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Representation of Descriptive Names

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1 Introduction

We discuss in this paper a new classification of descriptive names useful for referring computer resources which is based on a symbolic logic, and clarify the way of description of descriptive names.

Descriptive names are defined in IS 7498-3 (naming and addressing)[IS88] as ' a name that identifies a set of one or more objects by means of a set of assertions concerning the properties of the objects of the set.' Thus, it is convenient to use descriptive names for resolving objects of computer resources, instead of identifiers, which are ordinary used, because descriptive names allow us not to know their accurate identifiers, especially in case of affecting identifiers due to changing circumstances, and help us to lead in the desired objects without difficulties. However, only properties of objects are too ambiguous to express, so that it is necessary to make clear what must be represented in a descriptive name. We do this in this paper by comparing the forms of a symbolic logic[SL53] and by constituting a framework of describing descriptive names.

2 Forms in Symbolic Logic

Let us review some notations used in the symbolic logic. From the standpoint of the symbolic logic[SL53], there are following structures included:

a) **Abstraction** and **Interpretation** : Interpretation is an assignment of meanings to symbols, while abstraction is the opposite of it. Abstraction forms concepts.

b) **Specification** and **Generalization** : Specification is the assignment of values, and the opposite of it is generalization.

For elements, the total collection of elements is called the **universe of discourse**. In the universe of discourse, the followings are considered:

c) **Constituent relation** among elements.

d) **Elementary propositions** : Every elementary proposition has a truth-value.

e) **Logical Relations** : Logical relations are relations which hold among elementary propositions. Logical relations are $\cdot$, $\wedge$, and $\supset$. That is, conjunction, disjunction and implication, respectively.

f) **System** : A system is a total set of elementary propositions, connected by logical relations, without inconsistency. A system is classified into three: deductive system, inductive system and mixed system.

A **variable** is a symbol which denotes all the elements in a collection. In relation to variables, **value** and **range of significance** are defined. Applying to the variables in the propositions, **proposition forms** (propositional functions) are introduced, where they have variables whose values are propositions. There are symbols to denote ' true for all values of a' and 'there is at least one a, such that...' They are called universal quantifier and particular quantifier, respectively.

3 Requirements for Descriptive Name Representation

Since descriptive names describe properties of some object, it is expected to have the form of propositions. So, it may be useful to consider the way of representing descriptive names, on the basis of the logic forms described in the previous section. If a descriptive name is given, it is important to find the objects which satisfy the given conditions so that it is useful to compare the resemblance of representation of descriptive names with that of logics.

First, we consider the general forms of descriptive names, and then, consider the interpretation to computer resources.

3.1 Constant and Variable

Elementary proposition in the logic deals with truth-value of each element so that the value is fixed as a constant. On the other hand, propositional forms have variables and the range of significance must be considered.

Similarly, in the given descriptive name, we must consider whether the representation is a constant or a variable. In many cases, the description is to be a constant, but we must not forget to consider the representations of variables.

3.2 Relations

There are two relations observed in the logic. One is constituent relation, which is the relation among elements, and the other is logical relation, which holds among elementary propositions.

From the analogical point, descriptive names must have relations among descriptive elements and to the other descriptions. The functions for representing of relations are also necessary.

3.3 Degree of Generalization

Description of attributes must be considered carefully, because they can express various notions and if these notions can be expressed successfully, the representation of descriptive names becomes flexible.

There are many attribute values. Some of them show resemblance. They are regarded as constituting a class. In general, the class is called a **type**. The values in a type explain generality, difference, or levels of abstraction. A type-value pair can explain the attributes' situation more precisely than using only values or type. From this fact, we use a type-value pair notation for explaining an attribute of

an object. That is, a tuple (attribute-type, attribute-value) will represent an attribute.

From the standpoint of a type, attribute tuples having the same type make a class. In the class, tuples indicate various levels of abstraction, or generality, depending on the values. We can arrange the tuples in a class in the order of value's generalization degree. Descriptive names can be used in any degrees of generalization.

