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On Problems in Defining Abstract and Metaphysical Concepts – Emergence of a New Model

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A B S T R A C T

Basic anthropological terminology[i] is the first project covering terms from the domain of the social sciences under the Croatian Special Field Terminology program (Struna[ii]). Problems that have been sporadically noticed or whose existence could have been presumed during the processing of terms mainly from technical fields and sciences have finally emerged in »anthropology«. The principles of the General Theory of Terminology (GTT), which are followed in Struna, were put to a truly exacting test, and sometimes stretched beyond their limits when applied to concepts that do not necessarily have references in the physical world; namely, abstract and metaphysical concepts[iii]. We are currently developing a new terminographical model based on Idealized Cognitive Models (ICM), which will hopefully ensure a better cross-filed implementation of various types of concepts and their relations. The goal of this paper is to introduce the theoretical bases of our model. Additionally, we will present a pilot study of the series of experiments in which we are trying to investigate the nature of conceptual categorization in special languages and its proposed difference form categorization in general language.

Key words*: language for special purposes, categorization, cognitive sociolinguistic model, Idealized Cognitive Models*

Traditional Terminology and Objectivity

The General Theory of Terminology (GTT)[1], which can today be referred to as »traditional terminology«, assumes objectivity in defining concepts[iv]. Throughout our terminographical work in Struna, we have found numerous cases on the bases of which we can safely say that human categorization is mostly subjective. Traditional terminology is based on objective epistemology, which sees the human mind as an abstract machine for manipulating symbols, and sees thought as a mechanical manipulation of those symbols, and, finally, sees symbols as an inner representation of the world[2]. The problem with this approach is not in the way how mind, thought or symbol are defined, but in what this implies. The first implication is that objective categorization exists beyond human influence, and that all one can do is to mechanically mimic categories in constructing one's own categorization. The second is that a concept either belongs to a certain category or not, without any middle ground. With the development of cognitive linguistics, this objective epistemology was discredited by Roach[3,4], and later in the works of G. Lakoff and M. Johnson[2,5,6] and many others.

Unfortunately, GTT, although a part of applied linguistics, has never updated its foundations and still insists that concepts must fit into an objective categorization. GTT's ideal definition is in the form of a *genus proximum et differentia specifica*, which in practice takes the form of hypernym + characteristic that distinguishes it from other concepts on the same level. The idea is that defining all concepts in this manner will result in a clear-cut hierarchy representing one domain of reality.

[i] Antrona: http://antrona.yolasite.com/
[ii] Struna: http://struna.ihjj.hr/
[iii] Such as culture, magic, and sometimes space (we will elaborate this one later in paper).
[iv] For the purposes of this paper we include both concepts and categories into our definition of concepts.

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polygon = flat shape consisting of straight lines joined to form a closed chain or circuit

triangle = polygon with three sides

isosceles triangle = triangle with two sides that are equal in length

This works quite well on exact concepts, as we have shown above. The reason for this is that universal concepts emerge from objects or items that exist in realia, the existence of which does not depend on the human mind. Humans can call a triangle whatever they like and imagine it in all types and colors, and it will always remain a »flat shape consisting of three straight lines joined to form a closed chain«.

Problems arise when one tries to apply this formula to a concept that is not as exact as a triangle. The concept of culture is one of the key concepts in anthropology[v]. Therefore, a proper definition of culture is crucial to a systematic processing of the special language of anthropology. Although culture is a key concept, it is not a top-level category that does not have a superordinate category (hypernym). But what is its hypernym? There are probably as many definitions of culture as there are dictionaries in the world[vi]. Since dictionaries are (usually) written by experts, we must assume that all of them are correct, and they probably are. The mere fact that there are so many definitions of the same concept should lead us to the conclusion that there is no such thing as an objective (in a sense of universally appropriate) categorization for some concepts. Even if we were to arbitrarily choose a category that contains culture as its subordinate (hyponym), and many have tried[12],

> cumulative deposit of; the systems; communication; cultivated behavior, totality of a person's; way of life of a group of people; symbolic communication; consists of patterns; the sum of total of the learned behavior of a group of people; collective program of the mind…

this still does not solve any of the problems. Firstly, we are as far from objective categorization as we were before, and secondly, this kind of arbitrarily chosen category will most certainly generate problems in the future. Let us say that we have chosen, to the best of our abilities, a definition of culture with one of these hypernymic concepts, as we have done for anthropology:

> the totality of the conceptual, functional and material organization of lifestyle that serves as a means of adaption to the environment and ensures the survival of the individual and the community[vii]
> (*sveukupnost idejne, djelatne i materijalne organizacije načina života koja služi kao sredstvo prilagodbe okolini i osiguranja opstanka pojedinca i zajednice*).

