

## THREE ASPECTS OF PROCESSING OPHTHALMOLOGICAL TERMINOLOGY IN A “SMALL LANGUAGE”: A CASE OF CROATIAN TERM BANK STRUNA

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**Abstract:** In this paper, we will present the problems we have observed while editing terminological units as a part of the specialized language of ophthalmology that is currently being processed as part of the program Struna. Struna is the Croatian National term bank (<http://struna.ihjj.hr/>). Its aim is to gradually standardize Croatian terminology, for all professional domains, by coordinating the work of domain experts, terminologists and language experts [1], [2]. *The Croatian Ophthalmological Terminology*<sup>1</sup> is the first Struna project that encompasses a subfield of an already existing field in the database. Namely, in 2013 the general medical terminology was processed as a part of the project *Croatian Anatomy and Physiology*. This situation has revealed a new set of problems that previously were not taken into account and has forced us to re-evaluate methodology and adapt accordingly.

**Keywords:** Struna, terminology, specialized language of ophthalmology, terminology management

### 1 INTRODUCTION

The Croatian national terminological database – Struna was first inaugurated in early 2012, introducing terminology from 10, mostly technical, fields. Over the years, new specialized languages were included with the terminology from 18 fields open to the public with additional six in various stages of processing. The currently ongoing project of *Croatian Ophthalmological Terminology* is unique in a sense that it is the first project where a highly specialized domain is being processed following the language of the wider domain. Namely, in 2013 the general medical terminology was processed and open to the public, presenting 2 575 terminological units from human anatomy and physiology.

As expected, a number of those terminological units did cover the domain of ophthalmology. The fact that terminological units processed in the past were processed from the general medical point of view where current one are being processed from a highly specialized one, lead us to the point where we were forced to rethink the whole methodology in Struna.

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The problems of harmonization of multiple entries in Struna were discussed before by various authors, incorporating different aspects of terminology management [1], [2], [3]. The case discussed in this paper does transcend the scope of problems we have encountered earlier. Aside from the usual aspects of harmonization and standardization on the language and terminographic level, for the first time, the conceptual aspect did not include just a “simple” harmonization between different specialized fields but also a level of harmonization in-between two levels of expertise within the same domain.

In the following chapters, we will present the examples of newly encountered problems as well as solutions to them (in this stage of processing) from three inseparable aspects of terminology management: domain expertise, Croatian language standardization and conceptual one.

## **2 THREE ASPECTS OF TERMINOLOGY MANAGEMENT**

### **2.1 The Specialized Language of Ophthalmology**

The field of medicine comprises specific terminology that is estimated to include around 20 000 terms alone, apart from the nomenclature of the diseases, drugs and human anatomy. In the last two decades, there have been excessive developments in technology and revolution of Internet communication which have imposed challenges to generating new terminology as new diagnostic tools and diseases were accredited. When formulating terminology, we have to acknowledge the importance of the national and global effects of the strong points and shortcomings of these new terms’ transcription. This being the case, a medical professional is likely to be accustomed to limited native vocabularies introducing local language expressiveness in opposition to providing discriminative, right and indexed national term. There are several international tools providing standardized medical terminology that can facilitate assistance to manual extracting terms to national medical corpora. Unfortunately, to our knowledge, the automatic term extraction tool optimized for Croatian language has yet to be developed. One such controlled thesaurus providing a hierarchically organized terminology for indexing articles and designating biomedical information is the NLM’s (U.S. National Library of Medicine) MeSH (Medical Subject Headings). In addition, the World Health Organization’s International classification of diseases (ICD) defines diseases, disorders, injuries and other related health conditions and stands as the international coding tool for reporting health status for all clinical and research evidence-based objectives. International Nonproprietary Names (INN) as determined by WHO alleviate the identification of globally recognized pharmaceutical substances. Terminologia Anatomica released in 1998 and developed by the Federative Committee on Anatomical Terminology (FCAT) and the International Federation of Associations of Anatomists (IFAA) is the international standard when it comes to human anatomic terminology. It comprises about 7 500 terms.

In ophthalmology, a wide variety of medical concepts: diseases, symptoms, diagnostic tests and results, therapeutic strategies is related to terms with unique context on the one hand and exceedingly inconclusive medical context on the other

hand, the latter being associated with inaccurate interpretation of information and development of local community terminology, abbreviations and acronyms. The task of retrieving Croatian medical speech, phrases, definitions and words in the field of ophthalmology has always represented a challenge as no standardized specific bibliographical tool existed. In addressing those problems, the healthcare professional mostly relies on its own motivation, skills and language knowledge to bring high-quality morphosyntactic features of information through professional dictionaries, lexicons, encyclopedias and published evidence-based literature search. Possessing traits from Latin, British-American and German, many words have just been adapted to Croatian specific language forms with only minor differences in transliteration, retaining the originality of the item (examples like: ekscimer laser – excimer laser, hipotalamus – hypothalamus, keratoplastika – keratoplasty). The designation of visual acuity represents an everyday problem, as Latin, British-American English and Croatian spelling, acronyms and abbreviations are used simultaneously. In addition, multiword terms represent a special issue.

