

AMTI – Knowledge Management

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Knowlegde

- Knowledge = contextual, relevant, actionable information
 - Strong experiential and reflective elements
 - Good leverage and increasing returns
 - Dynamic
 - Branches and fragments with growth
 - Difficult to estimate impact of investment
 - Uncertain value in sharing
 - Evolves over time with experience

One Perspective of KM

- “KM [Knowledge Management] involves **blending** a company’s **internal** and **external** information and turning it into **actionable** knowledge via a technology platform.”

Susan DiMattia and Norman Oder in *Library Journal*, September 15, 1997.

Two Kinds of Knowledge

- **Tacit:** or unarticulated knowledge is more personal, experiential, context specific, and hard to formalize; is difficult to communicate or share with others; and is generally in the heads of individuals and teams.
- **Explicit:** explicit knowledge can easily be written down and codified.

KM: Learning and Communication Process

- In simple language KM is an effort to capture not only **explicit factual information** but also the **tacit information** and **knowledge** that exists in an organization, usually based on the **experience and learning of individual employees**, in order to advance the organization's mission.
- The eventual goal is to **share knowledge** among members of the organization.

Where does KM come from?

- **Technology**
 - Infrastructure, Database, Web, Interface
- **Globalization**
 - World wide markets, North American integration
- **Demographics**
 - Aging population, workforce mobility, diversity
- **Economics**
 - Knowledge about economy
- **Customer relations**
 - Quality
- **Increase in information**
 - Specialization, Volume, Order



KM: Organizational Learning

- Ability to learn from past
- To improve, organization must learn
- Issues
 - Meaning, management, measurement
- Activities
 - Problem-solving, experimentation, learning from past, learning from acknowledged best practices, transfer of knowledge within organization
- Must have organizational memory, way to save and share it

- Organizational learning
 - Develop new knowledge
- Organizational culture
 - Pattern of shared basic assumptions