Struna is an ever-growing national terminological database, which will eventually include most if not all Croatian terminology. Therefore we must assume that in the near future, a new field of knowledge (or special language), in which culture will be a part of the conceptual system, will be included. The definition of culture as proposed by anthropology will almost certainly[viii] not be ideal for that special language. Therefore a new definition of culture will be included. The problem of multiple entries of the »same« concept rarely occurs in single field terminologies; in multidisciplinary terminological databases multiple entries are fairly common and the source of many problems. The problem of harmonization of multiple entries in Struna was reported by Runjajić and Bergovec[13]. And, although several methods were applied, no satisfactory solution was found for this problem. We believe that the terminografical model based on GTT principles is not equipped with necessary tools for optimal description of conceptual variations that emerge from various special languages, especially in multidisciplinary term-bases. Human categorization is not an objective or universal process, but inevitably emerges from social/cultural experience[2,14–16]. We believe that this dimension must be incorporated in terminology, both in theory and in praxis.

Modern Terminology

The General Theory of Terminology has existed as an unquestioned theory for almost 30 years. It all started with Eugine Wüster[17], an engineer with a great interest in information science, who laid the foundations for what was to later become the General Theory of Terminology. In the last two decades, the principles of terminology developed by Wüster have been questioned and critiqued by many authors[18–23]. The main criticism is: the principles of GTT are not flexible enough to account for all the specific semantic aspects of a sign in language for special purposes (LSP). We must agree with this criticism. An explanation as to why this critique is valid can be traced to a combination of two factors that influenced Wüsters work; as an engineer, his main concern was the standardization of technical terms, and the approach to linguistics that prevailed in his time was structuralism[24]. This resulted in a formal approach to terminology that can be used optimally for exact (technical) concepts[ix], but is lacking in the adaptability needed for concepts of a more abstract nature.

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[v] Culture is mentioned in almost 300 terms or definitions in Basic anthropological terminology.

[vi] All Croatian dictionaries consulted for the purpose of this paper had a similar but slightly different definition of culture[7–12].

[vii] All of the definitions were originally written in Croatian and translated (to the best of our abilities) to English for the purposes of this paper. An original definition in Croatian is always marked in italic in text or as an endnote as a way of fact checking.

[viii] This statement is based on our experience with previous projects, where different definitions even for technical concepts such as anode were proposed by various projects.

[ix] Although even that statement is far too strong, as we have experienced in our work on Struna and as reported in literature[25].

The critique of GTT comes from (roughly) three main sides: cognitive science, language science, and communication science[x]. Most of the arguments are valid and point out, from various approaches, the problems and unsustainability of GTT.

A promising idea can be found in the early works of Rita Temmerman[25,26]. Temmerman suggested that the socio-cognitive approach to terminology could possibly solve most, if not all, of the problems emerging from GTT. The main argument stated is that, to explain (define) a concept, one must first fully understand it. Since concepts are not formed independently from human cognition but as a result of it, this must be done not by attempting to be objective, but by taking into account all of the socio-cognitive parameters crucial to the formation of human categorization. Unfortunately, as good as this idea may be, this theory has yet to be put into practice. In her latest work[27,28], Temmerman diverges first into an ontological approach,[xi] and finally into the development of knowledge bases. Although we do believe that both are useful and are valid paths to be taken, the result is a step too close to an encyclopedic representation of knowledge to be considered terminological term base such as Struna.

The second main approach to alternative terminological theory that will be mentioned here is that of M. Teresa Cabré Castellví. She argues that the subject of terminology, rather than being viewed as a concept as it is in GTT, should be seen as a »unit of knowledge«[18], showing its polyhedral nature through three components: linguistic (as part of a language – LSP), cognitive (knowledge component), and social, which would include both communicational and socio-cultural elements. This is a valid point and has been widely accepted, even by some Wüsterians. In its essence, Cabré's suggested approach does not differ significantly from the early works of Temmerman. Her main concern, however, is to establish terminology as a valid modern scientific discipline, not to solve »field work« problems; the idea being that one has to have a working theory in order to develop functional methods. This being said, we are not sure if »theory – practice« is a better path than »practice – theory – practice – revised theory«. We believe that human categorization is far too complex to theoretically cover all possible »types« of concepts in all of their variations. We fear that, if we develop a »new« General Theory simply through theoretical thinking, in thirty years we may find ourselves in a similar »crisis«; a situation where terminology cannot encompass all of its subjects.

