Ontology of Offers

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Abstract

In the paper, the ontology of individual object and interpretation of it in the area of offers of goods and services is presented and reconstructed by the author. The ontology is defined on the basis of Roman Ingarden's formal ontology, in particular on the basis of the theory of individual object.

Introduction

Problems of offer selection become a daily ritual for anyone who needs to acquire precise goods or services. Due to the Internet, there is increasingly wider access to catalogs, data bases and other resources presenting goods. However, in decision support systems for offer selection, an important issue is conceptualization of an offered object from the point of view of the purchaser. The purchaser usually is not oriented in the technical details of the offer. Technical properties of a good offered by a producer are expressed in one language (LM) and utility properties of the object, in which the purchaser is interested, are expressed in another language (LF). Hence, there is a problem in expression of a conceptual object of the offer with therelationship between descriptions of the object in both languages. The LM language is a language of matter (content) whereas the LF language is the language of the form of the object. A model of such a matter-form system can be defined on the basis of Roman Ingarden's formal ontology, in particular on the basis of the theory of individual object (Ingarden 1987a). In this paper, the author presents and reconstructs the ontology of individual object OPI and interpretation of OPI in the area of offer selection OOWU of goods and services in the OWL language (Allemang and Hendler 2008).

The state of the art for decision support systems of tender processes has been presented by J. Vanwelkenhuysen (1998), R. Mohemad, A. Hamdan, Z. Ali Othman, N.M. Mohamad Noor (2010), and T. Du (2009). A. Kayed, R.M. Colomb (2002) showed an offer ontology creation process on the basis of offer descriptions published in e-catalogs. A model of offer ontology is the conceptual structure TCS of an offer based on J. Sowa's conceptual graphs (Chein and Mugnier 2009).

1 Ontology of Individual Object OIO

Roman Ingarden, in collation of formally ontological results, showed a series of theorems concerning the individual object. A section which is used in construction of ontology of individual object in the OWL language, is presented below.

- *30. Each individual object is, in view of a formal subject of properties, directly determined by a constitutive nature.*
- *31. In each individual object, there can be distinguished form, matter, and mode of existence.*
- *37. In each individual object, there is a multitude of properties, but only one of them is constitutive.*

In this paper, the author analyzes a definition of an individual object according to Roman Ingarden's formal ontology at three levels of synthesis of information about the object. Level I corresponds to the matter-form-mode of the existence system. Level II distinguishes concepts defining

