INTRODUCTION TO KNOWLEDGE ENGINEERING

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Introduction

- Knowledge engineering is the process of building knowledge base system in any field
- The processes involved are:
  - planning,
  - knowledge acquisition,
  - system building,
  - system installation,
  - system maintenance.

Introduction

- Mainly with reference to computer science, has been defined by Feigenbaum (1980) as the **process of reducing a large body of knowledge to a precise set of facts and rules.**

- Knowledge engineering will be referred to as any activity demanding **acquisition and representation of knowledge**

Data, Information and knowledge

DATA

- Data refers to isolated facts such as individual measurements
- No meanings on their own
- Do not signify anything and are useless
- Example:
  - 10
  - 1.5672
  - Mary
  - Jones
  - red
  - 1,000,000

Data, Information and knowledge

INFORMATION

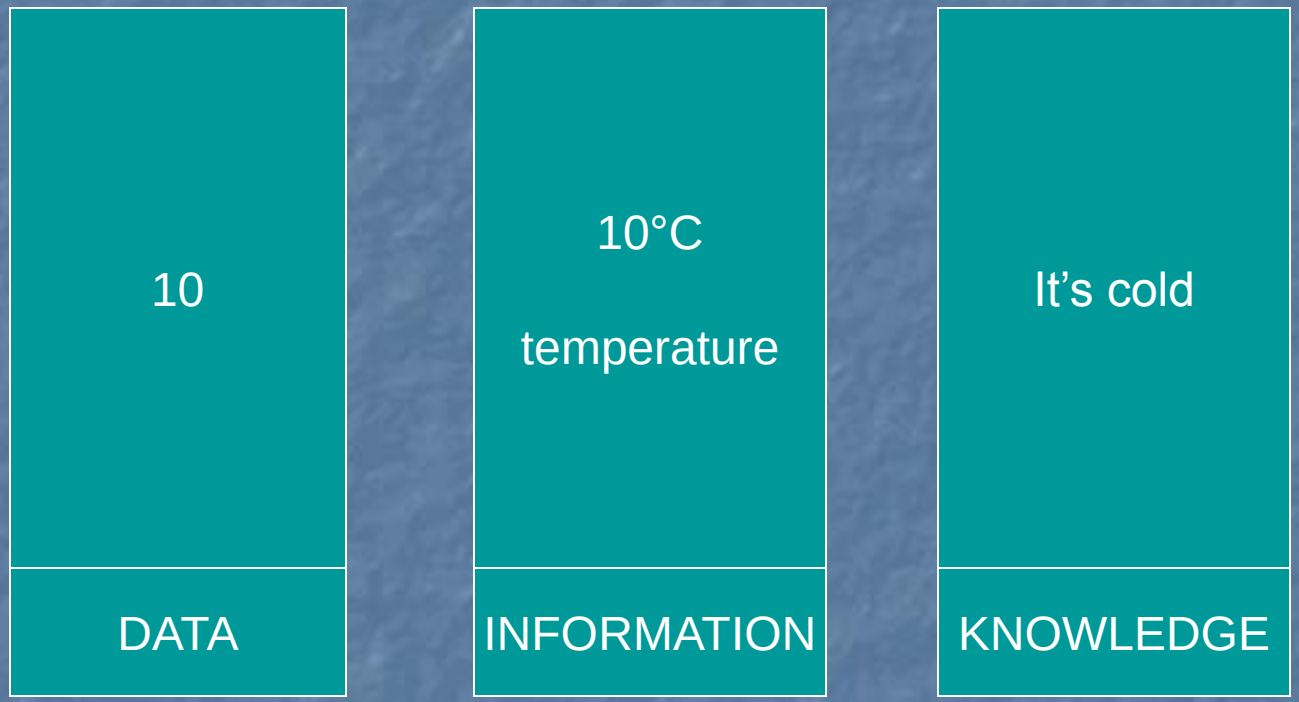
- Consist symbols such as texts and numbers plus some meaning associated with the symbols
- Due to this added meaning, the information now has some use or value
- Example:
  - 10°C
  - RM1,000,000
  - Mary Jones, New Street, Birmingham, UK
  - The big red ball