The most promising, and certainly the most developed approach to terminology is the Frame-based terminology proposed by P. Faber[29,30]. The aim of this approach to terminology, as the author herself claims (2001: 194), is to establish the basis for a complete terminographic description and presentation that will cover linguistic and nonlinguistic related relations in a given domain, but also the relationships with other domains. Faber and colleagues point out that the description of the conceptual structure of the specialized domains is a necessary aspect of terminology management. The way in which the concept is presented affects the form of the information in each processed terminological unit, as well as in any data field that contains information about the concept, especially the individual description of the concept or the definition[31]. Based on these principles, they conclude that conceptual representations should not be merely a hierarchical list of objects presented by simple or complex noun constructions, and therefore, propose dynamic organization of the conceptual system of terminology. Relying largely on the frame semantics[32], they are proposing a model which places concepts of a particular domain into a prototypical situation or frame for basic processes that occur in a specialized domain. In this model, concepts are organized around the interface which is defined trough events that are described by agent, process and patient templates.

Actions and events that are repeated form the basis of the conceptual structure of events. Faber and colleagues approach terminology based on the development of generic template which is used to process information at all levels of the structure. Starting from the premise that the description of the specialized domain is based on events that are taking place in that domain, they conclude that concepts are best described in terms of these events. Every domain of knowledge is given a template, which allows it to form a framework for the organization of specific concepts. Specific concepts in each category are organized in a network where they are connected through both hierarchical and non-hierarchical relationships.

Cognitive linguistic-based terminology proposed by Faber and colleagues has certainly set a sort of template for a modern approach to terminology. On the basis of linguistic theory and modified models for lexicographical description, they have produced a functional model for practical terminographical praxis.

The Special Language of Anthropology

As we have stated before, anthropology is the first language for special purposes from the domain of the social sciences that we have described in Struna. Up until then, most of the terminological units we encountered included concepts that were universal and exact in the sense that they designated physical objects or events in real world. Despite that, we have had problems when two

[x] We will not delve too deeply into the genealogy of modern terminological theories, nor into the history of Wüsterian terminology, as this would lead us beyond the main argument of this paper. Furthermore, enough papers have been written on this subject, and it would not be possible to outstrip them in quality. Limitations of space should also be borne in mind. For a detailed revision of terminological theories, the works of M. Teresa Cabré Castellví and Rita Temmerman are highly recommended[26,42].

[xi] Termontography.

(or more) experts from different fields insisted on a different definition for what seemed like the same concept. The example already reported[13] is anode, which even after harmonization still has four terminological units with various definitions:

physics: electrode with the greater electrical potential

engineering: positive electrode in electrolytic cell

chemistry: negative charged electrode

chemical engineering: electrode with predominately anode reaction.

It is obvious that experts from different fields see »identical« concepts with a semantic shift clearly conditioned by their field of expertise. This shift can be observed on two levels: between two or more languages for special purposes, and between an individual language for special purpose and the general language. It is reasonable to assume that problems of conceptual variations sporadically emerging in special languages of natural sciences and technical fields will exponentially grow as more social sciences and humanities are included in our term-base.

In anticipation of this growing problem, we are trying to develop a model that could deal with this, and possibly other, problems[xii] caused by following rigid principles of the GTT. Considering our modest funds and limited resources, an important requirement that we were forced to impose on ourselves and our model is that it must be easily incorporated in the existing conceptual structure described in Struna without excessive changes both in the database schema and in already processed data.

We have started our investigation with the general hypothesis that categorization in languages for special purposes is different than general categorization. In other words, we felt that categorization that can be observed in concepts used in special communication does not necessary reflect categorization one uses in everyday communication trough general language. We have based this assumption on two observations. First, an expert's knowledge of a certain concept which is in focus of their interest supersedes the knowledge a person has on concepts from everyday life. Second, the apparatus with witch expert knowledge is accumulated differs from the way people accumulate their knowledge of the world that surrounds them[33]. For example, let us look at the concept of internal combustion engine and compare the knowledge an engineer has on that concept and our[xiii] knowledge, and the way we have accumulated that knowledge. An engineer presumably knows all there is to know about internal combustion engines: how they work, what are their key components, what physical conditions such as pressure, fuel to air ratio etc. must be met for the engine to work properly... Perhaps more importantly, the expert has learned all that intentionally, with the purpose of accumulating as much information as possible or necessary for their education or career. We, on the other hand, have just rudimental knowledge: an engine needs fuel to work, there are two types based on the fuel they use, and if it stops working, we have to take it to service. Contrary to the engineer's way of learning, we have acquired what we know spontaneously, among other everyday knowledge.

