A POLYSYNTACTIC VIEW ON THE ENCODING OF SEMANTICS IN LEGAL VISUALIZATIONS

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Abstract: *The encoding of semantics plays an important role in the area of visualization, particularly in legal visualization. Legal visualizations are characterized by representations that are rich in semantics in order to facilitate the understanding of legal situations. It is thus interesting to investigate the concrete process of encoding semantics for the purpose of providing IT support. By taking a polysyntactic view of this encoding process, individual factors for the definition of semantics can be identified. The approach is illustrated by using an example from the area of business informatics.*

1. Motivation

The encoding of semantics in visualizations, and especially in legal visualizations, can be regarded as a central task when creating and regarding a particular (legal) visualization. It determines how legal facts, relationships or other contents of law are graphically represented in order to make them understandable by the beholder of the (legal) visualization. Thereby, the legal aspects may either be encoded *directly* or *indirectly*. When they are encoded directly, the (legal) visualization primarily focuses on the legal aspects, e.g. by showing a visualization for a specific legal situation and the corresponding courses of action. Legal contents may however also be encoded indirectly, e.g. when the (legal) visualization focuses on representing the business aspects of a situation where specific legal norms need to be considered. The legal contents are thus embedded in another context. The choice for the type of encoding that shall be used depends on the intended addressees of the (legal) visualization and their objectives.

In order to better understand the processes and tasks that are involved in this encoding of semantics, we will take a *polysyntactic* view in the following. It is assumed, that the encoding of semantics in visualizations is based on more than one syntax that influences the way of creating and understanding visualizations. By syntax we understand a set of rules that defines valid expressions based on a specific set of elements. This comprises the syntax of languages, i.e. rules how to compose sentences based on an alphabet, as well as visual syntaxes, i.e. rules how to compose a valid visual representation based on visual variables such as shapes, color etc. Our interest is to investigate the encoding principles and assess how they can be supported by using information technology. For this purpose we take into consideration the concepts of modeling and meta modeling as described by [Karagiannis and Kühn, 2002] and use an example from the area of business informatics to investigate the encoding principles for the case of an indirect encoding.

1.1. Used Example

The example is taken from the area of process management (see figure 1). It shows a (legal) visualization of a business process model from the area of banking, as it is commonly used in business informatics. The goal is to represent a specific episode in the context of an identity check of a customer. The legal basis for this identity check is given by the Austrian law for banking regulations (§40(1) Bankwesengesetz) as drafted on the top right side of the figure. The model is based on a meta model that defines the syntax, semantics, and notation of the modeling language cf. [Karagiannis and Kühn, 2002].

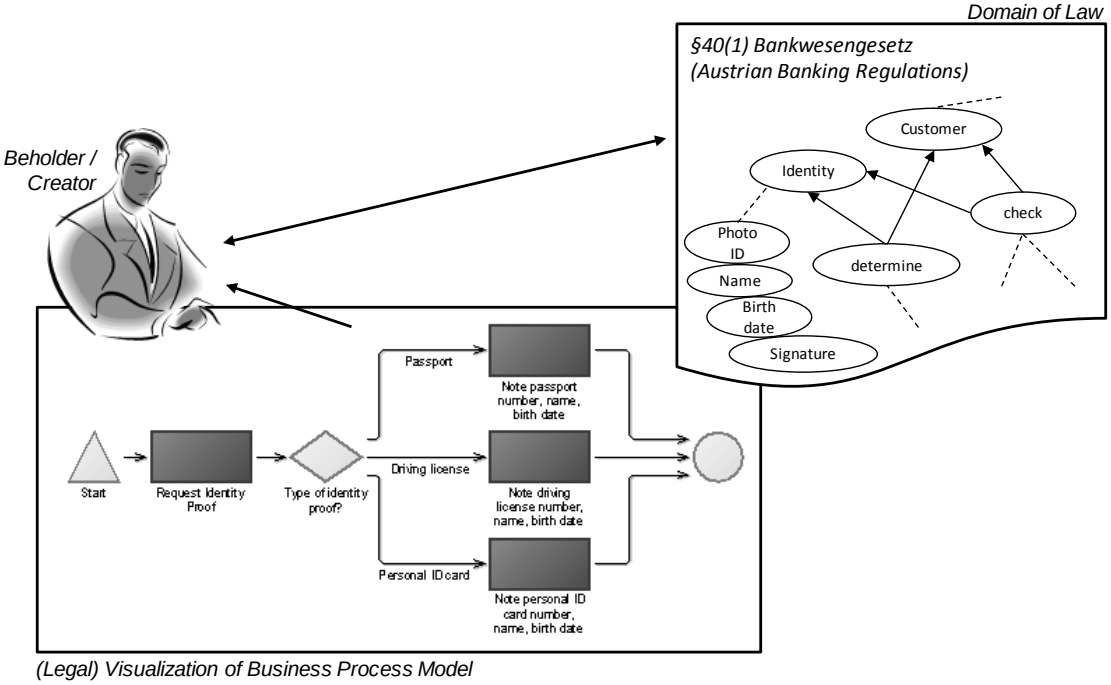
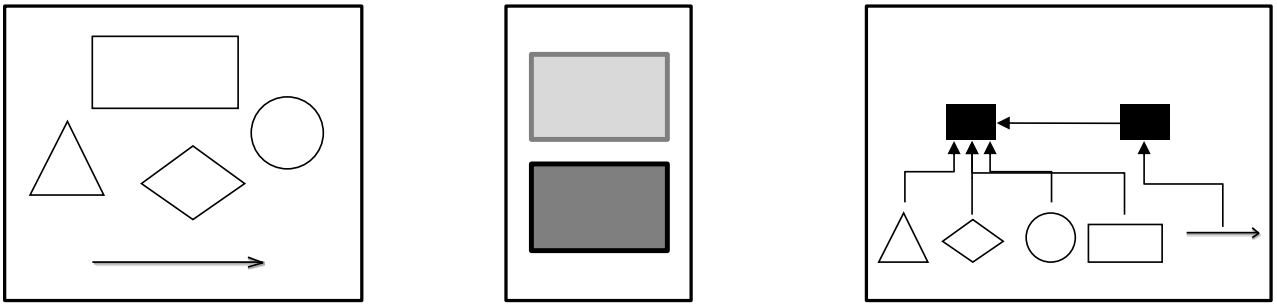


