A Landscape of Legal Teleology: Formalization through Visualization

Abstract. The paper advocates the view that visualization and symbolization precede formalization on the way to legal knowledge representation. Hence, an attempt is made to formalize the semantics of a fundamental legal concept. The visual metaphor of a continuous landscape with a path is used to convey the landscape of legal teleology; it is called a sinnlandscape. The metaphor is fit with the discrete path definition in a graph. In the survey, our earlier notation, which consists of a two-element relation (action-goal or means-telos), is extended to three elements, such as an initial situation, a path and a goal. Thus the visualization can have a favorable effect on the modeling of legal teleology and formal representation. The examined issues comprise the entities of the sinnlandscape, subjective and objective teleological interpretation, and teleological and causal relations. Positive and negative evaluations of means and goals are combined in the analysis of the statement ‘The end justifies the means.’
Keywords: Legal informatics, teleological interpretation, visual metaphor, spatialization, formalizing semantics.

1 Introduction

There are many approaches to formalizations in law. Here various formalisms, notations, logics and modeling techniques are used. Symbol level representations of legal teleology are extensively used in artificial intelligence (AI) and law; see e.g. [2]. We find the knowledge level representation [10] a true challenge for legal informatics. In this way, a knowledge engineer meets a problem of understanding the contents of fundamental legal concepts, such as the nature of law, a legal method, legal interpretation, justice, value, etc. Though, jurists know the contents. The concepts are studied at different levels of abstraction in specific branches of law, legal dogmatics, legal theory, jurisprudence, and legal philosophy.

The paper presents a kind of a cognitive approach to legal teleology. A new metaphor for visualization is proposed. The path metaphor consists of three elements:

initial situation – path – goal

This metaphor supplements the earlier proposed notation which consists of a two-element relation (action-goal or means-telos) [5]:

\[ A \text{ te} \to B \]

For example, \( A = \text{open the door} \) and \( B = \text{fresh air} \), or \( A = \text{close the door} \) and \( B = \text{security} \). Using this notation, the purpose of a street as defined in Austrian law\(^2\) is represented as follows:

\[ \text{Straße} = (\text{Landfläche te} \to (\text{Fußgängerverkehr} \lor \text{Fahrzeugverkehr}) \land (\text{Anlagen te} \to \text{Verkehr} )) \]

or in English:

\[ \text{street} = (\text{land area te} \to (\text{pedestrian traffic} \lor \text{vehicle traffic}) \land (\text{facilities te} \to \text{traffic} )) \]

2 The Entities of the Sinnlandscape

In the paper, legal teleology is comprehended as a landscape, sinnlandscape (Sinnlandschaft) of the legal domain.\(^3\) Different subjects (individuals, compa-
nies, associations, political parties, states, etc.) have different purposes. Their actions are ruled by very different laws. The entities of the sinnland-
scape are depicted in Figure 1. There is no uniform list of values which are
equally preferred by all the subjects. Therefore triangle arrows show different
directions. A statement about the teleological relation \( A \rightarrow B \) is denoted by
\( \text{stmt}(A \rightarrow B) \). For instance, “John says that opening the door serves to let
the fresh air in.” A reflection about \( te \)-structures is expressed by meta-
statements. A kind of them claims that goal entities are part of individual and
collective sinnlandscapes. This is a primary consideration of the paper.

The visual metaphor of a path in the landscape is a kind of a continuous
paradigm in legal visualization. Thus the discrete nature of logic is supple-
mented. Continuous and discrete models are not opposites but emphasize
different viewpoints to the same system. Formal (mathematical) logic has
certain limitations, especially when applied to law, legal reasoning and mod-
eling of legal argumentation. Stability which is characteristic of a continuous
system might be a certain advantage when comparing with a discrete sys-
tem. Small changes in the input of a continuous system usually cause small
changes in its output. A discrete system may cause big changes, for in-
stance, a slightly wrong initial choice can lead to a seriously wrong destina-
tion.