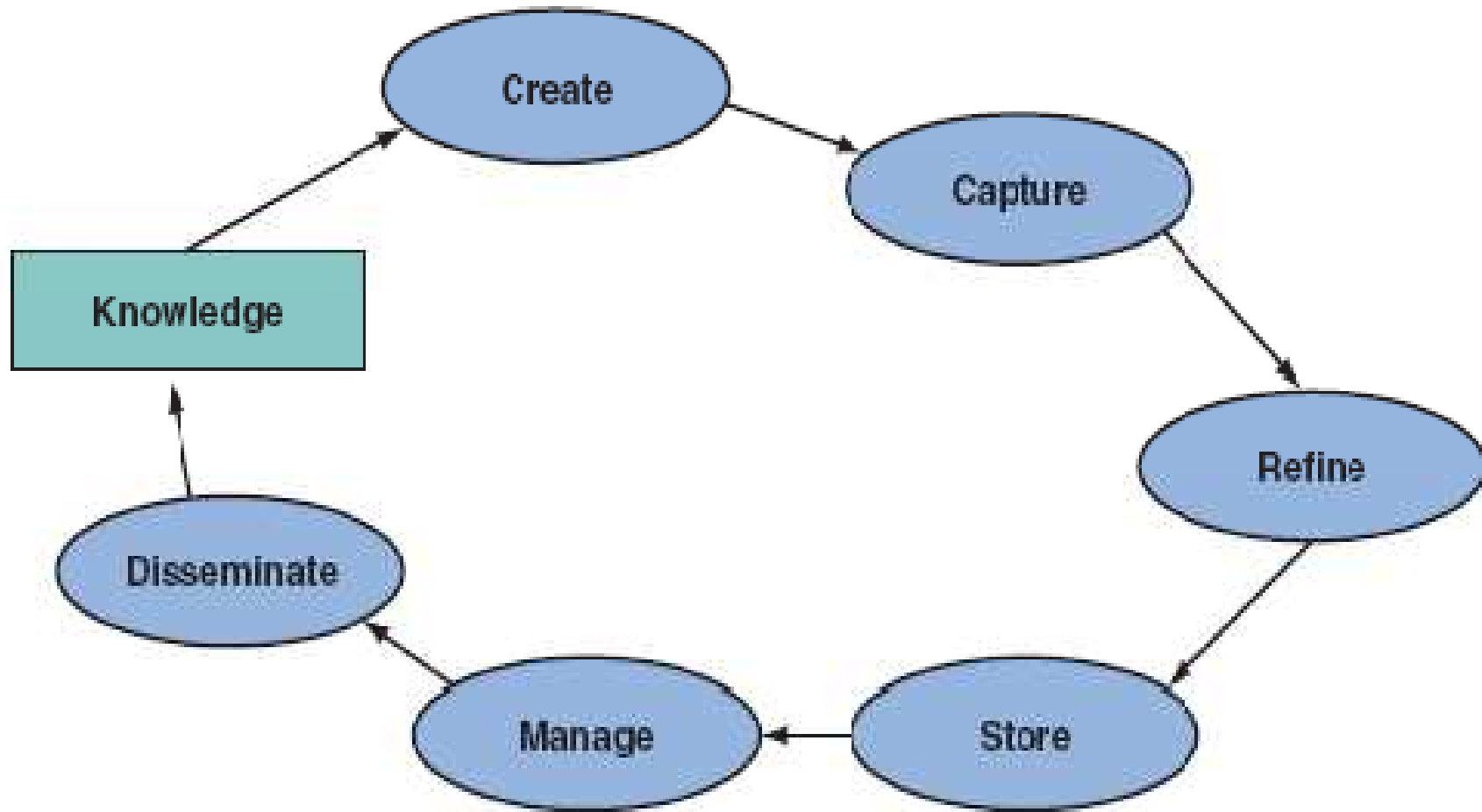
Knowledge Management

- Aims
 - Make knowledge visible
 - Develop knowledge intensive culture
 - Build knowledge infrastructure
- Processes
 - Creation of knowledge
 - Sharing of knowledge
 - Seeking out knowledge
 - Using knowledge

KM Processes

- Knowledge creation
 - Generating new ideas, routines, insights
 - Modes
 - Socialization, externalization, internalization, combination
- Knowledge sharing
 - Willing explanation to another directly or through an intermediary
- Knowledge seeking
 - Knowledge sourcing

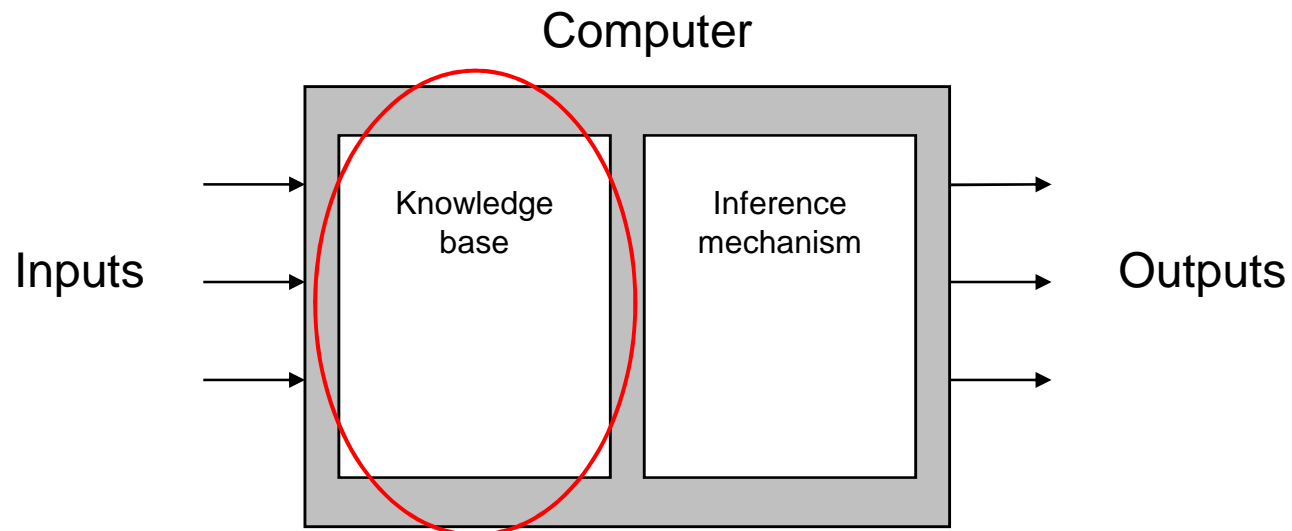
Knowledge



Knowledge and IT

Knowledge Base

- The first step in constructing an AI program is to build a **knowledge base**
- Will be used by the inference mechanism to reason and draw **conclusions**