respectively: matter: a constitutive nature, a material endowment of properties, form: a subject of properties: a positive state and a negative state: mode of existence: types of modes of existence (Rosiak 2003), and existential moment (Mordka 2002). Level III defines concepts of the two-subject relation, which is a definition of a relational property. Figure 1 shows concepts of the OPI ontology at three levels of synthesis of information about the object.
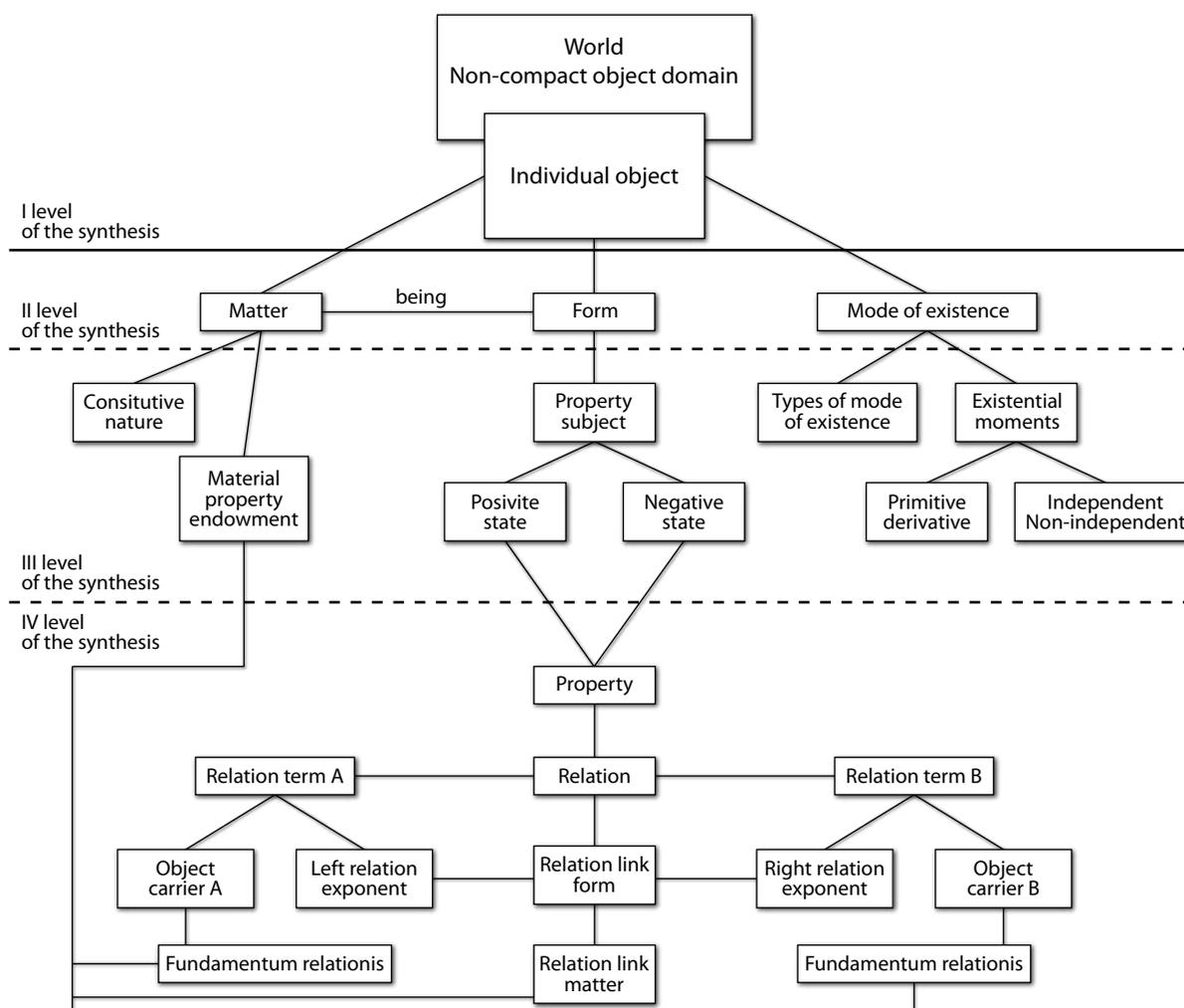

Fig. 1. A diagram of concepts of individual objects — on the basis of Ingarden (1987a)

Matter. "What is qualitative in the widest meaning of this word." [SS II/1, 41]

Ingarden treats matter interchangeably with content.

Form. "What is radically not qualitative, but in which „stands" what is qualitative in the widest meaning of this word." [SS II/1, 40]

J. Hartman (1993) shows difficulties in isolation of the form. He presents an example of the volume of a mass of wood, which cannot be isolated directly from this mass. Form is some abstract view of matter.

Mode of existence. An object is determined by Ingarden as tree-unity of three moments: from, matters, and mode of existence. The analysis of issues concerning mode of existence has been made by M. Rosiak (2003). He presents, following Ingarden, the terms of main existential moments:

- X is existentially autonomous: X is immanently qualified in itself.
- X is existentially heteronomous: X is not existentially autonomous.
- X is existentially original: X has the effective condition of existence itself.
- X is existentially derivative: X can exist only as produced by some other being.
- X is existentially separable: X can exist as a separate unit.

