In Chapter 3, the knowledge implementation is defined in the context of both human learning and machine learning. The term the knowledge implementation introduced in this book is referring to learning of the knowledge and skills by the machine, the shape understanding system (SUS). It is concerned with two main aspects of human learning: learning of visual knowledge in the context of the categorical structure of the learned categories of the visual objects and learning of the knowledge that is connected with understanding of the content of the text. The knowledge implementation is part of the shape understanding method, developed by authors [1] that stresses the importance of the knowledge acquisition in understanding and thinking processes. In this Chapter some aspects of the shape understanding method, that allow for better understanding of the knowledge implementation approach, are presented.

When the mind makes a generalization such as the concept of a tree (Fig. 5.1), it extracts similarities from numerous examples. The simplification of the complex form by making generalization enables higher-level thinking. Similarly, the shape understanding system (SUS) acquires knowledge by extracting similarities from the numerous visual objects in order to form a visual concept.

Fig. 5.1. Example of generalization of the concept of a tree

The shape understanding system understands an examined object based on knowledge and skills that were learned previously. Based on the general properties of objects that are part of the real world, the different epistemological categories of objects were established. The category of the visual objects is the basic epistemological category, described in Chapter 6. From the category of the visual objects, the category of the sensory objects, the category of the text objects and the category of aesthetic objects were derived (see Fig. 5.2). The category of the text objects, that is described in Chapter 7, is the category of visual objects that have dual meaning. The category of the aesthetic objects is the category of visual objects that are the subject of the aesthetic evaluation based on the aesthetic attributes of these objects.
In this book the visual objects, the sensory objects and text objects are described in the context of how SUS learns to understand objects that belong to these categories. The aesthetic evaluation of an object will be a topic of further study, based on the framework described in [106], [107].

For the purpose of this study, the text category $T$ is divided into four different specific categories: the text-query category $T^G$, the text-task category $T^T$, the dictionary-text category $T^D$ and the long-text category $T^L$. The text-task category is divided into the category of visual-text-task $T^T[V]$, the action-text-task $T^T[A]$, the explanatory-text-task $T^T[W]$, the educational-text-task $T^T[E]$ and the IQ-text-task $T^T[I]$. In this book only the text-query category $T^G$, the text-task category $T^T$ and the dictionary-text category $T^D$ is described.

SUS learns to understand the objects that belong to the different categories. The very important role in the understanding of the visual or sensory object plays the correct naming of the object whereas finding the meaning of the text plays a key role in the understanding of the text objects. In order to evaluate the ability of SUS to understand the text-tasks, standardized student achievement tests (selected tasks) were applied. It was assumed that SUS is able to understand the text from the selected text category if SUS can solve the different tests such as standardized student achievement tests. Learning of the text requires transferring of the knowledge from the different available sources and means, such as dictionaries or handbooks into SUS. Similarly to a student that is learning for passing a test, SUS learns different texts, from different achievement tests, that belong to the different text categories in order to “perform well” on student achievement test. The student achievement test is a test used for monitoring students’ performance at school. This type of tests are used to assess the ability of SUS to understand learned knowledge.

An object from the text category is interpreted based on the category of body of the knowledge $\langle \kappa_{BodK} \rangle$. The category of body of the knowledge (knowledge category) $\langle \kappa_{BodK} \rangle$ is divided into the category of theology $\langle \kappa_{Teol} \rangle$, the category of philosophy $\langle \kappa_{Phil} \rangle$, the category of science $\langle \kappa_{Sc} \rangle$ and the category of common sense knowledge $\langle \kappa_{KSK} \rangle$. The category of science (the knowledge object) $\langle \kappa_{KSc} \rangle$ is divided into the category of physical sciences, the biological sciences, the