In the Introduction to Cognitive Sociolinguistic[34], Kristiansen and Driven state: »A usage-based linguistics takes language as it is actually used by real speakers in real situations in a specific historical moment as the basis of its enquiry. As a logical consequence of this fact, Cognitive Linguistics needs to employ empirical methods capable of dealing in adequate ways with social variation: methods that conform to the traditionally high standards of socio- linguistic research and which are capable of distinguishing between social and conceptual types of variability.« It is not hard to recognize that we can (and probably should) replace Cognitive Linguistic with Terminology to create the optimal basis for LSP research. If we look at special language as a variation of general (standard) language, and consider experts as a social subgroup defined by their common, motivated domain of knowledge and active usage of that special language, it is obvious that cognitive sociolinguistics could provide a valid framework for this research. Unfortunately, it is hard to find many (if any) examples of cognitive (socio) linguistics research with language for special purposes in their focus. Nevertheless, there are studies on some of the aspects that we have recognized as potentially differential: influence of prior knowledge on categorization[35–37], the effects of context on the structure of categories[38], and dissociation of explicit and implicit category learning[39]. Possibly the most important studies that can be indirectly associated with special language are those that investigate the differences in the development of categorization and categorical structures in experts and novices as reported by Murphy and Wright[40] and Shafto and Coley[41].[xiv]

Materials and Methods

As a starting point of our investigation of presumed differentia of cognitive categorizations, we have conducted a pilot study that will (hopefully) provide foundation

[xii] Since our investigation is still in the early stages it would be inappropriate to claim that all of the problems of the GTT could or will be solved, but we believe that some, like usage of metaphor, could easily be incorporated in the proposed model.

[xiii] By ourselves we mean the authors of this paper.

[xiv] Space does not permit a systematic summary and critique of every study; therefore, we will mention just a few. As we have mentioned before, we have set a more modest goal for ourselves: to introduce the theoretical bases of a model that is still in the early stages of development, and to report on a pilot experiment. Papers mentioned in this paragraph have inspired us to try to contribute in a small way. Systematic summary of all of the studies that could contribute to further understanding of all of the aspects of human categorization that could be associated with special language deserve at least an independent paper.

TABLE 1
CROSSTABULATION OF RESPONSES FOR CONCEPT SPACE

Group – Crosstabulation[e]												
		Space[a]										Total
		vector space	n--space[b]	Euclidean space	vacuum[c]	open space	phase space	space--time[d]	room	closed space	contact zone	
Group Phy	Count	18	17	10	12	4	11	12	2	3	0	89
	% within G	20.2%	19.1%	11.2%	13.5%	4.5%	12.4%	13.5%	2.2%	3.4%	0.0%	
	% within Q	100.0%	100.0%	100.0%	70.6%	33.3%	100.0%	100.0%	18.2%	25.0%	0.0%	
	% of Total	14.3%	13.5%	7.9%	9.5%	3.2%	8.7%	9.5%	1.6%	2.4%	0.0%	71%
Group Ant	Count	0	0	0	4	5	0	0	4	5	6	24
	% within G	0.0%	0.0%	0.0%	16.7%	20.8%	0.0%	0.0%	16.7%	20.8%	25.0%	
	% within Q	0.0%	0.0%	0.0%	23.5%	41.7%	0.0%	0.0%	36.4%	41.7%	100.0%	
	% of Total	0.0%	0.0%	0.0%	3.2%	4.0%	0.0%	0.0%	3.2%	4.0%	4.8%	19%
Group Con	Count	0	0	0	1	3	0	0	5	4	0	13
	% within G	0.0%	0.0%	0.0%	7.7%	23.1%	0.0%	0.0%	38.5%	30.8%	0.0%	
	% within Q	0.0%	0.0%	0.0%	5.9%	25.0%	0.0%	0.0%	45.5%	33.3%	0.0%	
	% of Total	0.0**	0.0%	0.0%	0.8%	2.4%	0.0%	0.0%	4.0%	3.2%	0.0%	10%
Total	Count	18	17	10	17	12	11	12	11	12	6	126
	% of Total	14.3%	13.5%	7.9%	13.5%	9.5%	8.7%	9.5%	8.7%	9.5%	4.8%	100%

Percentages and totals are based on responses.
a. Dichotomy group tabulated at value 1.
b. N-space was used as code for all answers that referred to multidimensional space.
c. Vacuum was used as code for all answers that referred to empty space.
d. Spacetime was used as code for all answers that referred to four-dimensional space.
e. Answers in Croatian were: vektorski prostor, n-prostor, euklidski prostor, vakuum, otvoreni prostor, fazni prostor, prostor-vrijeme, soba, zatvoreni prostor, dodirno područje.

for later studies. We have first examined how experts in physics and anthropology and »laymen« generate members of three categories. To compare experts from different fields of knowledge and non-experts, we have tried to select two categories that are basic concepts in two fields of knowledge but are at the same time relatively common in general language. The terms from expert fields were: space (prostor) for physics and symbol (simbol) for anthropology. Furthermore, we have tried to select the terms which, even though perceived as specific to one of the fields, are not unknown or unused in the other fields[xv]. Finally, we selected one word from general language as a contrast category[xvi]. The contrast category was presented by automobile (car).

