

Automated Knowledge Engineering



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Expert systems

- ▶ **Knowledge based systems** that **mimic decision-making** ability of **human expert** in a **specific domain** of knowledge
- ▶ Apply theory to practice
- ▶ Heavy reliance on complete and reliable knowledge
- ▶ Problems
 - ▶ Time constraints
 - ▶ Communication
 - ▶ Costs

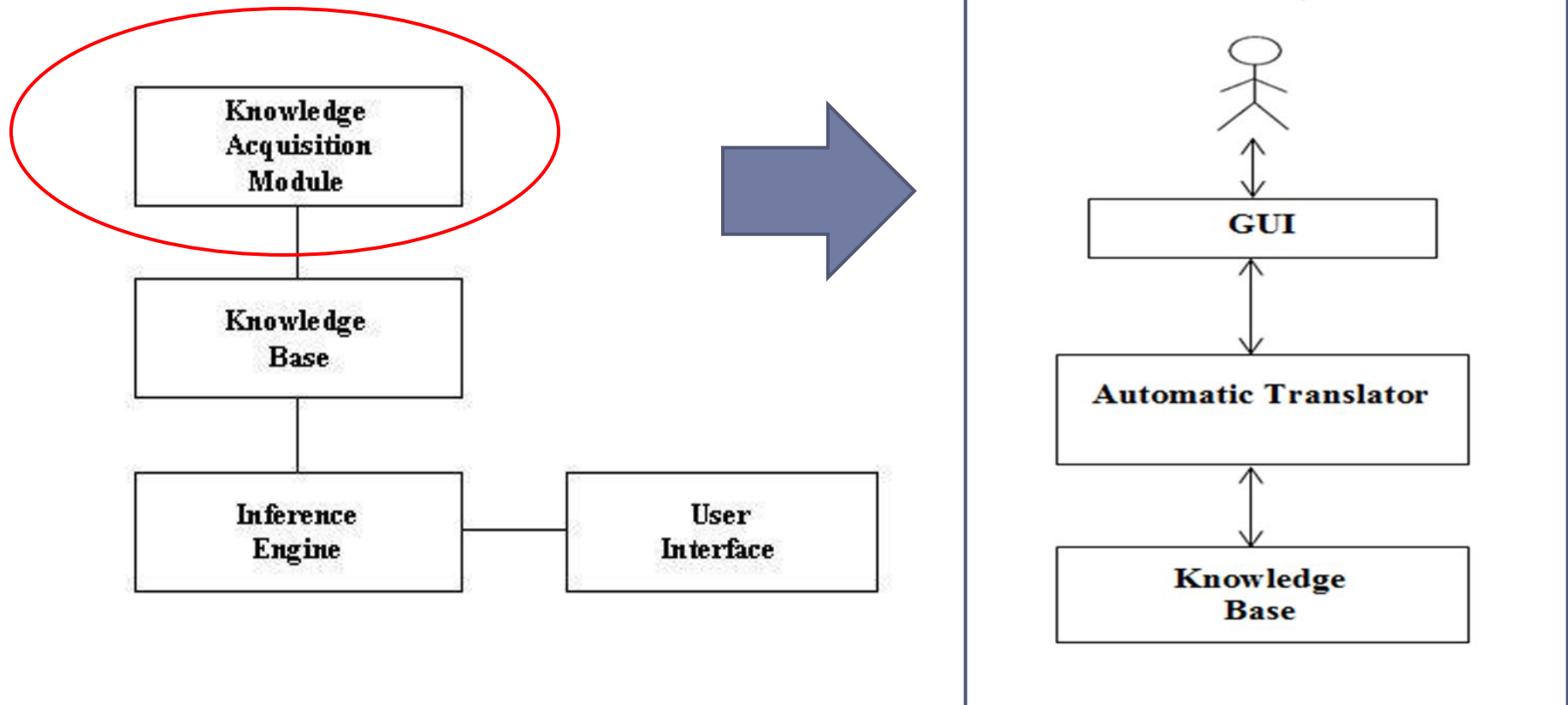


Objectives

- ▶ **Automated knowledge engineering**
 - ▶ Automated interview through GUI
 - ▶ Translation
 - ▶ Knowledge base system
- ▶ **Possible extensions**
 - ▶ Dynamic knowledge acquisition
 - ▶ Hybrid approach
 - ▶ Alternative ways of data input



