One world, Many representations

Basic Notions

Sensing and representing the world in the human's mind

Solution **1.11** ANSWER: coherent models are: a, d.

Solution **1.12** ANSWER: a, b, d.

Solution **1.13** ANSWER: e, f (NOTE: g is false because in #1 they run and do not have umbrella).

Solution **1.14** ANSWER: h, i (NOTES: about i, there might be multiple interpretations of human behavior, depending on the observations; about j, the modeler fails to recognize that only people with no umbrella are running, regardless the intensity of rain).

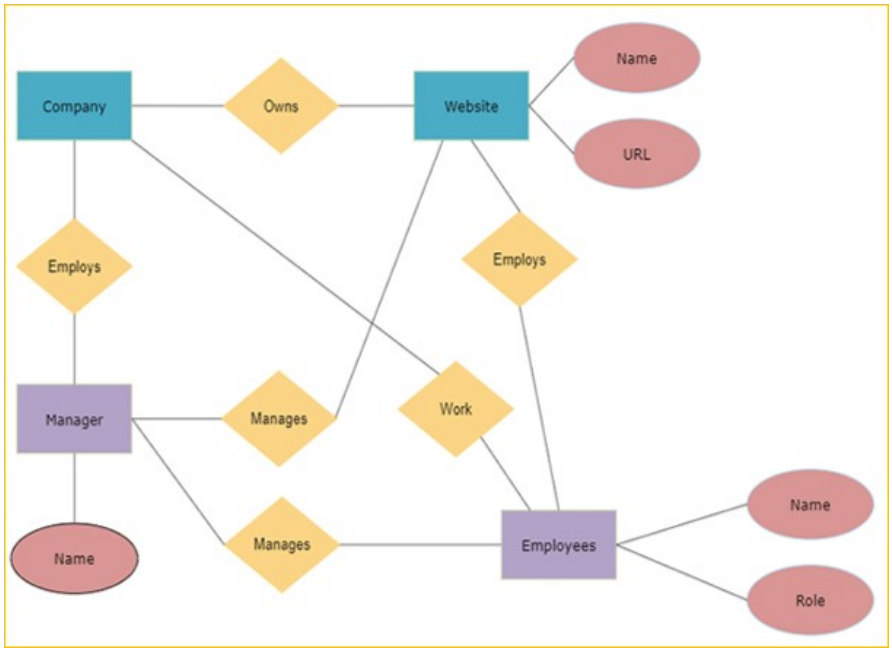
Solution **1.15** Examples of possible models for the 3 different observations:

- #1: the insect is red with black spots of circular shape; the insect has three pairs of jointed legs and one pair of antennae;
- #2: the insect is multicolour with several spots of different shape; the insect has three pairs of jointed legs and one pair of antennae;
- #3: the insect is pale blue with several black spots of different shape; the insect has three pairs of jointed legs and one pair of antennae;

Solution **1.16** ANSWER: T2.

Solution **1.17** ANSWER: b.

Solution **1.18** POSSIBLE ANSWER:



Solution 1.22 **(Linguistic and analogical mental representations).** We create the following linguistic representation to describe the analogical one:

- In(tree, lab)
- In (monkey1, lab)
- In(monkey2, lab)
- Eating(monkey1, banana)
- SittingOn(monkey2, tree)
- Scratching(monkey2, hisHead)

The Semantic Gap

Solution 1.23

- (Sight): We can only see a certain range of colors. Also, we need the light to be bright enough to see things.
- (Hearing): Humans, animals and even some insects have a range of wavelengths or pitches they can sense or hear. Within this range, there is also a minimum and maximum volume that can be heard.

Solution 1.24 EXAMPLES: Speed of car, Body temperature, Color of an object, …

Solution 1.25

- EXAMPLE 1: When modeling the problem of estimating the time needed by a car to travel from one location to another, we can just concentrate on its speed (no need to consider color, model, or weight …)
- EXAMPLE 2: When modeling the problem of representing students' performance, we can just concentrate on their scores on exams (no need to consider hair color, gender, nationality, …)
- EXAMPLE 3: When modeling weather forecast, we cannot represent all aspects of the entire Planet Earth.

Solution **1.26** ANSWER: c.

Solution **1.27** By now you should be able to do it without help.

Solution **1.28** By now you should be able to do it without help.

Solution **1.29** Given that it is not possible to represent a phenomenon fully, we must focus only on the relevant aspects of the task at hand, and even in this case we can only concentrate on some features with a certain degree of approximation. a positive consequence is that by focusing on the key features, appropriately selected, we can limit the complexity of reasoning with a reasonable approximation of correspondence with the real world.

Diversity of individual representations

Solution **1.30** Because of the inherent diversity of people, they generate different models of the same observed phenomenon.

Solution **1.31** ANSWER: c.

Solution **1.32** Here's the solution:

1. is true because it follows directly from the definition of the semantic gap; in fact, since it is not possible to capture all aspects of an observed phenomenon observed, it is practically impossible for two different persons to produce the same mental representation, also because there is between them an inherent diversity in terms of perception, experience and goals.
2. is false because it is the linguistic representations that describe the world. Analogical representations 'depict' it, in the sense that an analogical representation is merely a figure and is not constructed on the basis of a predefined language (via a syntax).
3. is true in that this is also a direct consequence of the semantic gap; a mental representation can never be complete with respect to the world.
4. is false; for example, I can create a linguistic representation in Italian and one in English for the same phenomenon.

Solution **1.33** Here's the solution:

- True

- True
- False
- True

Solution **1.34** By now you should be able to do it without help.

Solution **1.35** By now you should be able to do it without help.

Solution **1.36** Here's the solutions:

- is true, both because of the semantic gap and because of the inherent diversity of people in terms of perception and goals.
- is false because ambiguity arises from using the same term in the language for two different objects (or sets, or properties) of the world and not vice versa. For example, I can call a car a 'car' or as "car" and no ambiguity is generated.

Solution **1.37** By now you should be able to do it without help.