3. CSDP Step 1

> Step 1: Transform familiar examples into elementary facts.

Step 1: Transform Familiar Examples into Elementary Facts

In this step, we transform familiar examples into elementary facts.

For instance, if the universe of discourse is concerned with what departments employees are working in within a particular company, we can have an example like:

> "Mary Smith works in sales."

Here, "**Mary Smith**" and "**sales**" are objects, and "**works in**" is the role.

Objects and Roles

- Objects are typically nouns (e.g., Mary Smith, Sales).
- Roles are typically verb phrases (e.g., works in).

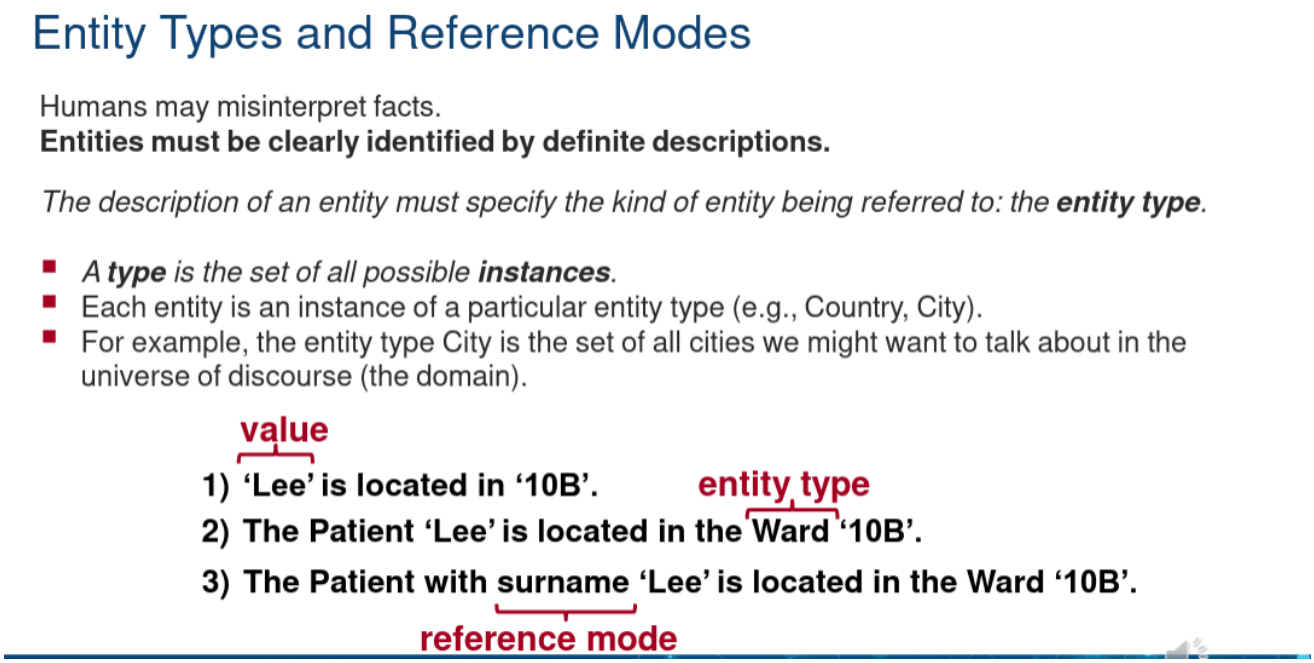
Defining the Universe of Discourse

When defining the universe of discourse or domain in elementary facts, we must ensure that we clearly identify the full description of the entity and define the entity type within this definition.

Types and Instances

- Types refer to all possible instances (e.g., student).

- Instances refer to specific individuals (e.g., Mark Walpole is a student).



Building Sentences

When building sentences, we start with a basic idea and gradually add more detail to create a well-defined statement. For example:

- "Lee is located in 10B" (not well-defined)
- "The patient Lee is located in ward 10B" (better, but still incomplete)
- "The patient with surname Lee is located in ward 10B" (well-defined, with entity types and reference mode)

Predicates in ORM

In ORM, predicates are used to describe how objects play roles. A predicate is a sentence template with placeholders for objects. The number of placeholders determines the arity of the predicate:

- Unary predicate: one placeholder (e.g., "... studies")
- Binary predicate: two placeholders (e.g., "Mary Smith works in sales")

- Ternary predicate: three placeholders (e.g., "Joe Bloggs obtains a grade of 54 for IFB105")

A **predicate** is a *sentence template*.

- For example: ..... works in .....
- The arity of the predicate tells us how many 'object holes' the sentence has.
  - A unary predicate has one, e.g., Ann studies (…… studies)
  - A binary predicate has two, e.g., ... works in .....
  - A ternary predicate has three, e.g., ….. obtains a grade of ….. for …..
  - etc.