- X is existentially independent: X is existentially separable and does not have to coexist with another existentially separate being.
- X is existentially dependent: X is existentially separable but not independent.
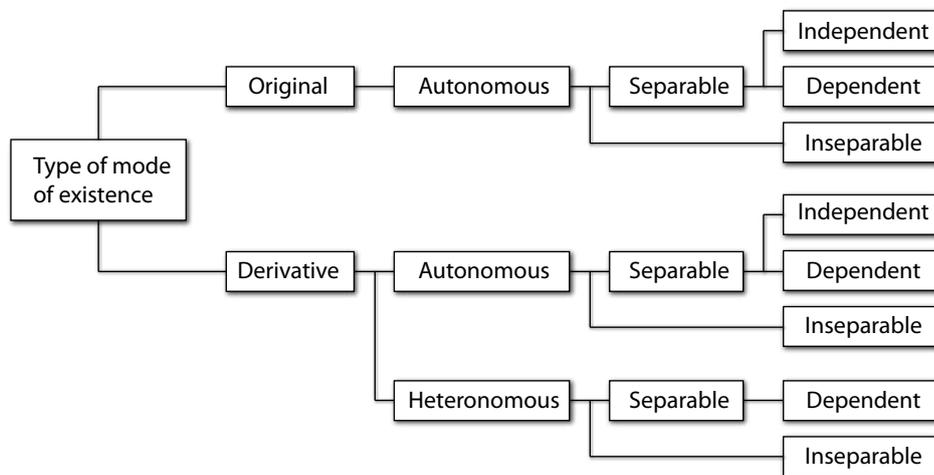- X is existentially inseparable: X is not existentially separable.

Fig. 2. Types of modes of existence according to M. Rosiak (2003)

M. Rosiak, in his analysis of mode of existence, distinguishes eight combinations of existence moments, which constitute the so-called mode of existence according to R. Ingarden's ontology.

Recognizing a real object. R. Ingarden proposes recognition of the object by means of conducting an experiment consisting of the influence an object has on other objects.

"For the time being it is enough to show that properties, especially the essence of the individual object can be best cognitively revealed if the recognizing subject inserts the examined object in real relations and relationships with other objects, if one exposes it — where it is possible — for their action and observes how it behaves and what properties it manifests. This is the true meaning of experimenting with real objects." [SS II/1, 74]

A static way of attributing properties to the object is replaced by a dynamic definition of relation, which reflects a property of the object identified in relation with other objects.

A model of the object. R. Ingarden treats the object globally, without defining its structure. However, taking the way of defining a property into consideration, he says it is abstractly on the interior and surface of the object. He considers the object as a geometrical sphere. The surface of the object is considered in a multi-layer and multi-side method in connection with attributing individual properties to the object.

A subject of properties (object representation). R. Ingarden, in his conception of individual object, attributes to the subject a role of direct representation of the object determined by properties. The subject of properties constitutes the form of the object.

A subject of properties (a reference point of properties). R. Ingarden attributes to the subject not only a function of representation of the object, but also a function of the base for a bundle of properties determining the object. Semantics of a reference point enforces a special role of possession in an absolute reference system for properties.

A subject of properties (moment of the form of an independent individual object). R. Ingarden defines the form of an individual object as a pair of moments: a subject of properties and properties themselves. He strongly stresses a mutual relationship of both moments.

Property (Aristotle's form of an individual object). R. Ingarden conditions existence of an object by existence of properties attributing to it.

"There is no property without an object, which is owned by it, but also there is no object without properties attributed to it." [SS II/1, 85]

Properties are strictly connected to the subject of properties.

"While the form of 'the subject of properties' (features) in concrete demands always a multitude of forms of properties, and indirectly properties, with which constitutes one whole." [SS II/1, 86]

A state of the thing. A state of the thing is defined as an opinion about the object.

A state of the thing is an effect of a process attributing properties to the object by "a subject of action". R.Ingarden defines a subject as a system of states of things.

"Each object is a set (if that word here is allowed to be used) of states of things associated with each other by one subject of properties." [SS II/1, 255]

Positive and negative states of things. R. Ingarden allows the possibility of states appearing both positive and negative. For example, a positive state is determined by the sentence: „a given pen is gold" and a negative state: „a pen is not steel".

Relation (multi-subject state of thing). R. Ingarden formulated a structure of bisubject relation in order to determine relative properties of the object. This structure includes the following elements:

c.A — carrier A

c.B — carrier B

r.l. — relation link

m — matter

f — form

l.r.e. — left relation exponent

r.r.e. — right relation exponent

f.r. — fundamentum relationis

r.t.A — relation term A

r.t.B — relation term B

Relation term — a role of object A or B in determining "relational constitutive nature."

