SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107

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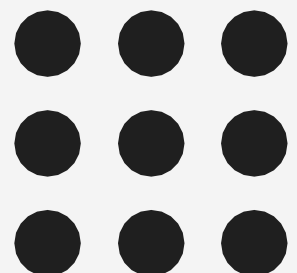**Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai**

Department of Artificial Intelligence and Data Science

Course Name – Introduction to Artificial Intelligence

II Year / III Semester

Unit 2 Knowledge Representation Issues

Knowledge Representation Issue

- The fundamental goal of knowledge Representation is to facilitate inference (conclusions) from knowledge.

- The issues that arise while using KR techniques are many. Some of these are explained below.

- Important Attributed:

  – Any attribute of objects so basic that they occur in almost every problem domain?

  – There are two attributed "instance" and "isa", that are general significance. These attributes are important because they support property inheritance.

- Relationship among attributes:
  - Any important relationship that exists among object attributed?
  - The attributes we use to describe objects are themselves entities that we represent.
  - The relationship between the attributes of an object, independent of specific knowledge they encode, may hold properties like:
- Inverse — This is about consistency check, while a value is added to one attribute. The entities are related to each other in many different ways.

- Existence in an isa hierarchy —
  - This is about generalization-specification, like, classes of objects and specialized subsets of those classes, there are attributes and specialization of attributes.
  - For example, the attribute height is a specialization of general attribute physical-size which is, in turn, a specialization of physical-attribute.
  - These generalization-specialization relationships are important for attributes because they support inheritance.

- Technique for reasoning about values —
  - This is about reasoning values of attributes not given explicitly.
  - Several kinds of information are used in reasoning, like, height: must be in a unit of length, Age: of a person cannot be greater than the age of person's parents.
  - The values are often specified when a knowledge base is created.

- Single valued attributes —
  - This is about a specific attribute that is guaranteed to take a unique value.
  - For example, a baseball player can at time have only a single height and be a member of only one team.
  - KR systems take different approaches to provide support for single valued attributes.

- **Choosing Granularity:**
  - At what level of detail should the knowledge be represented?
  - Regardless of the KR formalism, it is necessary to know:
    - At what level should the knowledge be represented and what are the primitives?
    - Should there be a small number or should there be a large number of low-level primitives or High-level facts.
    - High-level facts may not be adequate for inference while Low-level primitives may require a lot of storage.

- **Example of Granularity:**

  Suppose we are interested in following facts:

  John spotted Sue.

  This could be represented as

  Spotted (agent(John),object (Sue))

- Such a representation would make it easy to answer questions such are:

  Who spotted Sue?

- Suppose we want to know:

  Did John see Sue?

- Given only one fact, we cannot discover that answer.
- We can add other facts, such as

  Spotted(x, y) -> saw(x, y)

- We can now infer the answer to the question.

- Set of objects:
- How should sets of objects be represented?
- There are certain properties of objects that are true as member of a set but not as individual;
- Example: Consider the assertion made in the sentences:

  "there are more sheep than people in Australia", and

  "English speakers can be found all over the world."
- To describe these facts, the only way is to attach assertion to the sets representing people, sheep, and English.

- The reason to represent sets of objects is: if a property is true for all or most elements of a set, then it is more efficient to associate it once with the set rather than to associate it explicitly with every elements of the set.
- This is done,
  - in logical representation through the use of universal quantifier, and
  - in hierarchical structure where node represent sets and inheritance propagate set level assertion down to individual.

- Finding Right structure:
  — Given a large amount of knowledge stored in a database, how can relevant parts are accessed when they are needed?
  — This is about access to right structure for describing a particular situation.
  — This requires, selecting an initial structure and then revising the choice.

- While doing so, it is necessary to solve following problems:
  — How to perform an initial selection of the most appropriate structure.
  — How to fill in appropriate details from the current situations.
  — How to find a better structure if the one chosen initially turns out not to be appropriate.
  — What to do if none of the available structures is appropriate.
  — When to create and remember a new structure.