![Diagram](image)

**Figure 1.** The goal entities (Zweckentitäten) of the sinnlandscape (Sinnlandschaft). A reflection about teleological structures, a meta-statement, claims that the goal entities are part of individual and collective sinnlandscapes

### 3 Why Legal Teleology?

Why is teleology important? Several reasons can be listed:

- Teleology is innate in normative legal systems.
- The people reason primarily by goals and roles then by rules.
- Teleological structures are mostly implicit and rarely explicit.
- Teleological statements are extensively used in legal drafting.
In argument analysis, Woods emphasizes agent's targets and their implicit character [13]:

Argument and reasoning succeed or fail in relation to an agent's targets. Such arguments are cognitive in nature, typified by a desire to know what to believe and what to do. Targets are usually contextually cued and implicit in an agent's behavior. They are for the most part presumed rather than declared.

The nature of legal teleology is complex and multi-level. One may speak about the purpose of the statute (ratio legis), the purpose of a norm, the purpose of an action, the purpose of an entity (e.g., a street lane and a pavement), a promoted/demoted value, etc. Therefore, different formalizations can be built.

Modeling legal argument is a central but not the only concern in AI-and-law. Legal theory classifies the functions of law into three categories: the judicial function, the legislative function, and the executive function. The present research concerns applications in law making.

We focus on formalizing the teleological interpretation method. Peczenik [11, p. 329-339] examines teleological construction of statutes. To assure the logical character of the basic structure of the interpretation of a statute in view of its purpose, Peczenik added the third premise in the structure below (p. 329):

Premise 1: Obtaining of the situation Z is prescribed
Premise 2: If one had not do H, then Z would not be obtained
Premise 3: If
   1) obtaining of the situation Z is prescribed; and
   2) if one had not do H, then Z would not be obtained;
then one should do H

Conclusion: One should do H

Peczenik distinguishes between the subjective and objective teleological interpretation of statutes. The limitations of logic are noted in p. 330:

The purpose of the statute (ratio legis) as regards hard cases differs from the will of the persons that participated in the process of legislation. Neither the ratio nor the proposed construction of statutes follow logically (emphasis added) from the description of the will alone.

As the purpose does not follow logically, the linguistic (literal) and logical methods of interpretation are not enough in goal-based reasoning. "The step from the text of the statute and data concerning the will of its "authors" to the ratio legis is a jump" (p. 331). This jump constitutes a qualitatively new step which can be depicted as the semantic graph in Figure 2.

![Figure 2. A jump from the text of the statute and data concerning the will of its "authors" to the purpose of the statute](image-url)
We hold that the jump also serves to get over the limitations of formal logic. The use of the teleological method requires an invention, heuristics and discovery. This is important in hard cases, whereas logic copes well in ordinary cases. The nature of logic lies more in explanation than in discovery. Finiteness of assertion sets is essential in computationally effective models based on formal logic.

The objective-teleological construction of statutes is expressed in p. 331:

**Premise 1:** According to an interpretation, supported by various juristic substantive and authority reasons, the provision, L, is a means to fulfill the goal, Z

**Premise 2:** If one had not interpreted L as containing the rule R, then Z would not be obtained

**Conclusion:** One should interpret L as containing the rule R

We think that listing the purposes of a statute in its preamble is too little. In order to fully understand the purposes, more elaborate structures should be developed. For example, a first step might be to annotate the structural parts of the statute giving the purposes.

The statute has to be treated as a system [4]. The purposes of the statute have to form a coherent system. A formalization in the form of a list of atomic goals is too little. The purposes have to be attributed richer semantics. They are subject to multi-dimensionality, ordering and different evaluation by social groups.

## 4 Goal Modeling in Legal Argument

This section illustrates how goals are addressed in modeling legal argument. First we choose an approach to practical reasoning with agents, which is proposed by Atkinson, Bench-Capon and McBurney, see e.g. [1]. They consider the sufficient condition scheme from [12] and unpack Walton’s notion of a goal into three elements. We depict the three elements as the semantic graph in Figure 3.