The example presented below is selected from the STRUNA dental medicine and physics catalogue tailored to their specific demands. Some of those lexical items overlap with the field of ophthalmology where they are associated with the different level of granularity.

Dental medicine catalogue:

Retina – the innermost coat of the eyeball containing photoreceptors sensitive to light. Remark: Retina is divided into a blind part (ciliary body and iris) and perceptive part (choroid). A better definition would be – the light receptive, innermost nervous coat of the posterior part of the eyeball consisted of ten layers, lying between the choroid and vitreous body, extending from the optic disk to the ciliary body. (Uvea is the vascular coat of the eye comprising iris, ciliary body and choroid.)

Astigmatism – refractive anomaly of the eye in which parallel rays of light refract in the dioptric system and are focused at more than one focal point. It is our strong opinion that the definition of astigmatism should be – refractive anomaly of the eye in which parallel rays of light from an external single point luminous source are not focused as a single point of an optical system, but instead are focused as two line images at different distances from the retina, generally at right angles to each other.

Stereopsis – binocular ability to perceive the relative distance between two near objects in order to perceive the depth of field. Remark: interchangeable with: binocular vision. The definition we are suggesting is – perception of relative distance, or the depth separation, between objects that occur as a result of neural processing of the relative horizontal binocular disparities between the monocular retinal images. Related term: Stereoacuity – acuity for the smallest relative binocular disparity stimulus (smallest relative binocular difference in distance of two objects) for depth that can be detected, specified by arcsec of disparity at the threshold.

Tonometry – indirect method of intraocular pressure measurement by measuring the tension of the eyeball. A more reasonable definition would be – measurement of ocular tension with a tonometer.

Intraocular pressure – pressure of aqueous humor that distends the eyeball. We, on the other hand, are proposing – the pressure of the intraocular fluid, measurable by a manometer.

Physics catalogue:

Myopia – insufficiency of the human eye by which the image produced by the lens is focused in front of the retina, corrected with the diverging lens. The definition, our team has agreed upon, is – the refractive condition of the eye represented as one in which parallel rays of light entering the eye with relaxed accommodation, focus in front of the retina.

Hypermetropia – insufficiency of the human eye by which the image produced by the lens is focused behind the retina, corrected with a converging lens. Farsightedness or hypermetropia should be defined as – the refractive condition of the eye represented as one in which parallel rays of light entering the eye with relaxed accommodation, focus behind the retina.

Astigmatism – error of the lens due to its different horizontal and vertical curvature. Based on our research the definition of astigmatism should be – refractive anomaly of the eye in which parallel rays of light from an external single point luminous source are not focused as a single point by an optical system, but instead are focused as two line images at different distances from the retina, generally at right angles to each other. □ corneal a. Astigmatism caused by the toroidal surface of the cornea. □ lenticular a. Astigmatism of the crystalline lens due to variations of curvature or to inequalities of refractive index.

## 2.2 Croatian Language Standardization

Medical terminology has from the start been closely connected to Greek and Latin languages which have served as a basis for medical communication on the national and international level. Most of the European languages have at some point used these ancient languages as a linguistic pool for their national medical terms. The idea behind using Latin for official medical documentation was a valid one when it was introduced. It was the main mean of allowing patients to have medical documentation written in *lingua franca* and enabling them a comprehensible medical history no matter the language barrier between a patient and doctor. Unfortunately (or luckily), the technological and medical advances in the 21<sup>st</sup> century have led to a widespread acceptance of English as the unofficial *lingua franca* in most scientific domains, and, consequently, medicine also.

The problem that has emerged in the late 20<sup>th</sup> and early 21<sup>st</sup> century is the rapid decline of usage of the native languages in medicine. This phenomenon is especially notable in the so-called small languages such as Croatian. Most of the medicine research done today is published in English, and we have been witnessing current textbooks published in English as well as lectures offered at universities. As a result, there is an evident shortage of Croatian terms, especially for new technologies and procedures.

A certain kind of renaissance of the awareness of the importance of systematized terminology in the Croatian language did happen in the last decade, with Struna being just one of its products.