Knowledge Base

- ***Knowledge engineering***: process of collecting and organizing the knowledge
- ***Knowledge representation***: process of how knowledge is represented to form a knowledge base

Representasi Pengetahuan

- Bagaimana merepresentasikan pengetahuan ke dalam basis pengetahuan dan menguji kebenaran penalaran
- Cara-cara lama:
 - **List**, digunakan pada LISP
 - **Predicate Calculus**, digunakan pada Prolog
 - **Tree**, untuk heuristic search
- Karakteristik RP:
 - Dapat diprogramkan
 - Dapat dimanfaatkan untuk penalaran, menggambarkan kesimpulan sebagai fungsi kecerdasan

Alasan Pemilihan

- Why **knowledge representation** rather than **information representation**?
 - Karena pada konvensional database merepresentasikan **data** secara sederhana: string, number, boolean
 - Namun AI menganggap pengetahuan lebih kompleks, seperti proses, prosedur, aksi, waktu, tujuan dan penalaran

Representasi Pengetahuan (2)

- Harus terdiri dari **struktur data** dan **prosedur** untuk penafsiran
- Hal yang berhubungan dengan RP:
 - **Object** pengetahuan itu sendiri
 - **Event**: kejadian-kejadian dalam dunia nyata dan hubungannya
 - **Performa**: bagaimana melakukan suatu tugas tertentu
 - **Meta knowledge**: pengetahuan tentang pengetahuan yang direpresentasikan

Penggunaan Pengetahuan

- **Acuisition:** mengintegrasikan informasi baru kedalam pengetahuan sistem.
 - Dua level:
 - Menyusun fakta ke dalam database
 - Pembuatan fungsi untuk mengintegrasikannya dengan cara “belajar dan mengadaptasikannya” terlebih dahulu
- **Retrieval:** mengingat kembali, menyusun ulang pengetahuan berdasarkan hubungan pengetahuan terhadap masalah
 - Linking: mengekstrak informasi baru tersebut
 - Lumping: mengelompokkan hasil ekstraksi pengetahuan baru tersebut kedalam struktur yang lebih besar seperti yang dibutuhkan dalam menyelesaikan masalah

Penggunaan Pengetahuan (2)

- **Reasoning:** pengetahuan digunakan untuk menalar suatu permasalahan
 - Formal reasoning: menggunakan logika proporsional
 - Procedural reasoning: menggunakan aturan produksi (IF-THEN)
 - Analogical reasoning: sangat sulit

Klasifikasi Kategori RP

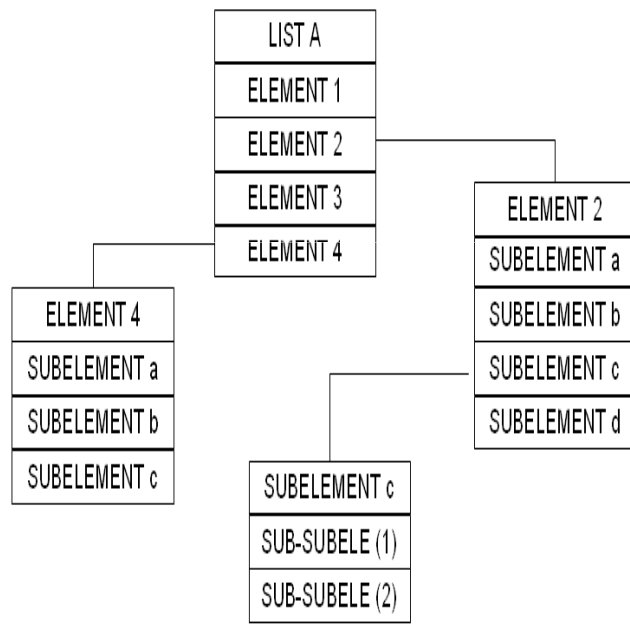
- Menurut Mylopoulos dan Levesque:
(**declarative**)
 - Representasi Logika: menggunakan logika formal. Digunakan pada PROLOG
 - Representasi Prosedural: menggambarkan prosedur sebagai kumpulan instruksi untuk memecahkan masalah. Digunakan dalam pemrograman: IF-THEN
 - Representasi Network: menggambarkan pengetahuan sebagai Graph dan Tree
 - Representasi Terstruktur: memperluas konsep Representasi Network dengan membuat node-nodenya menjadi struktur data yang kompleks. Contoh: script, frame, dan object