Deeper Structure of Statements

Even simple statements like "Mary Smith works in sales" have a deeper structure. We can also say "Sales employs Mary Smith." These two facts are semantically equivalent and need to be considered for each object to ensure proper understanding.

Surface Structures vs. Deep Structures

- Where the arity of a predicate is greater than one, the predicate can be read in more than one way, for instance:
  - Mary works in Sales
  - Sales employs Mary

.... employs .... is the *inverse* of .... works in ....

- These two predicates have different surface structures but the same deep structure!
- We need to look at the deep structure of the sentence to understand exactly what we are dealing with.

Entity Descriptions

Entity descriptions consist of three components:

- Entity type
- Reference mode
- Value

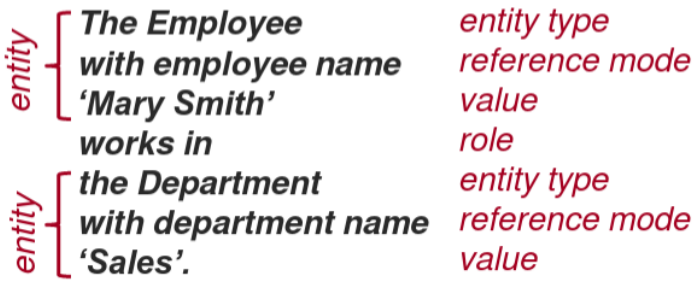
When describing the relationship between two entities, we need the role in the middle. Applying the full entity description to the earlier example, we get:

- "The employee with employee name Mary Smith works in the department with department name sales"
- "The department with department name sales employs the employee with employee name Mary Smith"

These statements are semantically equivalent and are called fact types.

Most entities can be identified using three components:

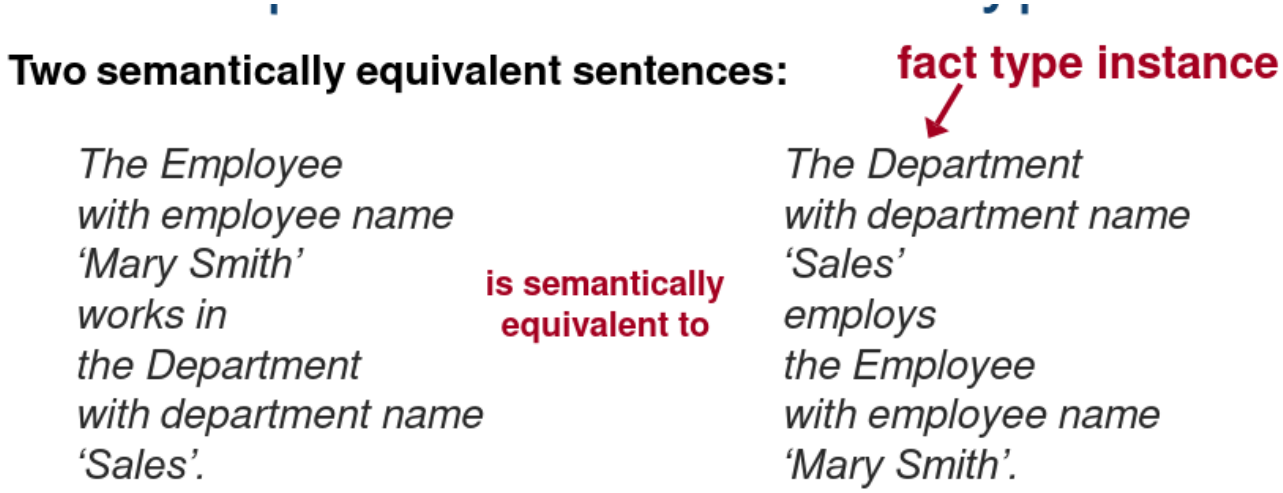
- Entity type (e.g., Country, City)
- Reference mode (e.g., surname, employee name)
- Value (e.g., “123ABC” or 3.14)



Fact Types and Fact Instances

- Fact types are the general description of the relationship between entities.
- Fact instances are specific occurrences of the fact type.

Roles are crucial in defining fact types. In the Mary Smith example, the role "works in" is equivalent to "employs."



Elementary Facts

Elementary facts are atomic and cannot be divided or subdivided. Each elementary fact asserts that a particular object has a property or participates in a relationship with one or more objects.

Things to Avoid in Elementary Facts

When defining elementary facts, it's important to avoid:

- Logical connectives (e.g., and, or, if)
- Logical quantifiers (e.g., all, some)

Examples of incorrect elementary facts:

- "Clare is female and Zach is male" (contains a logical connective)
- "All people who jog are fit" (contains a logical quantifier)

See Also

4. CSDP Step 2