The sample included two expert groups and one contrast group with 20 subjects each. Expert groups consisted of PhD students and D. Scs. from the fields of physics (Phy) and anthropology (Ant). The contrast group (Con) included university graduates with mayors in fields that are not (typically) related to physics and anthropology[xvii]. Participation was entirely voluntary and subjects did not receive any compensation for participation.

As mentioned, categories presented by two terms from Struna and one word from general language were used as stimuli in a members generation task. Categories were printed one per page in a booklet that included an additional page with instructions and an example. The instructions informed the subjects that the goal of the study was to find out how people think about random things. They would be given a number of categories, and they would have to write as many members of that category as they can think of. The example of a category dog was given, with various members listed as valid: German Shepard, Golden Retriever, small dog, big dog, fast dog… No time limit was given, but subject were not allowed to go back to previous category once they started a new one.

Results

Analysis of variance (ANOVA) on frequencies showed statistically significant differences for space $F(2.56)=10.79$ with $p\leq0.001$, and for symbol $F(2.56)=7.18$ with $p=0.002$. There was no significant difference for car p=

[xv] Although one can question any selection we have made, our selection was made after intensive »text« analysis of processed terms form projects of physics and anthropology in Struna. The selection was made after identifying terms that could potentially be used in a somewhat different meaning in these fields.
[xvi] The main (and only) requirement for the selection of the general language category was that it does not appear in the term list or in definitions of any terms in physics and anthropology.
[xvii] Professions encompassed in Con group were economics (N=10), law (p=4), computer science (N=2), dental medicine (N=1) and criminology (N1).

TABLE 2
CROSSTABULATION OF RESPONSES FOR CONCEPT SYMBOL

Group – Crosstabulation[b]												
		Symbol[a]										Total
		chemical symbol	cross	symbol of power	letter	symbol of fertility	symbol of life	mathe-matical symbol	symbol of death	status symbol	sign	
Group Phy	Count	12	3	0	6	0	0	10	0	0	3	34
	% within G	35.3%	8.8%	0.0%	17.6%	0.0%	0.0%	29.4%	0.0%	0.0%	8.8%	
	% within 0	57.1%	21.4%	0.0%	31.6%	0.0%	0.0%	76.9%	0.0%	0.0%	19.0%	
	% of Total	8.7%	2.2%	0.0%	4.3%	0.0%	0.0%	7.2%	0.0%	0.0%	2.2%	25%
Group Ant	Count	6	6	13	6	13	12	2	10	5	8	81
	% within G	7.4%	7.4%	16.0%	7.4%	16.0%	14.8%	2.5%	12.3%	6.2%	9.9%	
	% within Q	28.6%	42.9%	92.9%	31.6%	100.0%	100.0%	15.4%	100.0%	83.3%	50.0%	
	% of Total	4.3%	4.3%	9.4%	4.3%	9.4%	8.7%	1.4%	7.2%	3.6%	5.8%	59%
Group Con	Count	3	5	1	7	0	0	1	0	1	5	23
	% within G	13.0%	21.7%	4.3%	30.4%	0.0%	0.0%	4.3%	0.0%	4.3%	22.0%	
	% within Q	14.3%	35.7%	7.1%	36.8%	0.0%	0.0%	7.7%	0.0%	16.7%	31.0%	
	% of Total	2.2%	3.6%	0.7%	5.1%	0.0%	0.0%	0.7%	0.0%	0,7%	3.6%	17%
Total	Count	21	14	14	19	13	12	13	10	6	16	138
	% of Total	15.2%	10.1%	10.1%	13.8%	9.4%	8.7%	9.4%	7.2%	4.3%	12%	100%

Percentages and totals are based on responses.
a. Dichotomy group tabulated at value 1.
b. Answers in Croatian were: kemijski simbol, križ, simbol moći, slovo, simbol plodnosti, simbol života, matematički simbol, simbol smrti, statusni simbol, znak.