![Goal Diagram](image)

**Figure 3.** Unpacking Walton’s goal notion into three elements [1]

Representation of the goal model as a semantic graph can be suitable for both computer scientists and legal scholars. We depict the argument scheme AS1 from [1] as shown in Figure 4.
Goals are concerned in Bench-Capon and Prakken’s logical (hence, discrete) formalization of an argument-based reasoning [3]. They formalize goals as propositional literals in defeasible modal logic. The formalism is illustrated with an example of a judge who must determine the best way to punish (pu) a criminal found guilty. He has three options: imprisonment (pr), a fine (fi) and community services (cs). Besides punishment there are three more goals: deterring the general public (de), rehabilitating the offender (re) and protecting society from crime (pt). Punishment, (pu), is the most important goal, but the method of punishment chosen will depend on the other goals. The argument language is comprised of the following formulas. Imprisonment promotes punishment, pr ⇒ pu, imprisonment demotes rehabilitation, pr ⇒ ¬re, etc. The judge’s goal base is the set G = {Dpu, Dpt, Dde, Dre}, where D is the modality operator. Arguments are represented as trees. They are the most interesting part of the example and the reader is directed to [3].

We hold that the spirit of legal teleology is in the “sea” of concrete goals which are innate in substantive law. This is in accordance with the idea that the essence of a knowledge-based system is in the knowledge base (comprised of a vast amount of knowledge chunks), not in the inference engine.4 Further the landscape metaphor is used to visualize this “sea”.

5 The Landscape as a Surface

The notion of a landscape can be formalized as surface in mathematics, namely, a mapping f from n-dimensional Euclidean space $\mathbb{R}^n$ to real numbers set $\mathbb{R}$:

$$f: x \rightarrow y \text{ where } x \in \mathbb{R}^n, y \in \mathbb{R}$$

This mapping can be viewed as a surface in $n+1$-dimensional Euclidean space: n dimensions for the argument x and one for $y = f(x)$. In 3-dimensional space the surface serves as the graphical representation of a certain mapping from 2-dimensional space to reals, $y = f(x_1, x_2)$. A sample surface in 3D

4 "... the power ... does not reside in the inference method; almost any inference method will do. The power resides in the knowledge" [7, p.101]
is depicted in Figure 5. The higher a surface point is situated the higher value it represents.

The concept of legal teleology is substantially more complex than can be visualized with the surface above. However, our intuition attempts the landscape metaphor as the first iteration.

The initial situation can be comprehended as a point on a surface. It represents a state of the Is world. The goal situation is a point on the same surface. This is a state of the Ought world. The path metaphor fits to lead from the initial situation to the goal. The surface serves to visualize all possible paths from any initial situation to any goal.

The goal entities of the legal sinnlandscape are more complex than the metaphors above. Certain regions of the landscape shall form "holes". They represent tabu-negative values and shall not be approached. Certain regions form "mountain peaks" which can hardly be reached. They represent tabu-positive values; achieving them requires too expensive means.

A means can be formalized as a vector of factors (multiple criteria). For example, a destination can be reached by a cheap and slow train, means$_1$, or by an expensive but fast train, means$_2$. Here the formalization is a 2-dimensional vector means = \langle price, time \rangle. In order to weigh means$_1$ and means$_2$, a tradeoff of the criteria – price and time – has to be formalized. Linear models are extensively used in mathematics, especially game theory and mathematical economics. The weight (also called utility or gain) \( w \) of the means can be defined as the linear function of the criteria:

\[
\begin{align*}
    \ w(means) &= \alpha_1 \cdot \text{price} + \alpha_2 \cdot \text{time} \\
\end{align*}
\]

Here both the coefficients \( \alpha_1, \alpha_2 \) and the criteria are real numbers. The means with a greater weight is preferred:

\[
\begin{align*}
    \text{means}_1 \succ \text{means}_2 \text{ if and only if } w(\text{means}_1) > w(\text{means}_2) \\
\end{align*}
\]

where \( \succ \) denotes the preference relation.

