

Breuker's suite of **problem types** is shown in Fig. 7.1. The **problem types** are divided into two groups: the ones which adopt a behavioural view, and the ones which also use a structural view (see Fig. 7.1). This distinction indicates whether the **problem** is based on viewing a system in the world as a 'black box' of which we are interested in the external behaviour (the behavioural view), or whether one has access to the internal structure of the system as well (the structural view). The suite distinguishes eight basic **problem types**, some of them with small variations:

**Modelling** problems aim at identifying what is the system and what is the environment — that is, drawing a frontier between system and environment. In many real-life problems, modelling is not a concern because such distinction is available beforehand, e.g. when repairing a simple electric apparatus, but when dealing with complex or natural (biological and/or physical) systems modelling becomes a central concern.

**Design** problems produce as their conclusions a structure of interconnected components. These components may vary from concrete objects (e.g. components of an electronic circuit) to abstract processes (e.g. processes in the human body).

**Planning** problems aim at obtaining a plan, i.e. a sequence (or, more generally, a temporal structure) of events connected by actions (i.e. behaviour). When the planning aims at an explanation of an event in the past instead of the future (goal) states, it is called *reconstruction*.

**Assignment** problems 'fill' a structure with elements. The structure can be a design, a plan or a model. If the structure is a plan, for example, these elements are usually resources

major type	type of <b>problem</b>	generic conclusion
synthesis	modelling	behavioural model
	design	structure of elements
	planning (reconstruction)	sequence of actions
modification	assignment (scheduling, configuration)	distribution/assignments
analysis	prediction (postdiction)	state of system
	monitoring	discrepant states
	diagnosis	faulty element
	assessment	class/grade attribution

Table 7.1: Description of the **problem types** in Breuker's typology (from [Breuker, 1994], used with permission). Variations of the basic **types** are indicated in parentheses.

used by the steps of the plan; the **problem** is then called *scheduling*. If the structure is a design, the **problem** is typically called *configuration*.

**Prediction** problems find out future states of a system using a description of a present state. The **problem** can be reversed in time, in order to find out previous states of the system; it is then called *postdiction*.

**Monitoring** problems determine possible differences between observed and expected states of a system.

**Diagnosis** problems establish a faulty component or structure, i.e. elements which behaviour conflicts with their behaviour according to their model or design.

**Assessment** problems use a measurement of some characteristic of a system (usually expressed as norms) to classify their behaviour.