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# The application of object methods for functional features representation

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**Abstract:** The application of the object analysis as a method for identification of functional features was presented. Moreover a form of the selected objects record in respect of considered problem domain was presented.

**Keywords**: Object analysis, Functional features, Conjugation and transformation relations

## 1. THE OBJECT APPROACH

The object approach depends on modelling the reality in a way understood and interpreted by people. The object analysis consists of five main activities [2]: the subjects identification, the structures identification, the Classes-&-Objects finding, the attributes definition, and the procedures definition. As a result of carrying out mentioned activities an object analysis model is created. This model consists of five layers [2]:

- the subjects layer,
- the structures layer,
- the Classes-&-Objects layer,
- the attributes layer,
- the procedures layer.

Such positioned layers testify that “subjects” are identification of problem domains, “structures” are initial outline of problem complexity, Classes-&-Objects are components of complexity, attributes are specification of Classes-&-Objects characteristics, and procedures are specification of activities on Classes-&-Objects or more precise on their attributes. Therefore after identifying the Classes-&-Objects layer the attributes layer is considered and at the end procedures that work on the basis of available attributes are dealt with.

The appearance of big and complex models causes that a mechanism enabling progressively „sinking” into the problem domain is required. This mechanism works on the basis of keywords rather than on the basis of detailed solutions so that enables identification of model elements rather than detailed solutions for one of elements. Such a mechanism is the subject identification. Searching for subjects is implemented on the basis of “scale” rule. This rule depends on proper establishment of subjects priorities that means on the appropriate referring subordinated to superior subjects. “Scale” rule helps in the adequate scaling

of problem domain. Example subjects for the mechanism analysis may be: the motion analysis (collision), the kinematics analysis, the dynamic analysis, and the resistant analysis.

Structures are applied in order to express the domain of the problem. Complexity can be expressed with the aid of two structures, that is: gen-spec structure (generalisation-specialisation) and the whole-part structure [2, 4, 5]. The gen-spec structure enables finding generalisation of already existing Classes-&-Objects or finding their specialisations. The discussed structure has hierarchical character, where the "generalisation" class is of higher level in the hierarchy than the "specialisation" class (Fig.1a). The whole-part structure enables selecting of Classes-&-Objects on the basis of rules: matching-parts, container-contents, and collection-elements. The discussed structure has hierarchical character that means the whole "owns" parts, however, the part is not the specification of the whole and the whole is not generalisation of the part. In the hierarchy the whole is placed on the higher level while parts from which it is consisted of on the lower lever (Fig.1b).

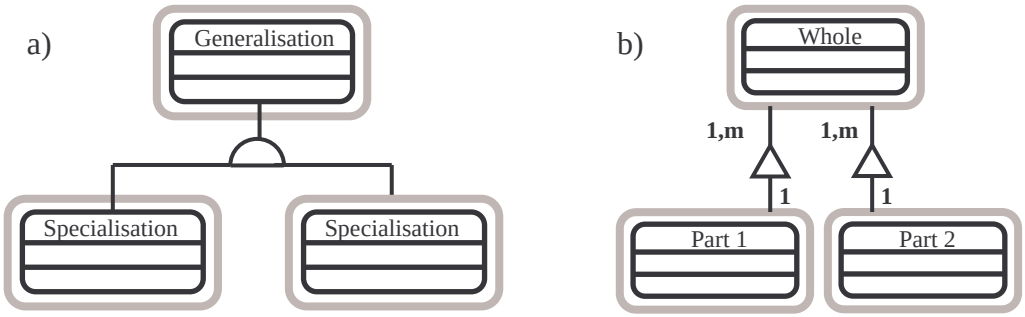


Figure 1. Structures: gen-spec and whole-part [2]

The Classes-&-Objects identification is one of the main aims of domain problem analysis understood as the considered operating field. It should be underlined that during an analysis only these Classes-&-Objects should be distinguished which enable description of considered operating field. That is why Classes-&-Objects aim at representation of basic components of considered problem domain.

The differentiation of attributes enables detail representation of reality in form of Classes-&-Objects. The selection of characteristics determining Classes-&-Objects has close relation with considered operating field. It means that only characteristics defining Class-&-Object directing them at operating on analysed problem are selected. Attributes are data for which objects of a given class take their own values. Characteristics describe a state of an object in a given moment, values of these characteristics.

The differentiation of procedures enables the further detail real object representation into a model. Procedure is the accepted behavior of an object that it has to realise to represent considered states of the real object.

The determination of states, in which a given object should be, is the basis for the procedures identification. These states should provide transition from one state (characteristics values) to the other. Besides the procedures enabling modification of characteristics values (that are present in the same object) it is necessary to define procedures enabling affecting of procedures present in a given object onto attributes describing that object.

## 2. DESCRIPTION OF FUNCTIONAL FEATURE

Fig.2. presents the general structure of the functional feature notation due to the denotation applied in the object approach.