Consequently, aside from producing terminological collections and making them available to the general public, one of the fundamental goals of Struna is popularization of existing Croatian terms, and when applicable, introducing new ones. Each terminological unit in Struna contains a preferred term with the associated part of speech information. A preferred term is the one in which both field expert and language experts have agreed upon as the best Croatian term. Considering how each terminological unit can be presented in various ways in a textual discourse, a synonymy section was introduced as a crucial language aspect of the terminological unit processing. The synonyms are categorized in six separated fields in the database, according to their level of acceptances within the Croatian standard. Each field is capable of keeping multiple terms, is related to the main table of the terminological unit, and makes a crucial part of the terminological unit both in editing stage and in public presentation. The categories are: admitted, deprecated, obsolete, colloquial and proposed. The admitted category contains the terms that are actively used by the field experts but not marked as preferred term due to a linguistic reason or overlapping with similar terms in other fields. The deprecated term is the one that is used in specialized texts but has been found as not appropriate according to Croatian standardization principles or as semantically inadequate to transfer the proper concept and its properties in the discourse – usually marked as such by the field expert. The obsolete term is the one that is no longer used in specialized texts and the colloquial term is the one used by the domain experts in informal communication.

As stated before, all of the terms are recorded in appropriate category by the experts-linguists consensus. The sole exception to this practice is the proposed term category which is activated in rare cases where domain experts and Croatian standard experts can't agree on the preferred term. In such cases, the domain experts' candidate is categorized as preferred and the linguists' one is categorized as proposed. The idea is that over the time the experts would possibly accept the proposed term and it will become the preferred one.

The main idea behind recording all the existing synonyms is to offer the end user a possibility to find the preferred term no matter what synonymous term is used in searching the database.

The Croatian terms can come into existence in a few different ways: by the 'pure' Croatian compounding (*implantat* – *usadak*), by the acceptance of internationalisms from ancient Greek and Latin or using elements from those languages in compounding new terms (*mortality* – *mortalitet*), by introducing foreign terms from modern languages (*shock therapy* – *šok-terapija*), by terminologization of general language lexemes (*neck* – *vrat*, *root* – *korijen* – of the teeth), reterminologization of existing terms in other domains (*concrete* – *cement*) and by compounding multiple words (*farmakotolerancija* – ability to take drugs) [5].

By analyzing the corpus of the Croatian ophthalmological terms we have identified three main problems with the existing terms extracted from medical dictionaries, textbooks and scientific papers.

1. The usage of internationalisms of Greek and Latin origin even though valid Croatian terms exist. The subcase of this problem should be noted where we have observed terms that were compounded using Latin or Greek elements.

2. Croatian equivalents for English terms don't exist, therefore, a phonetized version of English term is used.
3. Wrong word formation – i.e. using English adjective instead of the noun when forming Croatian adjective.

<b>retina</b>		<b>mrežnica</b>
adjective	retinalni	mrežnični
multiword term	periferna retina	periferna mrežnica
multiword term	retinalna vena	mrežnična vena
multiword term	ablacija retine	odignuće mrežnice
multiword term	anomalna retinalna korespondencija	anomalna mrežnična korespondencija
<b>pupila</b>		<b>zjenica</b>
adjective	pupilarni	zjenični
multiword term	pupilarna membrana	zjenična membrana
multiword term	pupilarni refleks na svjetlost	zjenični refleks na svjetlost
<b>sklera</b>		<b>bjeloočnica</b>
adjective	skleralni	bjeloočni
multiword term	skleralni prsten	bjeloočni prsten
multiword term	skleralna leća	bjeloočna leća

**Tab. 1.** An example of preferred Croatian terms for Latin and Greek synonyms

Table 1 shows the examples of Latin and Greek synonyms being replaced with purely Croatian terms. One of the main conditions for this kind of procedure is that the Croatian term is productive in a sense of related terms formation, in most cases this being the ability to make a valid adjective from a noun which is used in multiword terms.

The same principles are applied when English terms are translated into Croatian (Table 2). The corpus analysis has shown that most of those terms in Croatian texts are used in their English version, and when Croatian terms do appear they are usually noted in braces.

crowding	zbijanje
overlap masking	prekrivanje
crosslinking	umreživanje
cover test	test pokrivanja
uncover test	test otkrivanja

**Tab. 2.** An example of preferred Croatian terms for English synonyms

A special case involving English terms has been observed while analyzing medical corpus. A certain number of terms were found that were multilingual. Namely, a part of the multiword term was left in English and the other part was translated into Croatian.

Typically, these terms deprecate new concepts for which there is no traditional Croatian synonym or related term. Therefore, the experts, when using them in a text, simply leave the part of the term that can't be easily translated into English, and only translate the part of the term. Examples of such terms are *frequency-doubling perimetrija* – from eng. frequency-doubling perimetry and *double-void tehnika* from eng. double-void technique. The problem of standardizing these terms comes from the fact that by the time they are 'marked' as problematic by language expert, they are widely used in scientific discourse, and it is hard to change them.