"An individual object is not taken in its constitutive nature, which builds it for itself, but only as a term of certain relations with respect to another object (also as a term of a taken relation), and as a term materially determined by a core of this relation." [SS II/1, 300]

Fundamentum relationis

"Fundamentum is the constitutive nature or those and only those properties of objects used as the basis for an ontic relation (link carriers), which mark moment of material links ("core") of relation." [SS II/1, 300]

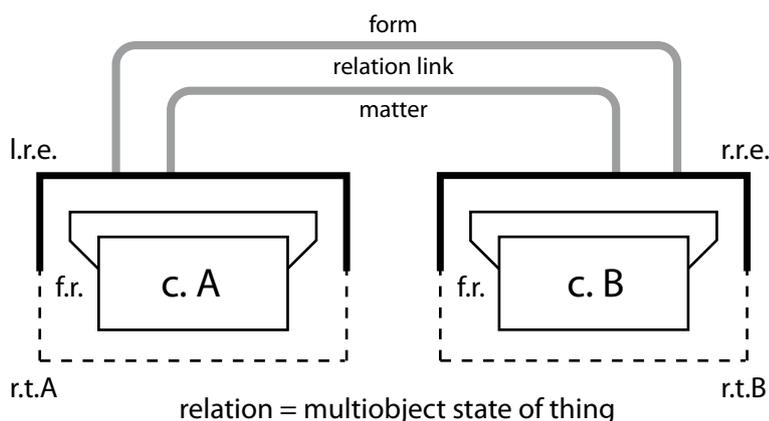A relation exponent constitutes a relative property.

Fig. 3. A scheme of the form of a biterm relation [SS II/1, 300]

Types of properties. R. Ingarden distinguishes four types of properties:
- relative properties
- externally conditioned properties
- acquired properties
- absolutely own properties of an individual object

Relative properties constitute exponents of relation R intervening objects P and P'. They have some material endowment coming from endowment of fundamentum relationis.

Externally conditioned properties come from an influence of other objects.

Acquired properties constitute properties induced by some external factor whose influence is finished.

"Properties acquired differ from the previously discussed properties in that however they are also externally conditioned, this conditioning concerns only the creation of properties with determined matters, but it is not required to maintain these properties. Once given the shape of a marble remains, however, activities that caused it have been stopped. Moreover, even they had to stop, if a given shape had to be made; further actions of the sculptor would have to change it into another." [SS II/1, 326]

Absolutely own properties are properties which are not conditioned by any external factors in creation and service of the object.

Constitutive nature of an individual object — matter (content) determining the object globally.

"In other words, the constitutive nature of the individual object may be only such matter, which can fully determine a given subject of properties." [SS II/1, 79]

More detailed definitions of concepts of ontology of individual object are included in (Mordka 2002; Hartman 1993; Nowak and Sosnowski 2001).

2 Ontology of offers of goods and services OOGS

Traditional properties of goods or services such as price, technical parameters, usage parameters, construction parameters, service parameters, a list of additional equipment or additional services cannot constitute an exclusive characteristic of goods or services. The ontology of offers of goods and services, presented below, refers to the concept apparatus of Roman Ingarden's ontology of individual object OIO.

An offer of good/service is defined analogously by purchaser value, purchaser utility, and after-sales service.

- Purchaser value (constitutive nature) — is such a material characteristic of a product that is expressed in monetary units of the value of a good or a service for the purchaser with respect to product novelty, its brand, and a level of consumer acceptation.

    EXAMPLE

    In assessment of a university educational offer, a value for a graduate is the market value of a diploma, i.e., a predicted salary level. Hence, there should be provided, in an educational offer, a predicted salary for a graduate of a given university instead of, for example, a fee for the entire period of studies.

- Purchaser utility (subject) — is a subject of a list of properties, which characterize purchaser expectation.

    EXAMPLE

    Utility for a graduate of the university is presented in the University System Asserting Education Quality including outcomes of education according to Recognition of Professional Qualifications for a given study program.

- Utility potential (positive state) — constitutes a list of utility properties related to advantages of an offer in relation to the line standard.