The path metaphor suits with the notion of path in a graph, which is used in discrete mathematics. Suppose a graph \( G = (V, E) \), where \( V \) is the set of vertices and \( E \subseteq V \times V \) is the set of edges. A path \( L \) is defined as a sequence of nodes

\[
\begin{align*}
    L = \langle g_0, g_1, g_2, \ldots, g_M \rangle \\
\end{align*}
\]

where \( g_i \in V \) such that each pair \( e_i = (g_{i-1}, g_i) \) is an edge, i.e. \( e_i \in E \). Thus the path can also be represented as the sequence of edges:

\[
\begin{align*}
    \langle (g_0,g_1), (g_1,g_2), \ldots, (g_{M-1},g_M) \rangle \text{ or simply } \langle e_1, e_2, \ldots, e_M \rangle \\
\end{align*}
\]

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Figure 5. A sample surface in 3-dimensional space. The surface represents a kind of mapping from 2-dimensional Euclidean space $\mathbb{R}^2$ to real numbers $\mathbb{R}$.

In the path metaphor, each node $g_i$ plays the subgoal’s role. The goal situation in the sinnlandscape is a certain point on the surface, usually the top of a hill. The path from the initial situation to the goal is a sequence of intermediate subgoals

$$\langle g_0 = \text{initial situation}, g_1, g_2, \ldots, g_M = \text{goal situation} \rangle$$

Each step—the edge from the subgoal $g_{i-1}$ to the subsequent $g_i$—is realized by a certain means $m_i$. Thus the goal situation is achieved by the sequence of means

$$\langle m_1, m_2, \ldots, m_M \rangle$$

Several paths can lead from the initial situation $g_0$ to the goal $g_M$ in the given graph, i.e. in the agreed sinnlandscape. A path $\text{path}_1$ is preferred to $\text{path}_2$ if its weight is larger (i.e. the cost is smaller). For example, $\text{path}_1 = \langle \text{up, up} \rangle$ is preferred to $\text{path}_2 = \langle \text{up, down, up, up} \rangle$ as the cost $\kappa(\text{path}_1) = 2$ is smaller than $\kappa(\text{path}_2) = 4$. Here the path cost is calculated as the number of edges. This preference is denoted

$$\text{path}_1 \succ \text{path}_2, \text{ where } \text{cost}(\text{path}_1) < \text{cost}(\text{path}_2)$$

The interpretation above is “the cheaper—the better”, i.e. $\text{cost} = -\text{weight}$.

More elaborate formalizations should take into account the cost of each means $m_i$ which leads from one situation, $g_{i-1}$, to another, $g_i$. The cost of an edge $e_i$ is defined as the cost of this means $m_i$, i.e. $\kappa(e_i) = \text{def} \kappa(m_i)$, which
realizes the transition. The cost of a path $L$ is defined as presumed in graph theory, namely, the sum of edge costs:

$$\kappa(L) = \sum_{i=1}^{M} \kappa(e_i)$$

A good path is short and climbs up. It does not lead to deep holes nor does it circle around the goal's hill like a serpentine. The cost of a continuous path $L$ on the landscape $f$ can be calculated as the thread length from the initial situation $g_0$ to the goal $g_M$. This length is calculated with the mathematical function that is called variation. Another continuous formalization can be defined as the curvilinear integral of the cost $\kappa$ on the path $L$:

$$\int_L \kappa \approx \sum_{i=1}^{M} \kappa(m_i)$$

This definition follows the intuitive interpretation that the path cost sums up the costs of all the steps.

6 The Landscape Metaphor in Means-Ends Analysis

The landscape metaphor can explain the weight of a means. In this section the proverb "The end justifies the means" (Der Zweck heiligt das Mittel) is analyzed.