TABLE 3
CROSSTABULATION OF RESPONSES FOR CONCEPT CAR

Group – Crosstabulation[c]												
		Car[a]										Total
		manu[b]	motor car	two--seater	sport car	Fićo	conver-tible	city car	limo	off-road	caravan	
Group Phy	Count	12	7	8	7	3	4	4	2	3	3	53
	% within G	22.6%	13.0%	15.1%	13.0%	5.7%	7.5%	7.5%	3.8%	6.0%	5.7%	
	% within Q	30.0%	44.0%	61.5%	47.0%	33.0%	33.3%	80.0%	20.0%	27.0%	33.3%	
	% of Total	8.6%	5.0%	5.7%	5.0%	2.1%	2.9%	2.9%	1.4%	2.0%	2.1%	38%
Group Ant	Count	14	4	1	3	6	2	0	5	5	2	42
	% within G	33.3%	9.5%	2.4%	7.1%	14.0%	4.8%	0.0%	12.0%	12.0%	4.8%	
	% within Q	35.0%	25.0%	7.7%	20.0%	67.0%	16.7%	0.0%	50.0%	45.0%	22.2%	
	% of Total	10.0%	2.9%	0.7%	2.1%	4.3%	1.4%	0.0%	3.6%	4.0%	1.4%	30%
Group Con	Count	14	5	4	5	0	6	1	3	3	4	45
	% within G	31.1%	11.0%	8.9%	11.0%	0.0%	13.3%	2.2%	6.7%	7.0%	8.9%	
	% within Q	35.0%	31.0%	30.8%	33.0%	0.0%	50.0%	20.0%	30.0%	27.0%	44.4%	
	% of Total	10.0%	3.6%	2.9%	3.6%	0.0%	4.3%	0.7%	2.1%	2.0%	2.9%	32%
Total	Count	40	16	13	15	9	12	5	10	11	9	140
	% of Total	28.6%	11%	9.3%	11%	6.4%	8.6%	3.6%	7.1%	8%	6.4%	100%

Percentages and totals are based on responses
a. Dichotomy group tabulated at value 1.
b. Manu was used as code for all answers referring to individual manufactures in car industry.
c. Answers in Croatian were: proizvođač, osobni automobil, dvosjed, sportski auto, Fićo, kabriolet, gradski auto, limuzina, terenac, karavan.

0.105. Post hoc test of multiple comparisons (Games-Howell) revealed between which groups the difference was located.

space: $Phy^J : Con^I$ (3.11, 95% CI [2.96, 10.14]) $p \leq 0.001$; $Ant^J : Con^I$ (3.44, 95% CI [0.56, 6.32]) $p = 0.016$,

symbol: $Ant^J : Con^I$ (6.44, 95% CI [3.25, 9.62]) $p \leq 0.001$.

For further analysis, we have taken 10 generated members of each category. We have tried to avoid that most (if not all) selected members coming from answers given by the expert group of the field that category prototypically belongs to[xviii]. Therefore, 10 most frequently generated members for each group were taken, ranked form 1–10, with 10 being the most frequent. In the next step of selection, we have combined the generated members in a new list and added together their »ranks«. From that combined list, 10 members with the higher sum of ranks were selected.

Crosstabulation of multiple answers reveals percentages differences of given answers between groups. For the sake of clarity, the results are given in tables (Tables 1, 2 and 3).

Discussion

Although too few categories were covered in this pilot study to consider it pertinent for the proposed hypothesis, we believe that differences observed could serve as a justification for further investigations. Analysis did show certain statistically significant differences both in the variance of frequencies and in the dispersion of generated members between groups. One-way ANOVA expectedly showed no significant differences for the category car. Since car is not a dominant concept in special languages of physics or anthropology, we did not expect to find differences between experts and non-experts in those languages. Significant differences observed for space and symbol, as revealed by post-hoc test, were located mainly between experts in the field that term belongs to and the contrast group; namely, between Ant and Con for symbol and between Psy and Con for space. There was also a significant difference between Ant and Con for space, although a slightly smaller one. We were expecting more significant differences between Psy and Ant groups for both terms. Although analysis did not meet our expectations, these results do not necessarily disapprove our presumption. A plausible explanation could be that experts from both groups simply know more members of the presented categories than the subjects from the contrast group, although not necessarily the same ones. Crosstabulation does support this explanation. If we compare members of the symbol category that half or more subjects from Ant group generated ($C \geq 10$), it can be noted that percentages within category (%WQ) are over 90%. Specifically, symbol of power ($C = 13$, %WQ 92.9), symbol of fertility ($C = 13$, %WQ 100), symbol of life ($C = 12$, %WQ 100) and symbol of death ($C = 10$, %WQ 100). Similar effects can be observed for space: vector space ($C = 18$), n-space ($C = 17$), Euclidean space ($C = 10$), phase space ($C = 11$) and space-time ($C = 12$) are all within category percentage 100. The sole exception is vacuum ($C = 12$, %WQ 70).[xix] Furthermore, both chemical and mathematical symbols did get the highest counts and percentages in the Psy group. Similarly, contact zone for category space in the Ant group has a relatively low count (6) but does have 100% within the category.

These results do imply a certain difference between how experts of a certain field of knowledge categorize concepts that are motivated, and how non-experts of that field categorize them. We believe that results from this pilot study do justify further investigation. Naturally, future studies should in the first place include more categories; furthermore, in selecting stimuli, more thought should be invested into profiling categories. Namely, separating potentially shared categories from those that are in use exclusively in a particular LSP. Category generation does seems like a logical choice for the next step, and further in the future, probably, studies that include members/category rating and grouping concepts in semantic contexts or »spaces« should be designed.