Figure 1: Example from the Area of Process Management

2. Polysyntactic View

In order to analyze the above given example using a polysyntactic view, the first step is to determine the factors that influence the encoding of semantics. As a second step the syntaxes of these factors of influence can then be investigated. In line with the shown example, the encoding of semantics needs to take into account the following factors of influence: the objectives of the *creator* and the *beholder* of the (legal) visualization, the *domain of law*, the *visual language* to be used, as well as the *meta model* for composing business process models. When regarding these factors, it becomes obvious that several syntaxes are involved that influence the creation and the understanding of the resulting (legal) visualization: the meta model and the visual languages have their own syntaxes as well as the domain of law and also the description of the objectives of the beholder and the creator is based on its own syntax. For a more detailed investigation, we focus on the syntax of the visual language. The syntax of visual languages in general is again composed of several syntaxes, originating from the different dimensions or variables that can be used for encoding information. [MacEachren, 2004] describe twelve dimensions of visual syntaxes based on the work by Bertin, Morrison and others. These are location, size, crispness, resolution, transparency, color value, color saturation, color hue, texture, orientation, arrangement, and shape. When encoding semantics using these syntaxes, it therefore has to be chosen carefully, which syntactic elements and dimensions are used for which semantic representation.



Shape Syntax

Elements:
Graphical Primitives
Rules:
Combination of Elements

Color Saturation Syntax

Elements:
Color Saturation Levels
Rules:
Combination of Saturation Levels

Meta Model Syntax

Elements:
Classes and Relations
Rules:
Combination of Classes and Relations

Figure 2: Examples for Three Syntaxes

Coming back to the example from the area of process management, the syntaxes involved, e.g. concerning law (legal or legally relevant contents) and the objectives of the involved persons, need to be mapped to the syntaxes of the visual languages in order to establish the basis for encoding semantics. Otherwise, the transfer of semantics from one syntactic area to another cannot be conducted. In the example above, the syntax of law has been mapped to the syntax of the visual language indirectly through the syntactic basis of the creator and beholder of the (legal) visualization as indicated by the two arrows. Therefore, the encoding of semantics is performed implicitly here through the involvement of the human as a mediator. Another possibility to allow for an explicit encoding would be for example to insert references to the pertinent articles of law in the (legal) visualization, e.g. by inserting the reference as textual fields. A third possibility could be to use another syntax for the area of law that allows to explicitly represent semantics such as an ontology language. Then the syntaxes of the meta model, the syntax of the visual language, and the syntax of law could be mapped as described in the approach of semantic (legal) visualization [Fill, 2009].

3. Conclusion

To support (legal) visualization by information technology, the involved syntaxes need to be formalized in order to allow for a processing by machines. Based on these formalizations, mappings between the syntaxes can be defined explicitly, again using a formal language. With these mappings in place, the encoding of (legal) semantics can be conducted. It seems however essential to involve human actors in all these tasks as the syntaxes of the beholder and the creator of the (legal) visualization can only be made explicit to a certain degree. Due to the formal definitions, information technology can then be used to facilitate these tasks.

4. References

Fill, Hans-Georg, Visualization for Semantic Information Systems, Gabler (2009).

Karagiannis, Dimitris, Kühn Harald, Metamodelling Platforms, in: *Bauknecht, Kurt; Tjoa, A Min; Quirchmayr, Gerald* (eds.) Proceedings of the 3rd International Conference EC-Web 2002 - Dexa 2002. (2002).

MacEachren, Alan, How Maps Work – Representation, Visualization, and Design, The Guilford Press (2004).