Tahap Pengembangan Sistem Pakar (Marimin, 2002)

1. Mulai
   - Identifikasi Masalah
   - Mencari Sumber Pakar

2. Akuisisi Pengetahuan
   - Representasi Pengetahuan
   - Membuat Mesin Inferensi
   - Implementasi
   - Pengujian

3. Mewakili Kepakaran ?

4. Selesai
The heart of ES

- Knowledge Acquisition (KA)
- Knowledge Representation (KR)
- Human Computer Interaction (HCI)

Knowledge base

Inference Engine

KA KR HCI

Knowledge

- Declarative vs Procedural Knowledge
  - Declarative Knowledge (knowledge of facts)
  - Procedural Knowledge (knowledge of how to do something)
- Tacit vs Explicit Knowledge
  - Tacit (cannot be articulated easily)
  - Explicit (can be articulated easily)
- Generic vs Specific Knowledge
Overview

Knowledge Acquisition

- What is it?
- What are the issues?
- What are the solutions?
- What techniques are used?

Knowledge Acquisition – What is it?

Knowledge Repository

Knowledge Engineer

Knowledge

People

Documents

Software
Tujuan Akuisisi Pengetahuan

- Merumuskan pengetahuan (knowledge Base), sehingga dapat diorganisasikan dalam komputer
- Mendapatkan pengetahuan, fakta aturan, model dan cara pemecahan masalah dari pakar

Akuisisi Pengetahuan

- Mengumpulkan informasi dari berbagai sumber/pakar untuk kemudian disimpan dalam sistem komputer
- Sumber pengetahuan: pakar/experts, buku, technical reports, databases, forms dll.
**Knowledge Acquisition** is a bottleneck in the construction of ES. The KE’s job is to act as go-between to help build an expert system. Since the knowledge has far less knowledge of the domain than the expert, however, communication problems impede the process of transferring expertise into the program.

Knowledge Acquisition - Issues

Much vital knowledge is in people’s heads (experts)

- The most relevant and up-to-date knowledge
- The knowledge required for optimal task performance
- What really happens (and should happen)
Knowledge Acquisition - Issues

The repository should contain knowledge that is:

- Relevant, Vital, Best Practice, Unambiguous
- Stored in ways that are easy to access and maintain
- Presentable in ways that are easy to understand

Acquiring knowledge is difficult, and can be very time consuming, costly and inefficient.

Tacit Knowledge: Deep knowledge not consciously available to the expert, hence difficult to describe.

Need techniques that:
- Take experts off the job for short periods
- Capture structured knowledge efficiently
- Focus on the essential knowledge
- Can capture tacit knowledge
Causes of Difficulty of Knowledge Acquisition

- *Expressing Knowledge*
- *Transfer to a Machine*
- *Number of Participants*
- *Structuring Knowledge*

Abilities of Knowledge Engineer

- Computer skills
- Tolerance and ambivalence
- Effective communication abilities
- Broad educational background
- Advanced, socially sophisticated verbal skills
- Fast-learning capabilities (of different domains)
- Must understand organizations and individuals
- Wide experience in knowledge engineering
- Intelligence
- Empathy and patience
- Persistence
- Logical thinking
- Versatility and inventiveness
- Self-confidence
"Comparing the Kob to a similar engine, the SN4, I'd say the Kob was a lot smaller and lighter. I'd characterise the Kob as having high efficiency and low emissions and quiet. It's a quiet engine."
Knowledge Models – Further Examples

Semantic Network

- Kob
- SN4
- Kob is smaller than SN4
- Kob is lighter than SN4

Frame

<table>
<thead>
<tr>
<th>Kob</th>
<th>efficiency</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>emissions</td>
<td>low</td>
</tr>
<tr>
<td></td>
<td>noise level</td>
<td>quiet</td>
</tr>
</tbody>
</table>

From Expert to Repository

- Knowledge Objects
- Knowledge Models
- Knowledge Repository
Proses Akuisisi Pengetahuan (ES Development)

Domain Expert | Knowledge Engineer | Expert System
---|---|---
Question | Answers | Results

Basic Acquisition Process

- Elicit knowledge from experts
- Perform knowledge analysis
- Knowledge objects
- Construct knowledge models
- Knowledge models
- Populate repository
- Transcript
- Documentation
### Acquisition Techniques - Examples

- Protocol Generation Techniques
- Laddering
- Protocol Analysis
- Process Mapping
- Concept Sorting
- Repertory Grid/Matrix-based

### Protocol Generation Techniques

- **Interview**
  - Unstructured Interview
  - Semi-Structured Interview
  - Structured Interview
- Commentary
- Observation
Acquisition Techniques

- Laddering
- Protocol Analysis
- Constrained Tasks
- Process Mapping
- Concept Sorting
- Repertory Grid

Concept Ladder

- Anthophyta (Flowering plants)
- Gymnosperms
- Pteridosperms (seed plants)
- Flowering plants
- Conifers
- Evergreen
- Spruce
- Fir
- Redwood
- Sequoia
- Pine
- Oak
- Coniferous
- Woody
- Pollen
- Seed
- Fruit
Attribute Ladder

- Tastiness
  - Tasty
  - Very tasty
  - Not tasty
- Cost
  - Expensive
  - Cheap
  - Free
- Fizziness
  - Fizzy
  - Still
- Serving temp
  - Served hot
  - Served at room temp
  - Served ice cold

Process Ladder

- Make cup of tea
  - Boil water in kettle
  - Add tea-bag to cup
  - Add boiling water to cup
  - Add sugar and milk if required

- Boil eggs
  - Wait 3 minutes
  - Remove egg from boiling water
  - Make toast
  - Butter toast
  - Cut toast into strips

Prepare breakfast
**Acquisition Techniques - Examples**

- Laddering
- **Protocol Analysis**
- Process Mapping
- Concept Sorting
- Repertory Grid

**Protocol Analysis**

Expert provides a running commentary as they perform a task. This is recorded and transcribed.

**Process Mapping**

- Laddering
- Protocol Analysis
- **Process Mapping**
- Concept Sorting
- Repertory Grid
Acquisition Techniques - Examples

- Laddering
- Protocol Analysis
- Process Mapping
- Concept Sorting
- Repertory Grid

**Concept Sorting**

Expert repeatedly sorts cards, images or objects into piles based on similar properties.

**Reptorial Grid**
Acquisition Software - PCPACK

Expert System Shell - WinExsys
RunTime

Select ONE OR MORE values:
Anda Batuk?
1: Tidak
2: Ya
Terima Kasih