List dan Tree

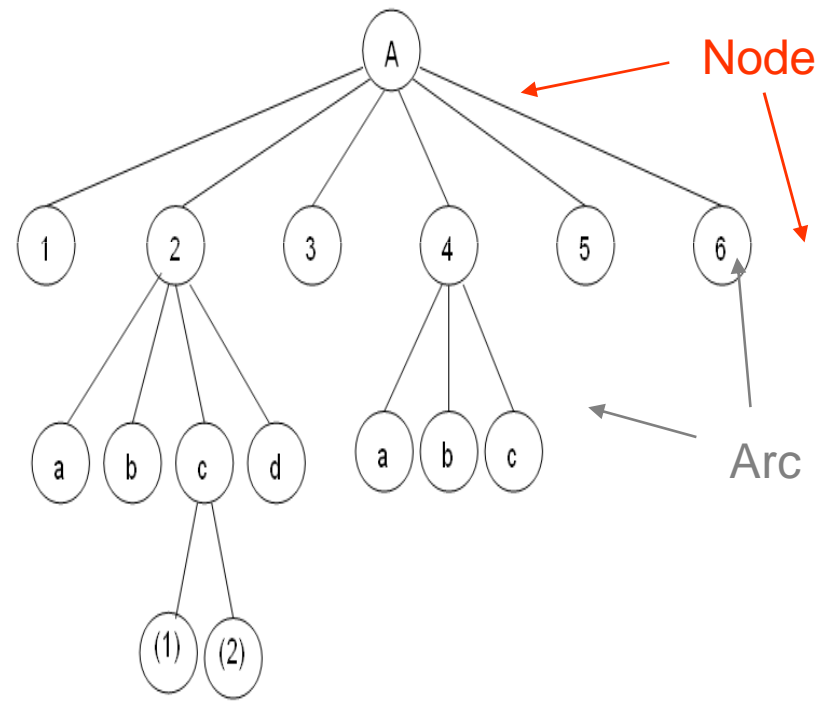
- List: serangkaian struktur data yang dibuat secara berhubungan, list bisa juga menggambarkan relasi dan hirarki
- Tree: suatu struktur data yang berupa node-node yang dibuat secara hirarkis dan hubungannya
- Lihat di Struktur Data!

Lists & Trees (2)

List:



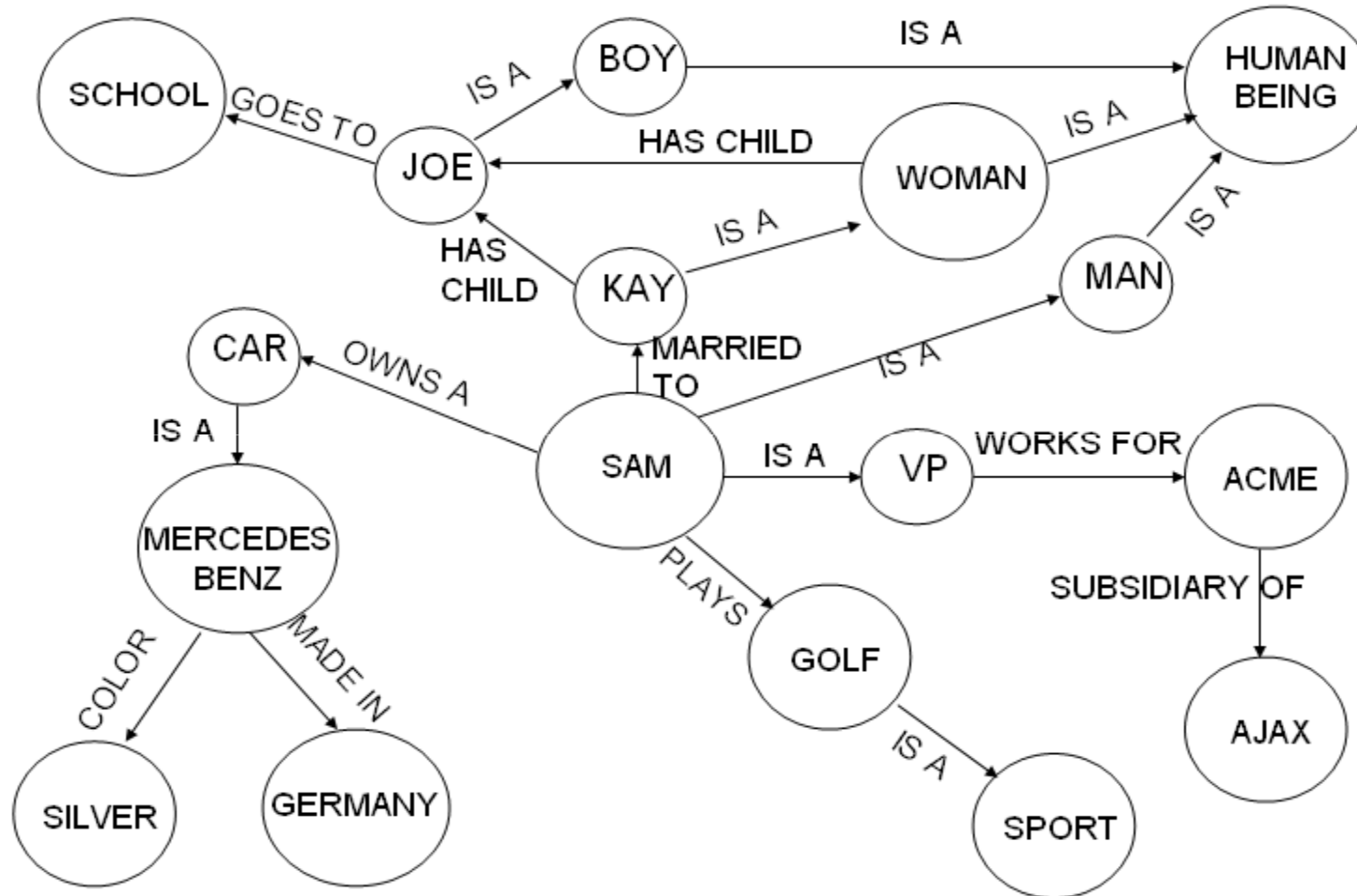
Tree:



Sematic Network

- Diperkenalkan oleh Ros Quillian
- Very flexible: almost any kind of object, attribute, concept, etc. can be defined and relationship created with links
- To seek answer: the computer simply searches forward or backward through the arcs from a starting node
- Terdiri dari:
 - lingkaran-lingkaran yang menunjukkan obyek dan informasi mengenai obyek tersebut
 - panah (arc) yang menunjukkan hubungan antar obyek
- Kelebihan:
 - Memiliki sifat inheritance
- Menggunakan representasi OAV (Object Attribute Value)