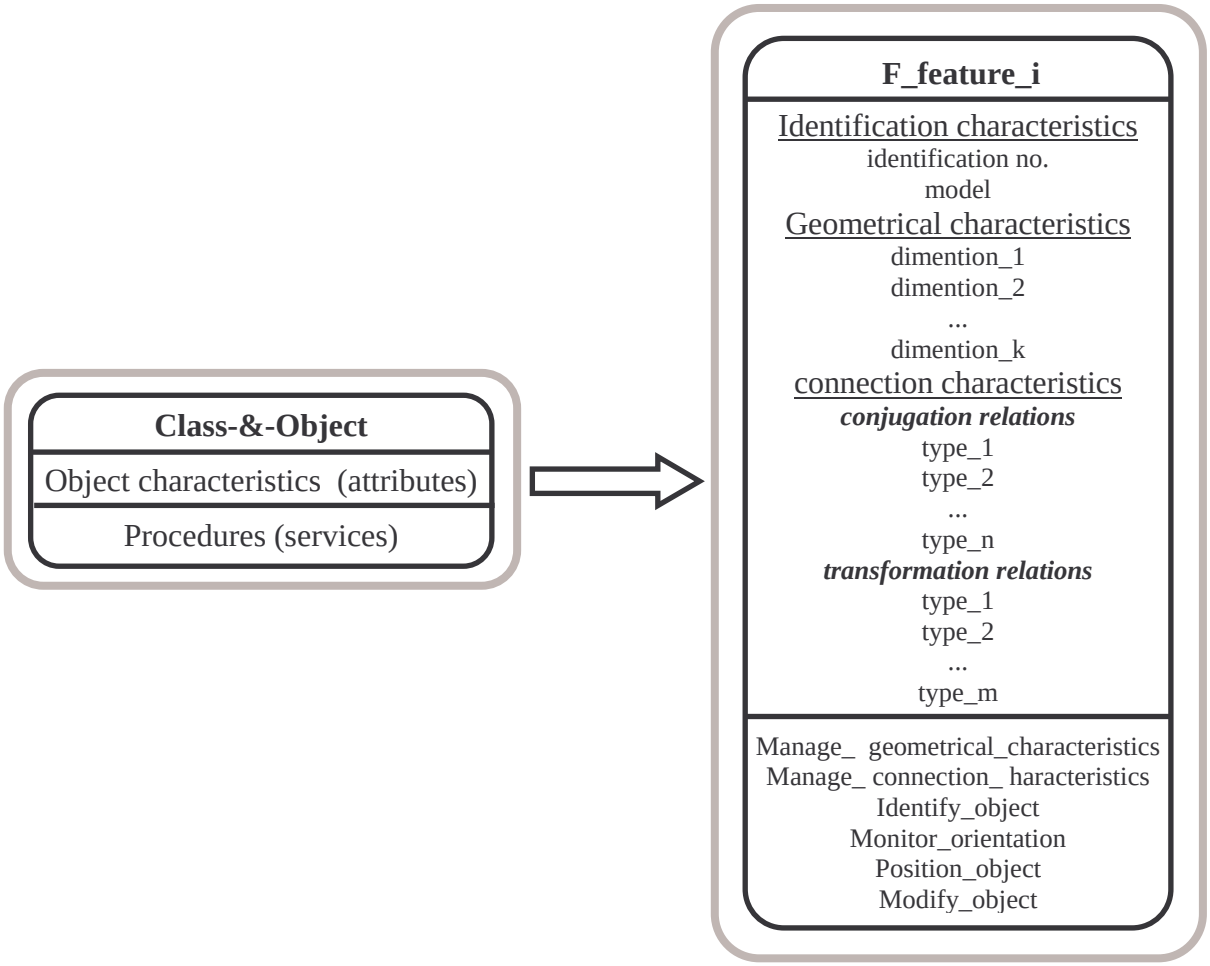


Figure 2. The general structure of the functional feature in the object representation

The presented denotation consists of three basic areas that are connected with:

- the name of the elementary feature (F_feature_i);
- characteristics defining the functional feature (the identification, geometric and connection characteristics);
- procedures enabling operating on characteristics connected with the given functional feature.

In the paper denotations compatible to Fig.2 representing class (filled internal black rectangle divided in tree parts) and its object (external grey rectangle) or objects (copy) were accepted [2]. In the presented figure class name, characteristics names and procedures names can be distinguished. Attributes and services contented in a given class are applied to each object (copy) in this class. The object in the object analysis is an abstract of a real element from the problem domain. The object has got determined values of characteristics and procedures operating only on these characteristics. The class is a set of objects (copies)

connected by the set of characteristics and procedures. The Class-&-Object term defines class and objects occurring in this class [2, 5].

The presented form of the functional feature in the object presentation (Fig.2) was obtained as a result of the problem defining domain that is: modelling of a given object class oriented on the motion analysis. Considered problem is through modelling oriented on motion analysis. The whole-part structure in order to differentiate objects being considered as a part of machines class is created. Next step is definition of characteristics which each object has to posses for the realisation of assumed problem. Characteristics of functional feature described by it in respects of constructional form as well as possible connections with other functional features, that is [1, 3]:

- geometrical characteristics – unequivocally define the geometric form of a given functional feature,
- connection characteristics – define „relations" that the given functional feature can create. The basic connection characteristics are:
  - conjugation relations – define the set of permitted conjugations that the object can create,
  - transformation relations – define behaviour of object characterised by them.

The next step will be the definition of procedures set enabling management of the functional feature. This management is carried out on the characteristics of the functional feature. The discussed case aims at constraining of operations driven on the given characteristics by the given products. That constraining depends on the defining set of object characteristics that may be valuated by a given procedure.

## 4. CONCLUSIONS

The application of object methods enables for clear and systematic representation of functional features. In the presented method of the functional feature describing three basic fields can be distinguished: the name, characteristics and procedures operating on its values.

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