Architecture of Expert System



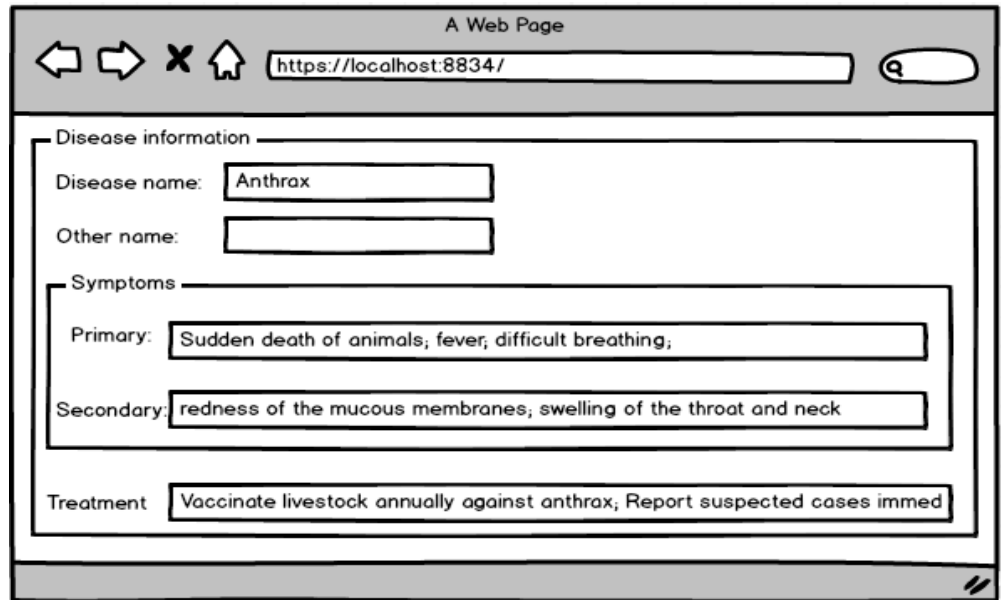
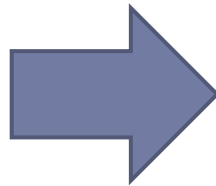
Steps

1. Knowledge elicitation
 - ▶ Declarative & procedural
2. Intermediate knowledge representation
 - ▶ Input to KB generator
3. Knowledge base generation
 - ▶ KB system as output
4. Verification
 - ▶ Semantic and syntactic



1. Knowledge elicitation

- ▶ Automated interview to acquire expert's declarative and procedural knowledge
- ▶ Design facilitates what information is stored



A Web Page

https://localhost:8834/

Disease information

Disease name: Anthrax

Other name:

Symptoms

Primary: Sudden death of animals; fever; difficult breathing;

Secondary: redness of the mucous membranes; swelling of the throat and neck

Treatment: Vaccinate livestock annually against anthrax; Report suspected cases immed

2. Intermediate knowledge representation

- ▶ Prepossessing of information acquired
- ▶ Representation allows for monitoring
- ▶ XML is used
 - ▶ Excellent for data storage and transportation
 - ▶ Several tools available to process XML

```
<DiseaseList>
  <disease>
    <name>Anthrax</name>
    <othername>Anthrax disease</othername>
    <symptoms>
      <mainSymptoms>
        <symptom>Fever</symptom>
        <symptom>Sudden death</symptom>
        <symptom>Difficult breathing</symptom>
      </mainSymptoms>
      <secondarySymptoms>
        <symptom>swelling of the throat and neck</symptom>
      </secondarySymptoms>
    </symptoms>
    <treatment>Vaccinate livestock annually against anthrax.</treatment>
  </disease>
</DiseaseList>
```