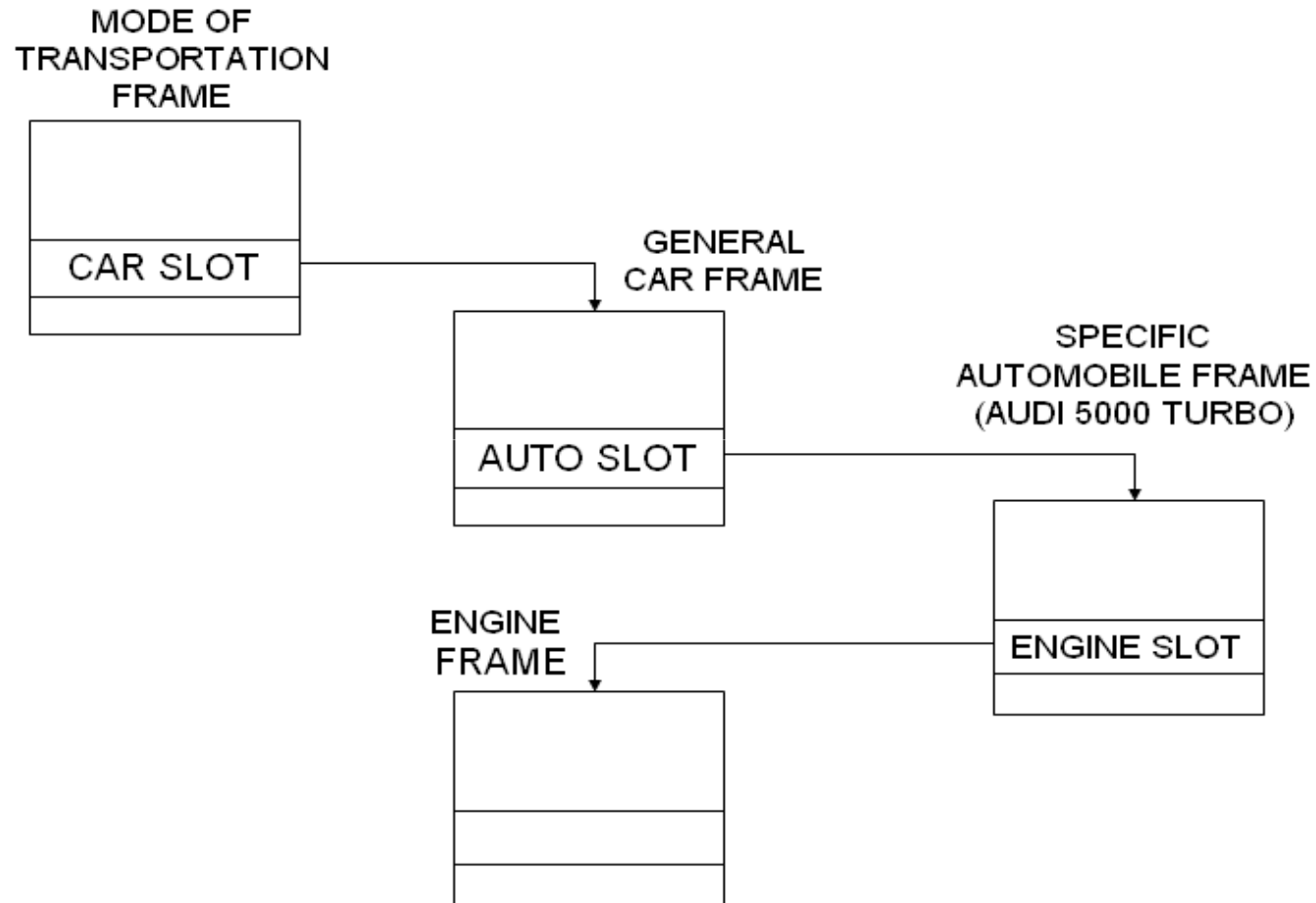
Semantic Network (2)



Frame

- Diperkenalkan oleh Minsky tahun 1975
- Suatu struktur data yang digunakan untuk merepresentasikan pengetahuan dan situasi-situasi yang telah dipahami
- Frame memiliki slot untuk menggambarkan rincian dan karakteristik obyek

Frames (2)



Script

- Mirip dengan frame, merepresentasikan pengetahuan berdasarkan pengalaman-pengalaman
- Frame menggambarkan obyek, sedangkan script menggambarkan urutan peristiwa
- Elemen script:
 - Kondisi input: start, awal
 - Track: variasi yang mungkin terjadi
 - Prop: obyek pendukung
 - Role: peran yang dimainkan oleh suatu obyek
 - Scène: adegan yang terjadi
 - Hasil (result): kondisi akhir yang terjadi

Schemas: Scripts (2)

RESTAURANT SCRIPT

Track: Fast food restaurant

Roles: Customer (C)
Server (S)

Props: Counter
Tray
Food
Money
Napkins
Salt/Pepper/Catsup/Straw

Entry Conditions: Customer is hungry
Customer has money

Scene 1: Entry

- Customer parks car
- Customer enters restaurant
- Customer waits in line at the counter
- Customer reads the menu on the wall and makes a decision about what to order

Scene 2: Order

- Customer gives order to server
- Server fills order by putting food on tray
- Customer pays server

Scene 3: Eating

- Customer gets napkins, straw, salt, etc.
- Customer takes tray to an unoccupied table
- Customer eats food quickly

Scene 3A (Option): Take-out

- Customer takes food and exits

Scene 4: Exit

- Customer cleans up table
- Customer discards trash
- Customer leaves restaurant
- Customer drives away

Results:

- Customer no longer hungry
- Customer has less money
- Customer is happy *
- Customer is unhappy *
- Customer is too full *
- Customer has upset stomach *