Data, Information and knowledge

KNOWLEDGE

- Consist of symbols, the relationship between them and rules/procedures for manipulating them
- Add context to information, providing greater meaning and much value
- New knowledge can be derived or inferred from the rules
- Dynamic and changes with time: constantly being added to and develops as we discover new things

Data, Information and knowledge



Engineering, software engineering & knowledge engineering

ENGINEERING

- World oldest profession
- Oldest engineering disciplines is civil engineering
- Concerned with design, site preparation and construction of structures and facilities
- Civil engineers design and build roads, houses and factories

Engineering, software engineering & knowledge engineering

SOFTWARE ENGINEERING (SE)

- Closest to KE
- KE is subset of SE as knowledge base system (KBS) is a piece of software
- First introduced in 1960s to respond to the lack of disciplines in programming

Engineering, software engineering & knowledge engineering

SOFTWARE ENGINEERING (SE)

- Problems in software development
  - Software projects take longer to finish than originally plan
  - Software was costing a lot more to develop than initially imagine
  - Software was being delivered to the customer only to fail
  - Software projects were being abandoned because of disastrous failures

Engineering, software engineering & knowledge engineering

SOFTWARE ENGINEERING (SE)

- Software should be engineered in a manner as civil engineer might construct a bridge or a motor engineer construct a car
- May be defined as “the application of traditional engineering approach to the development of software”
- SE implies the use of tools, techniques and methods for production of quality software

Engineering, software engineering & knowledge engineering

KNOWLEDGE ENGINEERING (KE)

- In a similar manner, KE is SE applied to the design of KBS.
- Donald Michie first used the term in 1972, others accredited Edward A. Feigenbaum in 1977
- Can be thought of as the process of developing knowledge based system

Engineering, software engineering & knowledge engineering

KNOWLEDGE ENGINEERING (KE)

- KE includes:
  - Knowledge acquisition
  - Knowledge representation
  - Software design
  - Implementation in an appropriate computer language

Engineering, software engineering & knowledge engineering

KNOWLEDGE ENGINEERING (KE)

- Like SE, KE is the application of rigorous SE approaches to the development of knowledge based system

The role of knowledge engineer

- Those involves in KBS production come from wide range of background
- Reflecting different technologies that feed into KE.
- They can be:
  - Computer scientist
  - Knowledge specialists
  - Software engineers
  - System analysts
  - Psychologists
  - Project managers
  - Expert in a particular domain (domain experts)

The role of knowledge engineer

- A survey done in UK by Smith and Ross (1994), scrutinize 7 important skills of knowledge engineers:
  - Management
  - Creativity
  - Analysis
  - Verbal skills
  - Human skills
  - Fact finding
  - Knowledge representation

The role of knowledge engineer

- KE is a versatile creature , with numerous skills in:
  - project management,
  - software development
  - system analysis
- KE also requires:
  - considerable human & interpersonal skills,
  - skills particular to the development of KBS such as knowledge representation techniques

Categories of Knowledge Based System

- KBS is a computer system which embodies knowledge about a specific problem domain and can thus be used to apply this knowledge to solve problems from that problem domain

Categories of Knowledge Based System

- KBS includes:
  - **Expert systems**
  - **Intelligent database systems**: usually take the form of intelligent front end
  - **Intelligent tutoring system**: attempt to model a human tutor
  - **Intelligent CASE tools**: replicate knowledge of software engineer, integrating CASE and KBS
  - **Integrated of hybrid system:** integrating KBS with traditional information system

Exercise for Discussion

- Ensure you understand and can differentiate among the following term:
  - Data
  - Information
  - Knowledge

Look up the above terms in a dictionary and see if the dictionary makes a clear distinction between them (it may not!)