3. Knowledge base generation

- ▶ Intermediate representation used as input
- ▶ Program to use representation to generate rules
- ▶ Executable knowledge base system as output

```
RULE 12
  IF sudden_death_observed
  AND fever
  AND difficult_breathing
  THEN disease = anthrax;
...

RULE 14
  IF disease = anthrax
  AND [animal_alive]
  THEN treatment = recommend_treatment_alive(anthrax);
```

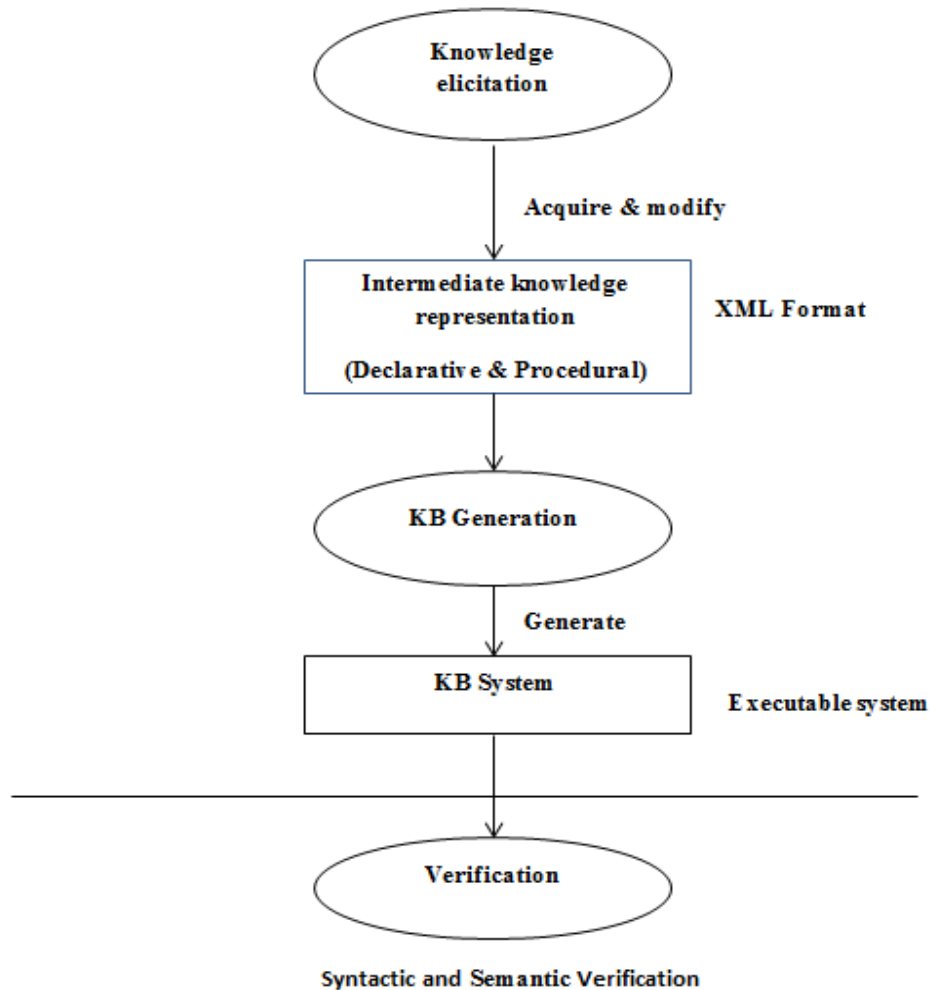


4. Verification

- ▶ Syntactically correct?
- ▶ Semantically correct?
- ▶ Expert may verify that the rules reflect his expertise



Architecture



Development phases

- ▶ Designs in place ✓
- ▶ Knowledge gathered ✓
- ▶ Develop elicitation module
- ▶ Develop rule generator
- ▶ Verification



Questions

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