Model

As we have mentioned in the introduction, the model for describing variations in categorizations between different languages for special purposes that we are developing for the most parts relies on Idealized Cognitive Models as described by G. Lakoff[2]. In our work in Struna we have numerous cases where experts from different fields perceive the »same« concept in a slightly or completely different way. The previously mentioned case of anode is just one of many. We believe that those differences reflect field-specific categorization that is relatively stable within the group consisting of experts with same motivated domain of knowledge[xx]. Furthermore, as results of our experiment are possibly implying, a specific definition of a concept entails different definitions of other concepts for certain groups. Even in a small scale experiment as one presented here, it is evident that different groups of experts usually generate different members of the category. For instance, the category symbol stimulated the Psy group to generate symbols that are

[xviii] We have observed that if we used total frequencies as the rule for selecting the answers for category space and symbol, most answers would come from Phy and Ant groups respectively.

[xix] This could be the result of less than optimal coding. Videlicet we have coded all »empty spaces« and vacuums as vacuum. In the light of this result, the question we have to ask ourselves is: is e.g. a lawyer's empty space the same concept as a physicist's empty space or vacuum.

[xx] By motivated domain we consider any domain of knowledge in which a person has great motivation for learning. This could include, beside common reasons such as higher education or professional specialization, personal hobbies or interests.

universally accepted and defined: chemical and mathematical symbols. The Ant group, on the other hand, initially generated symbols the definitions of which are more dependent on socio-cultural environment. Death, life, fertility and status are all concepts that vary in definitions both spatially and historically. Idealized Cognitive Models optimally (for our purposes) explain and encompass this kind of categorical variations. Thus, ICMs could be perceived as an inter-sphere for a semantic environment in which certain concepts form relatively stable relations and are categorized slightly differently than »same« concepts in other ICMs.

Example and implementation

As an example we decided to use space. Space is a concept that initially encouraged us to think about alternate ways of describing conceptual systems in our term-base. In 2010/11, when we were working on terms from the field of physics, we encountered a logical problem with concepts of space (3D) and n-dimensional space (ND). Intuitively, we know that any space that has more than 3 dimensions is a special case of »normal« 3D space. However, if we look at the definitions proposed by physicists, our intuition is disapproved.

a. space (3D): infinite three-dimensional extent in which bodies have relative positions
b. n-dimensional space: infinite n-dimensional extent in which bodies have relative positions[xxi]

When we have to place those two concepts in a hierarchical relation, logic demands that 3D space be just one of the possible members of the n-dimensional space category. There are two main problems with this kind of terminographic intervention:

a. a smaller one; if we define IS-A relation from space to n-dimensional space, we should use *genus proximum* (*GP*) in definition of space. That would produce a definition that would not make much sense – n-dimensional space that has only three dimensions. This can be bypassed by pretending that that *genus proximum et differentia specifica* is more a guideline than a rule[xxii].
b. a much bigger problem is that we are describing the conceptual system of special language of physics incorrectly. Experts in the field of physics do not think of space as a member of n-dimensional space, but vice versa. This was confirmed in our experiment where both 4D and ND spaces were generated as members of space (Table 2). Unfortunately, it wasn't as easy to fix this as it had been to fix previously mentioned problem, and we were forced to leave this artificially created relation in our term-base.

There are a number of concepts in anthropology that refer to the concept of space in their definitions. As far as we were able to detect, they can be divided into three groups by versions of spaces:

a. »Normal« (3D) space includes concepts that refer to certain geographical areas. Such as: culture area (GP = geographic area); workshop (GP = space in which …)
b. Space that beside its geographical reference includes a socio-culturally depended component. Such as: contact zone defined as: a social space where groups of diverse cultural traits meet. Where social space is geographical area but at the same time must be socially recognized as acceptable for one reason or another.
c. Completely metaphorical space as seen in the definition of state of exception: space outside of the political community in which sovereign power excludes from law those that have been reduced to bare life. Where space is a metaphor, as it does not represent actual geographic area but a government enforcement of different rules for undesirable people which puts them »outside« of desired social groups.

Since the principles of GTT do not provide valid tools for describing this kind of specific semantic dependencies, end-user's query for space will produce all of these terms[xxiii] as equally relevant. We are hoping that by connecting concepts in inter-spheres that are based on ICMs we would be able to group concepts in layers that would better represent inter-field and intra field conceptual relations. In the case of space in the special language of anthropology, that would mean that tree cognitive models would be needed[xxiv]:

a. First one that would refer to »normal« space as defined in physics and would layer all concepts that refer to geographical areas.
b. The second one that would, beside a reference to 3D space include an anthropology-specific component that refers to more abstract concepts such as society and culture.
c. The third one that would layer metaphoric spaces.

In physics, the obvious layering would be to classic and modern physics. Here, the classic layer would include 3D space as well as Euclidean space, and the modern layer would include n-dimensional space, space-time and phase space[xxv]. Deeper layering based on specific theories or approaches in physics should be implemented when possible and/or needed.

