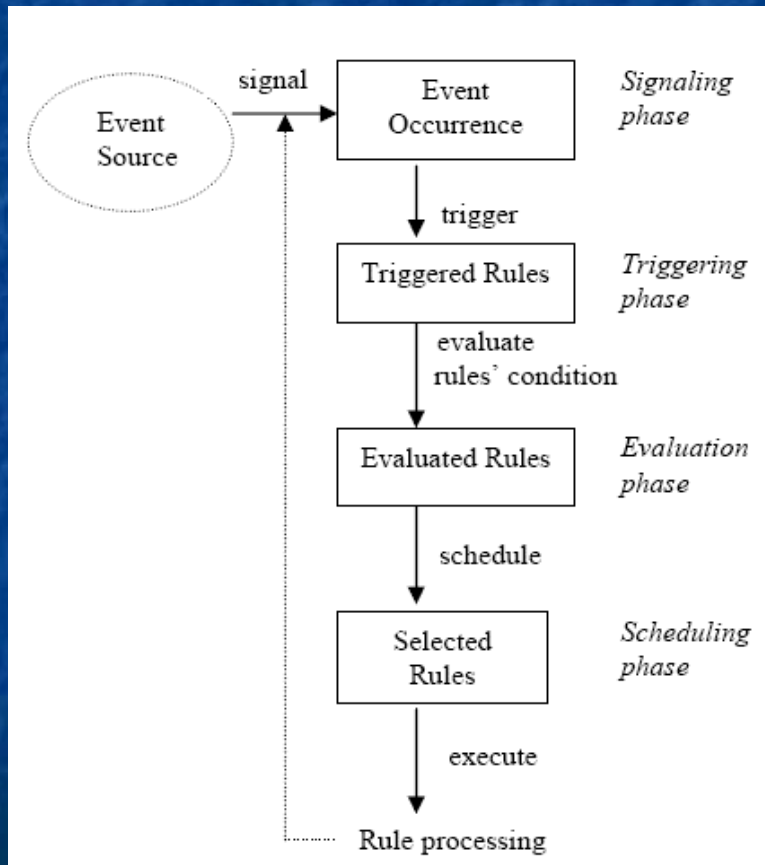
Algorithm Rule Induction

Input: Example cases

Output: Rule set

1. Create rule R from existing cases by greedily adding conditions that minimize error
2. Add R to the rule set RS
3. Remove cases covered by R and continue with step 1 until all cases are covered
4. Return RS

Knowledge Validation and Reorganization Subsystem



Algorithm 4.4 Trigger conflict resolution algorithm.

Input: an unordered stratum set S , a relational active database R and its metadata

Output: an ordered stratum set O in which the priority of each stratum has been assigned.

Steps:

1. $Active_Rule_Set_i \leftarrow Activate(S_i, E)$

/* Activate every stratum S_i , $S_i \in S$, such that the occurrence of an event E can invoke its trigger rule(s), and record all affected rules in the corresponding $Active_Rule_Set$. */

2. $K_i \leftarrow Induce(Active_Rule_Set_i)$

/* The knowledge induction method (such as association-rule learning, decision-tree induction) is applied to induce knowledge from the content of each $Active_Rule_Set$. The induced knowledge is stored in K_i . */

3. $q_i = Degree_of_Constraint(K_i, metadata)$

/* Calculate the value q_i or the $Degree_of_Constraint_i$ of each set of induced knowledge K comparing to the integrity constraints given as a metadata. */

4. $sort(i, q)$

/* Apply any sorting algorithm on the q -value associated with each stratum S_i . */

5. return an ordered stratum set $O = \{ S_i \mid S \text{ has been sorted by its index } i \}$

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