Some attributes must be depicted with numerical expressions or dependency expressions; Quantitative attributes are represented by (attribute-type, attribute-range value) tuples. We use the notation of the dependency between the two attributes by rel(attribute, attribute), where the former relates to the latter.

Therefore, a set of attributes which belong to the same object are represented by a set of attribute tuples, where the tuples are formed (attribute-type, attribute-value), (attribute-type, attribute-range value), or rel(attribute, attribute).

3.4 Durability

The symbolic logic doesn't deal with times nor intervals. However, the lifetime of an object must be considered, and this must be reflected to the descriptive names. That is, the description of contingency and permanency is necessary for descriptive names.

3.5 Interpretation to Computer Resources

What context do we intend to show by using descriptive names? The main purpose is to indicate the attributes and properties which a target object has, or to explain the relation of the object to other objects in some environment.

As for attributes, we can distinguish proper ones from exteriors. That is, properties of objects are split into two categories; One is the proper attribute, which explains the nature and intrinsic attributes of an object. Some of them has no notion of measure. It works as a constant. Some has a quantity or measuring notion. It works as a variable. These categories continue permanently during object's life; The other is the attributes which are determined by their environments. This kind of attribute is determined by the situations around the objects. Thus, the values may change when the environment around the object changes. The notion is considered to be contingent to the object.

From the above observation, we shall call a proper attribute with constant a **proper attribute**, and call a proper attribute with variables a **quantitative property**. We shall call the latter attributes the **position** of an object.

As for relations, the concepts corresponding to the constituent relation and the logical relation in the symbolic logic are interpreted as **dependency** and **interaction** among others, respectively. In both cases, either constant or variable is possible in the elements. Interaction and dependency may be contingent or permanent.

Interaction to other objects is important because it is rare that objects are isolated from each other. In most cases, objects' attributes are related to attributes of other objects.

4 Discussion

Logics deal with propositions, that is, true and false values. On the contrary, descriptive names are concerned with only true values. However, there are much resemblance between them so that it is useful to compare them and make a framework of descriptive names.

We make several different categories for description of descriptive names. Among them, it might be ambiguous the difference between position and quantitative property. so we try to explain a bit; The difference between position and quantitative property is that in the former case, a change of environment influences the reference to the object, and makes the reference name change, and in the latter case, when the quantitative property changes within the quantity range, the surroundings will not be influenced and will remain unchanged.

Several examples of the descriptive categories are as follows.

a) Examples of **proper attributes** are the function of an object, such as a calculator, a container of data, and the nature of objects such as the sum of angles in a triangle is π.

Attributes can be presented by different abstract levels of description. For example, a concrete description is that a triangle has the angles, $\pi/2$, $\pi/4$, and $\pi/4$, while a more abstract description of it is that the triangle has a $\pi/2$ angle.

b) Examples of **quantitative property** are the internal states of an object, the file lengths, and so on. Capability is also considered in this context.

The indication of a status that a container can be read by whom and can be written to by whom is an example of the quantitative property. The indication is necessary, but its value needs not necessary be the same at all times.

c) The following is a description of the **position** of an object in relation to administrative or management aspects: If a container moves from a node to the other for some reason, then the description of its location will change because its location management will change. In this case the container itself will not change.

5 Conclusion

We have discussed the representation of descriptive names for computer resources. First, we have considered formally by using a symbolic logic and have determined some necessary conditions for the representation of descriptive names. Then, we have interpreted some forms to the description of resources. There, we have observed that the representation of descriptive names for computer resources can include a) proper attributes, b) quantitative property, c) position, d) dependency and e) interaction, and in these representations, the expression of constant and variable, and representation of durability can be considered as well.

References

[IS88] ISO7498 Part 3, 1988

[SL53] Susanne K. Langer: An Introduction to Symbolic Logic, 1953