Naturally, layers should not be limited to individual concepts like space, but should include all the concepts

[xxi] Definitions in Croatian are: neograničena trodimenzijska/n-dimenzijska protežnost u kojoj tijela imaju relativne položaje.
[xxii] As we did.
[xxiii] And many more.
[xxiv] By no means do we claim that only three IMC layers would be needed, or even that maybe two would not be sufficient. This approximation is based on our observation so far as presented in this paper.
[xxv] Naturally, this is just a basic generalization based on our modest knowledge of physics. More precise differential layering should be (and hopefully will be) done in close collaboration with physic experts.

that function in that ICM. For example if a layer »special relativity« is defined, it should include concepts such as: space-time, proper time, rest energy, relativistic addition of velocities, time dilation, twin paradox etc.

Implementation of this kind of description in our term-base will be far from simple. There are at least two issues that we will have to address prior to actual development of practical solutions. First of all, there is the issue of defining top and bottom layers. As one can imagine, there are possibly unlimited ways to group concepts into layers: by theories, by branches of the field, by schools, by subjects of study etc. There is a real possibility that too many layers would result in exactly the opposite of what we are hoping to achieve: A presentation of special languages that is next to useless to the end-user. On the other hand, we should refrain from arbitrarily choosing the number of layers that should be implemented. No two languages are the same, either in size of conceptual system or in the »broadness« of it. It is hard to compare the field of physic with for instance that of corrosion and protection of materials[xxvi]. We believe that a custom approach to each individual special language will be necessary. Analysis of particular special language prior to implementation of layers will have to be mandatory. The definition of the top layer will probably require the implementation of the general language module. We must assume that if we follow hierarchical relations in the conceptual system of LSP upwards, we will eventually come to general language. Therefore, a general lexicon should be the logical choice for top level layer.

The second issue that we must mention is that process of identifying layers or Idealized Cognitive Models requires knowledge of the field that far supersedes the knowledge of an average terminography expert[xxvii]. Therefore, close collaboration with field experts will have to be included in this phase.

Conclusion

It is evident that the principles of GTT are (mostly) adequate for defining technical and exact concepts when dealing with individual languages for special purpose. For multidisciplinary term-banks like Struna, problems emerging as the result of rigid GTT principles multiply as more and more special languages are included.

We have presented the results from a pilot experiment that will be used as a starting point for further investigation of the nature of the categorization in special languages.

Although our model is currently just a zygote, we believe that after further studies we will be able to develop it to the functional level that will insure enough flexibility to encompass specific variations both in particular LSP and between different ones. Technically speaking, we are hoping that our model will be relatively easily implemented as an overlayer on the existing structure. Implementing such a flexible model for describing categorization variations we would improve the end-users' experience and, more importantly, we would achieve a more accurate representation of conceptual structures of processed LSP. That would result in term databases that could accommodate more contextually-dependent knowledge and would help the end-user to understand what culture is, as well as why it cannot be and is not defined in the same way in two or more different languages for special purposes.

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[xxvi] »Corrosion and Protection of Materials« was a project that we worked on in 2009/10 which resulted in 892 terminological units that were included in Struna. For comparison, the project »physic« produced 3507 terminological units.

[xxvii] Authors of this paper are humbly included in this category.

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O PROBLEMIMA U DEFINIRANJU APSTRAKTNIH I METAFIZIČKIH KONCEPATA – POJAVA NOVOG MODELA

S A Ž E T A K

Osnovna antropološka terminologija prvi je projekt koji je obuhvatio nazivlje iz područja društvenih znanosti pod programom hrvatskoga strukovnog nazivlja (Struna). Problemi koji su bili sporadično primijećeni ili čije se postojanje moglo predvidjeti tijekom procesuiranja nazivlja, poglavito iz tehničkih područja i znanosti, konačno su se pojavili u »antropologiji«. Prinicipi opće teorije terminologije (OTT), koji su bili slijeđeni u Struni, stavljeni su na zaista ozbiljan test i ponekad rastezani preko svojih granica kada su primijenjeni na apstraktne i metafizičke koncepte koji nužno nemaju reference u fizičkome svijetu. Trenutačno razvijamo novi terminološki model zasnovan na idealiziranim kognitivnim modelima (IKM), koji će, nadamo se, osigurati bolju međupoljnu primjenu različitih koncepata i njihovih odnosa. Cilj je ovoga rada prikazati teorijsku osnovu našega modela. Dodatno, prezentirat ćemo pilot studiju serije eksperimenata u kojima pokušavamo istražiti prirodu konceptualne kategorizacije u posebnim jezicima i njihovu predloženu razliku u odnosu na kategorizaciju u općemu jeziku.