Hans Kelsen devotes a whole section [9, p. 13-15] to logical relation between willing an end and willing a means. He starts with the examination of Kant's imperative "Who is willing the end, must be willing the means" (Wer den Zweck will, muss das Mittel wollen). Kelsen is concerned with teleological and normative necessity. In his logical analysis, both the end and the means are treated as one-dimensional (positive-negative), even Boolean: 1, right (heilig), or 0, wrong (unheilig). Such formalization suits well the logical analysis of relations between norm, the act of will (Willensact) and thought operation (Denkoperation).

In this analysis, the means is also evaluated as one-dimensional, even Boolean: true-false (1-0, right-wrong, positive-negative). We extract from "The end justifies the means" the following meaning: only a positive (right) means is justified. The constraint for the means to be positive is essential. In other words, the statement's idea is to seek a means $m$, such that (1) brings about the end, and (2) is evaluated positively:

$$\text{eval}(m) = 1 \quad \text{(or eval}(m) > 0 \text{ in continuous mathematics)}$$

Though the means war realizes the end peace (Si vis pacem, para bellum), but it is evaluated negatively, eval(war) = 0. Therefore the war does not satisfy the search criteria. Hence it does not suit to achieve peace.
Figure 6. A representation of three means, $m_{\text{wrong}}$, $m_{\text{weak}}$ and $m_{\text{right}}$, in the form of two-dimensional vectors. (1) $m_{\text{wrong}} = \langle 1, 0 \rangle$ realizes the end, but it is evaluated negatively. (2) $m_{\text{weak}} = \langle 0, 1 \rangle$ does not realize the end, though it is evaluated positively. (3) $m_{\text{right}} = \langle 1, 1 \rangle$ both realizes the end and is evaluated positively.

As noted earlier, in multiple criteria interpretation the means is treated as a vector (of reals, integers or otherwise ordered ordered values). A simple way to expand one-dimensional Boolean representation is to add the second dimension. To illustrate this, the dimension $\text{bringsAboutTheEnd}$ is added. This dimension is assigned the value true, 1, in the case the means realizes the end; otherwise, it is assigned false, 0. For example, a disproportionate means $m_{\text{wrong}}$ realizes the end (represented $\text{bringsAboutTheEnd} = 1$), but is evaluated negatively ($\text{evaluation} = 0$); see Figure 6:

$$m_{\text{wrong}} = \langle \text{bringsAboutTheEnd} = 1, \text{evaluation} = 0 \rangle$$

A weak means $m_{\text{weak}}$ does not realize the end ($\text{bringsAboutTheEnd} = 0$), though it is evaluated positively ($\text{evaluation} = 1$):

$$m_{\text{weak}} = \langle \text{bringsAboutTheEnd} = 0, \text{evaluation} = 1 \rangle$$

A right means $m_{\text{right}}$ both realizes the end ($\text{bringsAboutTheEnd} = 1$) and is evaluated positively ($\text{evaluation} = 1$):

$$m_{\text{right}} = \langle \text{bringsAboutTheEnd} = 1, \text{evaluation} = 1 \rangle$$

7 Teleological Relations in the Theory of Rudolf von Jhering

This section provides analysis of statements about legal teleology in Rudolf von Jhering's "Law as a Means to an End" [8]. Quotations below are provided according to the English translation.

In the Editorial preface [8. p. xxi], Joseph H. Drake writes about Bentham's idea that "legislation must be shaped with reference to the greatest good for the greatest number". Thus Bentham's conception of the purpose of law can be represented in the notation of 2-elements relation:
law $te \rightarrow$ the_greatest_good_for_the_greatest_number

The assertion "law is not an end in itself, but a means" can be inferred from the book's title. Further in the preface (p. xxiii), Drake reminds not to forget "that law is not an end in itself and as such to be brought to a state of formal and static perfection, but that the end is the good of society".

From the above we extract two assertions. The first is "Law is a means." It is interpreted as "Law is an instance of the class means." It can be represented as the relation

law instance-of means or in the prefix notation instance-of(law, means)

The second assertion is "This means teleologically serves to achieve a certain end." Both assertions are represented as the semantic graph in Figure 7.