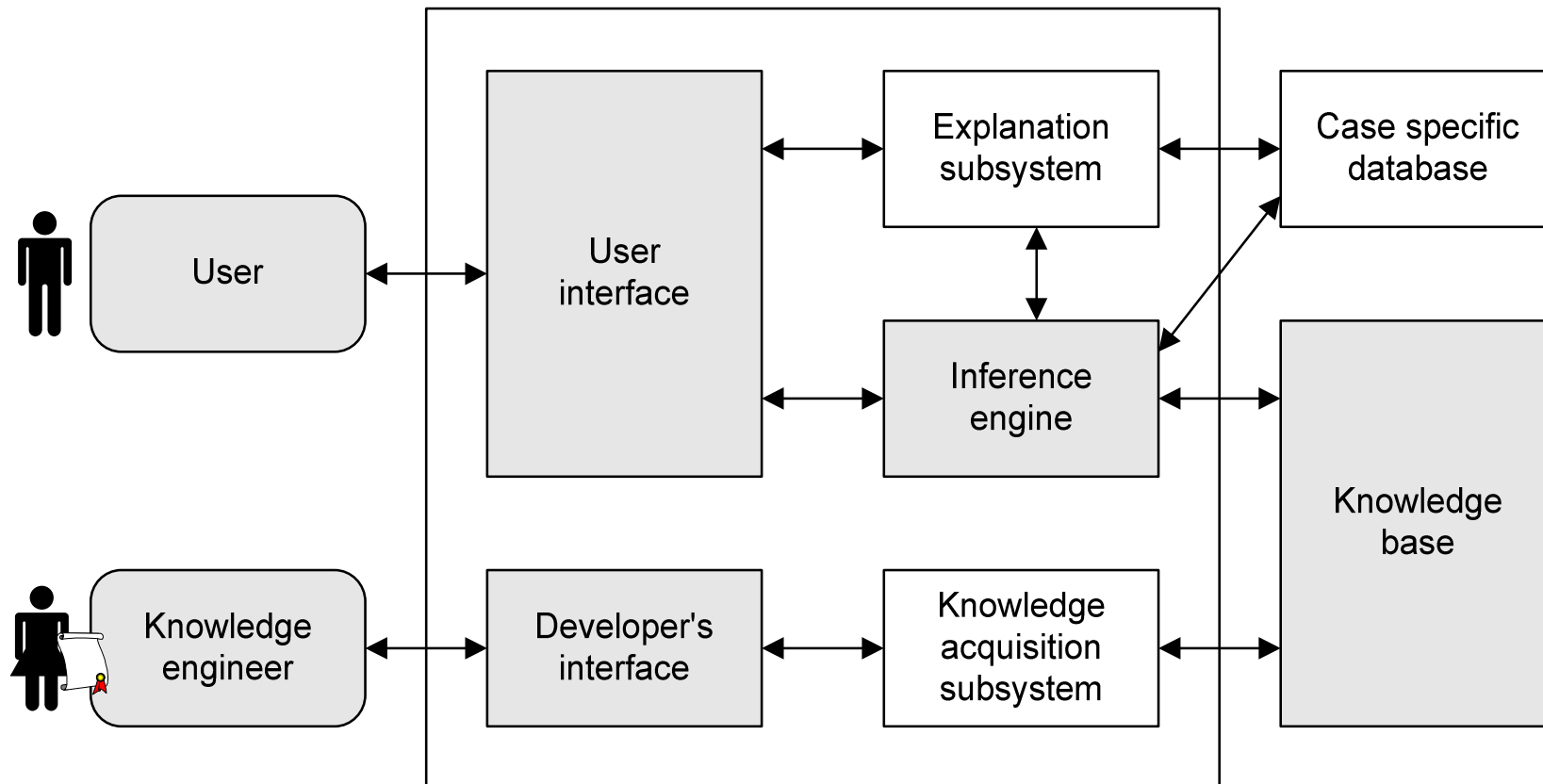
* Options

Knowledge-based systems

Structure and characteristics 1

- KBSs are computer systems
 - contain stored knowledge
 - solve problems like humans would
- KBSs are AI programs with program structure of new type
 - knowledge-base (rules, facts, meta-knowledge)
 - inference engine (reasoning and search strategy for solution, other services)
- characteristics of KBSs:
 - intelligent information processing systems
 - representation of domain of interest → symbolic representation
 - problem solving → by symbol-manipulation