The third case of problematic terms refers to the ones that are simply phonetized from foreign language. Such as *skrinig* – screening, *distraktor* – distractor etc. In these cases, it is preferable to find a proper Croatian term i.e. *probir* for screening and *ometač* for distractor.

There are several problems observed that occur in the creation of Croatian terms incurred by eponym or from the English adjective or from the Latin prefix. Eponyms are commonly used in medicine terminology, and ophthalmology is no exception. The English language has several ways of forming eponyms. Until recently, the most numerous were the eponyms containing synthetic genitive: e. g. Purtscher's retinopathy, Horner's syndrome. Today, they are being replaced by another way of forming eponyms: substantively adjunct + principal noun: e. g. Edinger-Westphal nucleus, but in Croatian these eponyms must be changed into a construction with a possessive adjective: *Purtscherova retinopatija*, *Hornerov sindrom*, *Edinger-Westphalova jezgra* [4].

In spite of the clear and explicit term-forming principles, terms that are simply left in original English form or treated as an abbreviation, such as *Hess-Lancaster test/Hess-Lancaster-ov test* and *Hirschberg test/Hirschberg-ov test*, are often found in texts.

## 2.3 Conceptual Aspects

As we have mentioned before, along with the more common problems of forming terms for new concepts using terms from languages such as English, Greek or Latin, a problem we had not encouraged before is the one of the different semantic extent of the same term, based on the more narrow specialization of the domain.

concept	definition in anatomy
eye	visual organ located in the orbit
retina	part of the inner layer eyeball which contains a light-sensitive cells

**Tab. 3.** Ophthalmological concepts that were defined as part of anatomy terminology.

Table 3 shows the most basic examples of the ophthalmological concepts that were defined previously as a part of anatomical terminology. Both of these definitions are good when we consider them from a discourse of general medical anatomy. As soon as an ophthalmologist observes them it is clear they are not acceptable as a part of the specialized language of ophthalmology.



During our work on various specialized languages in Struna, we have observed numerous examples of this kind of conceptual variance between two or more different domains [5], [6].

Considering that our end users find multiple occurrences of the same term with different definitions distracting and confusing even when they appear as search results in two or more different domains, we can assume that two different definitions for the same concept inside the field of medicine would be even more unwanted advent.

It has been argued by many researchers that the classical approach to terminology (based on the so-called Vienna School [7], [8]) is not flexible enough to deal with this kind of conceptual variations [8], [9], [10], [11], [12]. Unfortunately, terminology management in Struna is currently based on the Vienna School and no elegant solution can be offered for this kind of problems in the present. The only 'solution' is to enter new terminological units in the domain of ophthalmology, which will coexist independently of all the terms that were edited in the past.

Starting in the year 2014, the researchers working on Struna have started to develop a new model for terminology management; Domain Cognitive Models (DCM) [5], [12] [13], [14]. The DCM is a sociocognitive based paradigm for processing and presenting specialized languages that is trying to solve exactly this kind of problems. It is currently in a testing stage (<http://skm.ihjj.hr/>), showing promising results. Hopefully, it will soon be implemented in Struna as an additional method for processing terminological units, not as an alternative but as an integral module for dealing with conceptual substructures that are impossible to process using the traditional terminological principles.

### 3 CONCLUSION

Struna is the Croatian national term bank the aim of which is to (eventually) include processed specialized languages from most specialized domains that are being researched in Croatia. *Croatian Ophthalmological Terminology* is the first project under the Croatian Special Field Terminology program (Struna) that is covering terminological units from the domain that can be considered to be a highly specialized subfield of the domain that was previously processed in Struna. Furthermore, besides that ophthalmology is a subfield of medicine it is also a profession that has experienced an incredible progress in theory, praxis and technology in the last few decades. This has led to numerous new problems that we have not encountered before.

We have categorized the observed problems and presented them according to three unique, yet obviously mutually dependent aspects: the one of the domain specialist, linguistic one, with emphasis on the Croatian standard, and the conceptual or terminographic aspect.

Even though the problems we have observed and identified during our work on processing ophthalmological terminology can be categorized in three seemingly independent categories, it is evident that none of them can be solved by the aspect's expert respectfully. The domain expert, in our case the ophthalmology practitioner,



the Croatian standard expert and the terminologist have to work together on each individual case and solve the problems by coming as close as possible to a consensus, bringing all three aspects of terminology processing into a unified model of terminology management.

We have shown that most of the problems can, and will be solved using the well-established principles and praxis that are employed in Struna. On the other hand, some of the problems that have arisen during our work on the specialized language of ophthalmology will not be able to solve within the classical terminology principles, and will eventually lead to further research of both terminological theory and terminographic praxis.

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