    EXAMPLE

    For civil engineering studies, the Polish Chamber of Civil Engineers defines proceedings of the recognition of professional qualifications in the building industry. The university system of education outcomes is referred to this standard. Assessment can be made using the AHP method (Saaty 1980). Grades exceeding standard requirements are respected. For example, if the student has a high knowledge level in the area of construction projects. This property constitutes also relative assessment of the University System Asserting Education Quality in relation to the standard.

- Utility gap (negative state) — constitutes a list of utility properties related to disadvantages of an offer in relation to the line standard.

  EXAMPLE:

  Grades below standard requirements are respected. For example, the student has a low knowledge level in the area of construction projects. This property constitutes also relative assessment of the University System Asserting Education Quality because it does not satisfy the standard in a given range.

- Utility property (relational property) — is a property attributed to the given utility potential or utility gap.

  EXAMPLE:
  There are the following properties in the University System Asserting Education Quality:
  student has the (low, medium, high) knowledge level (in a given range)
  student has the (low, medium, high) practical skills (in a given range)
  student has formed social skills (in a given range)

- Advantage indicator (object carrier) — is a measure of a given (positive) property defined as a result of the control procedure.

  EXAMPLE:

  In the University System Asserting Education Quality, a measure can be as follows: the student has practical skills in the area of project management, and takes part in implementation of construction projects in national and foreign enterprises during the planned placements organized for individual studies.

- Disadvantage indicator (object carrier) — is a measure of a given (negative) property defined as a result of the control procedure.

  EXAMPLE:

  In the University System Asserting Education Quality, a measure can be as follows: the student does not have social skills in the area of team management, a measure can be the number of team projects completed during studies in relation to the required standard.

- An indicator value (relative assessment) (relation exponent) (advantages, disadvantages) — is a value of a linguistic variable (low, medium, high, good, very good). A resource base (fundamentum relationis) constitutes the so-called material endowment of properties, they are resources (system, human, document) authenticating a given utility property.

  EXAMPLE:

  A utility property: the student has high knowledge in the area of calculations of steel constructions. A resource base to justify this property constitutes: planned projects related to calculations of steel constructions, the number of tools for calculations (the FEM method) in the university CAD laboratory, the number of experienced teaching staff, the number of the student's own work hours on calculation projects, and completed calculation projects for enterprises during placements.

Figure 4 shows a class (concept) diagram of ontology of offers of goods and services in the OWL language.

Conclusions

In this paper, the formal ontology of individual object of the Polish philosopher Roman Ingarden, reconstructed by the author, has been presented. This ontology includes a material and formal view of the object. A key element of this ontology is the concept apparatus of biobject relation, which constitutes a procedure of attributing properties to the object. The author showed original ontology of offers of goods and services OOGS related to the concept apparatus of the ontology of individual object. In definitions of individual concepts examples are presented from the ontology of the University System Asserting Education Quality of Zamość University of Management and Administration.
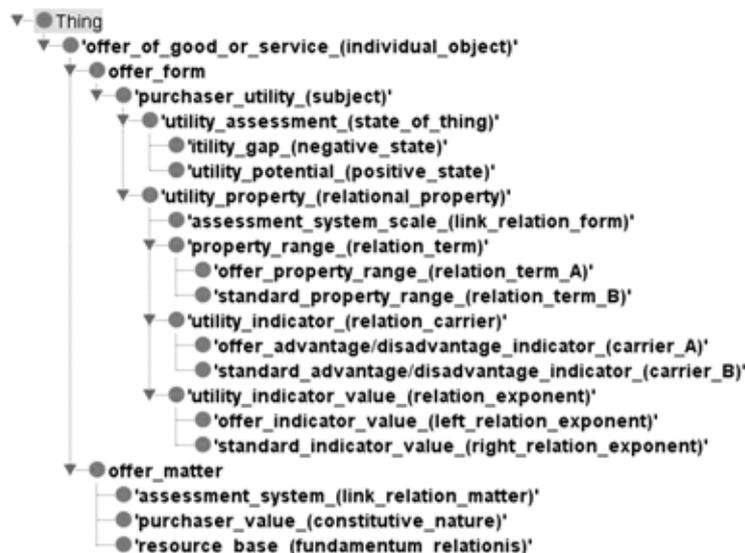
Fig. 4. A class (concept) diagram of ontology OOWU in the OWL language

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