Structure and characteristics 2



Main components 1

- knowledge-base (KB)
 - knowledge about the field of interest
 - symbolically described system-specification
 - KNOWLEDGE-REPRESENTATION METHOD!
- inference engine
 - „engine” of problem solving (general problem solving knowledge)
 - supporting the operation of the other components
 - PROBLEM SOLVING METHOD!
- case-specific database
 - auxiliary component
 - specific information (information from outside, initial data of the concrete problem)
 - information obtained during reasoning

Main components 2

- explanation subsystem
explanation of system' actions in case of user' request
typical explanation facilities:
 - explanation during problem solving:
 - WHY... (explanative reasoning, intelligent help, tracing information about the actual reasoning steps)
 - WHAT IF... (hypothetical reasoning, conditional assignment and its consequences, can be withdrawn)
 - WHAT IS ... (gleaning in knowledge-base and case-specific database)
 - explanation after problem solving:
 - HOW ... (explanative reasoning, information about the way the result has been found)
 - WHY NOT ... (explanative reasoning, finding counter-examples)
 - WHAT IS ... (gleaning in knowledge-base and case-specific database)

Main components 3

- knowledge acquisition subsystem
 - main tasks:
 - checking the syntax of knowledge elements
 - checking the consistency of KB (verification, validation)
 - knowledge extraction, building KB
 - automatic logging and book-keeping of the changes of KB
 - tracing facilities (handling breakpoints, automatic monitoring and reporting the values of knowledge elements)
- user interface (→ user)
 - dialogue on natural language (consultation/ suggestion)
- specially interfaces
 - database and other connections
- developer interface (→ knowledge engineer, human expert)

Main components 4

- **the main tasks** of the knowledge engineer:
 - knowledge acquisition and design of KBS:
determination, classification, refinement and formalization of methods, thumb-rules and procedures
 - selection of knowledge representation method and reasoning strategy
 - implementation of knowledge-based system
 - verification and validation of KB
 - KB maintenance

Perbedaan Pengguna KBS

- **Manager:** apa yang dapat saya gunakan?
- **Teknolog:** bagaimana saya dapat mengimplentasikan teknologi dengan baik?
- **Peneliti:** bagaimana saya dapat mengembangkannya
- **User:** bagaimana dapat membantu saya? Dapat menghemat biaya? Bagaimana kehandalannya?

Example of KBS

- The famous:
 - MYCIN: diagnosa penyakit,
 - DENDRAL: mengidentifikasi struktur molekul campuran kimia yang tidak dikenal,
 - XCON & XSEL: konfigurasi sistem komputer besar,
 - Prospector: bidang geologi
- The other:
 - SOPHIE: analisis sirkuit elektronik,
 - DELTA: pemeliharaan lokomotif listrik,
 - FOLIO: stok dan investasi

Benefits of KBS

- Memungkinkan orang awam dapat mengerjakan pekerjaan para ahli
- Bisa melakukan proses berulang secara otomatis
- Menyimpan pengetahuan dan keahlian pakar
- Meningkatkan output dan produktifitas
- Melestarikan keahlian pakar
- Dapat beroperasi pada lingkungan berbahaya
- Dapat meningkatkan kemampuan sistem komputer
- Dapat bekerja dengan informasi yang tidak lengkap
- Sebagai media pelengkap dalam pelatihan
- Menghemat waktu pengambilan keputusan

The Down Side of KBS

- Development of an KBS is difficult
- KBS is expensive
- Most KBS still must be implemented & delivered on a big mainframe or minicomputer
- Not 100% reliable
- Kepakaran tidak selalu tersedia pada bidang-bidang tertentu

KBS Categories

- KBS is not suitable for all situations
- Generic KBS categories:
 - Control : intelligent automation
 - Debugging : recommends corrections to faults
 - Design : developing products to specification
 - Instruction : optimized computer instruction
 - Interpretation : clarification of situations
 - Planning : developing goal-oriented schemes
 - Prediction : intelligent guessing of outcomes
 - Repair : automatic diagnosis, debugging, planning and fixing

NEXT

- Presentasi
 - Senin, 5 Desember 2011
 - Pukul 08.00