![Semantic graph](image)

Figure 7. A semantic graph which represents two assertions: (a) "Law is a means" (more precisely, "Law is an instance of the class means") and (b) "This means teleologically serves a certain end"

Jhering's Law of Purpose is: no volition, or, which is the same thing, no action, without purpose (p. 2). We visualize the law of purpose in Figure 8. In other words, Jhering's theory claims that "no rule which does not owe its origin to a purpose" (p. xxviii-ix).

![Visualization of Jhering's law of purpose](image)

Figure 8. Visualization of Jhering's law of purpose

Jhering notes that the purpose belongs to the future. Therefore in our notation the arrow leads from the action to the purpose: $A \ te \rightarrow B$, i.e. action $\ te \rightarrow$ purpose. Motive can be treated as a synonym of purpose (p. 3).

Drake refers to the philosophy that knowledge is not wisdom: "Knowledge comes, but wisdom lingers" (p. xxviii). Thus wisdom is rated above knowledge. In this way an ordering or preference is introduced: knowledge $\triangleright$ wisdom. This preference is important from the standpoint of knowledge representation, whereas the latter is modeled in computing and AI. Knowledge is subject to representation in computers, whereas law is subject to wisdom. The latter is attributed to human beings and the humanity on the whole.
8 Mixed Systems: Systems with Teleological and Causal Relations

This section concerns supplementing a teleological relation $A \text{te} \rightarrow B$ with a causal relation $A \text{c} \rightarrow B$. Hence, we aim at a notation for normative systems which include two kinds of relations: teleological and causal. Then we analyze different combinations of evaluation of $A$ and $B$. It should be noted that evaluation and weighing is within the nature of law. (The author is indebted to F. Lachmayer for the examples below.)

Consider a causal relation $A \text{c} \rightarrow B$. Consider that the action $A$ is evaluated positively, for instance, “wandering”. Hence, generally, the consequence $B$ has to be evaluated neutrally:

$$A^{\text{positive}} \text{c} \rightarrow B$$

But in the derived causal relationship the consequence $B$ is generally evaluated positively, i.e.

$$A^{\text{positive}} \text{c} \rightarrow B^{\text{positive}}$$

Now consider that $A$ is evaluated negatively. Hence, generally, the consequence $B$ has to be evaluated neutrally, too: $A^{\text{negative}} \text{c} \rightarrow B$. But in the derived causal relationship, $B$ is usually evaluated negatively:

$$A^{\text{negative}} \text{c} \rightarrow B^{\text{negative}}$$

A problem of formalization (multiple criteria) arises when the action $A$ is evaluated positively, while its consequence $B$ – negatively (the so called conflicting evaluation):

$$A^{\text{positive}} \text{c} \rightarrow B^{\text{negative}}$$

For example, a negative consequence of wandering is wasting time. Other examples are: “give a chocolate”, “reach a toy-arrow from the roof”, etc. The consequences are evaluated negatively because of a side effect such as teeth caries, or high risk to fall down from the roof, etc.

Conflicting evaluations are dominant in our lives. Here we derive a metanorm “not to do $A$”:

$$A^{\text{positive}} \text{c} \rightarrow B^{\text{negative}} \Rightarrow \text{metanorm}( \text{norm}(\neg A) )$$

9 Conclusions

The paper emerges as a reflection on legal teleology. Here the law can be viewed as a whole. Such a view is required by a cognitive approach to the law. The result is a metaphorical view to legal teleology.

The proposed action-goal model is of declarative nature. It describes one step; another question is whether this leap is a little or big. The path metaphor is of more procedural nature. The reason to mix a continuous and a discrete paradigms is as follows. Open-texture is innate in the legal domain. The fuzziness of the justice concept is innate in the law. Discrete (mathe-
metrical) formalizations bring their pro and contra. An advantage is mathematical strictness. However, a disadvantage is a risk to lose the spirit of law.

We think that formalizing semantics can contribute to the open-texture problem in the law. This can be illustrated by Hart’s example of “Vehicles are forbidden in the park” and its analysis [2].

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References


