M. A. Kukhar

FORMALIZATION OF LAND CODE OF UKRAINE ELEMENTS FOR THEIR PRESENTATION IN KNOWLEDGE BASE

Land legislation of Ukraine consists of a large volume of normative documentation. The given paper shows the possibility of using the methods of linguistic analysis for the decomposition of the Land Code of Ukraine. The possibilities of lexicographic systems application for more organized formalization of some of its sections and clauses for subsequent creation of knowledge base, that could be used in intelligent-information technologies of land administration, are suggested.

Key words: *model, corpus of the text, predicates computation, formula, set, land relations, Land Code of Ukraine, intelligent information technologies.*

Introduction

In modern world information technologies are the most efficient tool for successful, rapid and efficient solution of problems, emerging in various spheres of human activity, including the sphere of land management.

Practical tasks of land management are solved on the base of the methods of land administration [1]. Unfortunately, as the data from [2 – 3] prove, nowadays in Ukraine these problems are solved non efficiently as a result of low performance, weak law enforcement, high level of subjectivism of their solutions, etc.

It is possible to increase the efficiency of practical problems of land administration solution on the basis of development and application of intelligent information technologies, based on modern knowledge bases.

For their creation it is necessary to develop the software for intelligent technologies of land administration, that is based on the norms and rules of the Land Code of Ukraine [5]. However, as it is known, norms and rules of the Land Code is the integral product of subjective judgements. That is why, they contain eroded and fuzzy notions and in certain cases, contradictions that complicate the construction of the models for knowledge and data bases. In its turn, eroded, fuzzy judgements of the Land Code of Ukraine, complicate the creation of efficient software complexes that realize the above-mentioned information technologies.

The study of the research on the subject of law formalization [6 – 8] showed that not all legal relations could be presented by means of this method. However, its application, presented in the formula of legal norms does not assume varying interpretation. Application of the method of formalization in law science promotes complete and correct information perception and realization of legal directives. Usage of formalization methods will enable to determine clearly all basic notions.

Decomposition of the Land Code of Ukraine

The aim of the given paper is formalization of the elements of land legislation on the example of the Land Code of Ukraine, applying the methods of mathematical and linguistic modeling for their further presentation in knowledge bases.

To achieve this goal we will present Land legislation of Ukraine and, in particular, Land Code of Ukraine in the form of generalized hierarchic structural model, that illustrates the decomposition of Land legislation to the last linguistic object by means of the methods of linguistic analysis, as it is suggested in [9, 10, 11] (see Fig. 1).
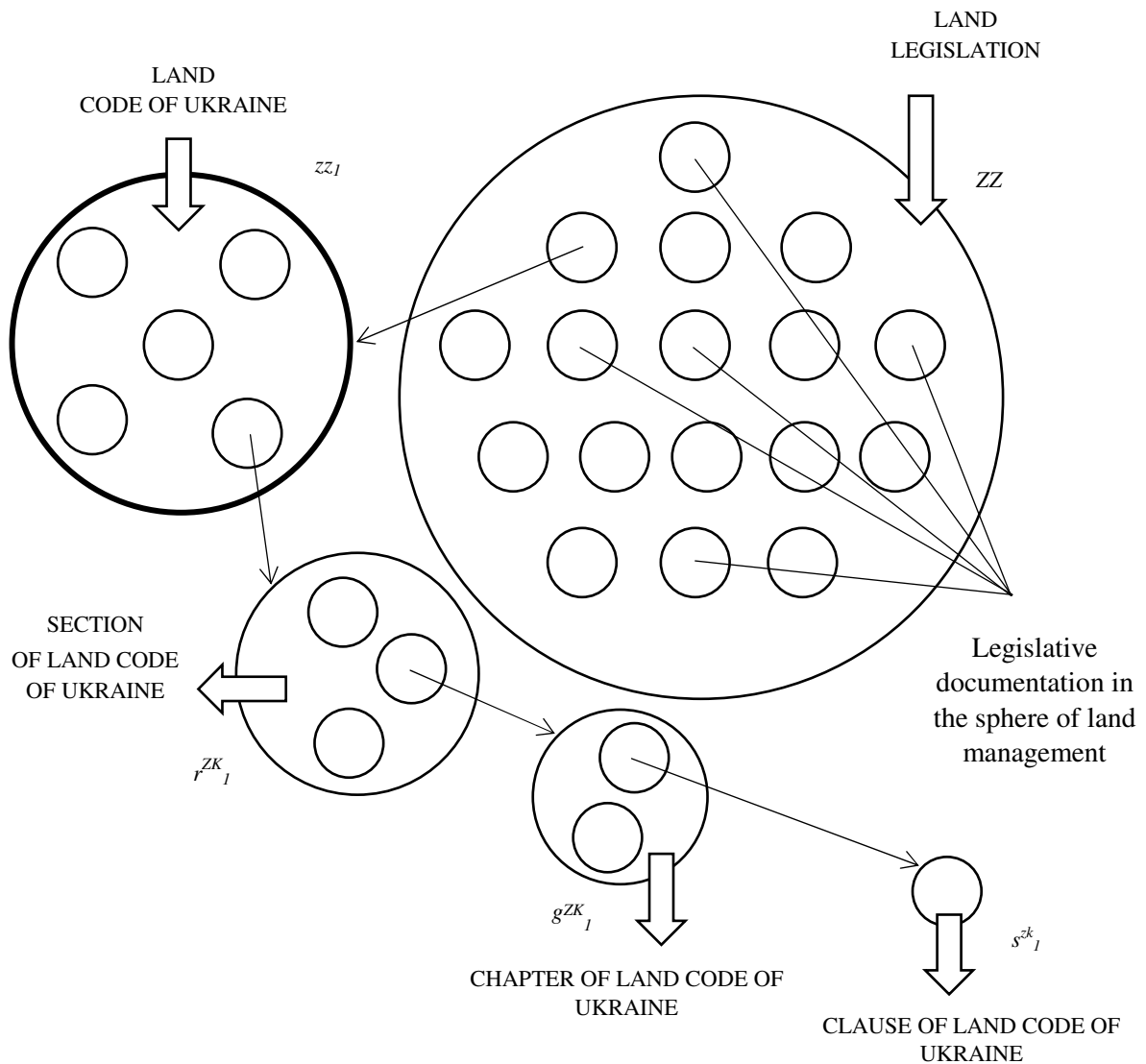
Fig. 1. Generalized structural model, illustrating the decomposition of land legislation to the last linguistic object(clause)

In Fig. 1 land legislation is denoted by ZZ, it will be considered as basic set in the tower of sets.

$$PM = \left\{ zz_1, ..., \left\{ r_1^{zk}, ..., \left\{ g_1^{zk}, ..., \left\{ s_1^{zk}, ..., s_\varsigma \right\} \right\} \right\} \right\}. \qquad (1)$$

Proceeding from the structure and degree of the inclusions in the tower of sets in Fig. 2 we will show how the components of the Land Code of Ukraine correlate, what semantic load carries the component of the Land Code of Ukraine and in what degree the essence of land relations in the studied linguistic object is revealed [9, 10, 11] (the term «linguistic object» means interconnected set of text corpuses (sections, chapters, clauses, and text of their content)).
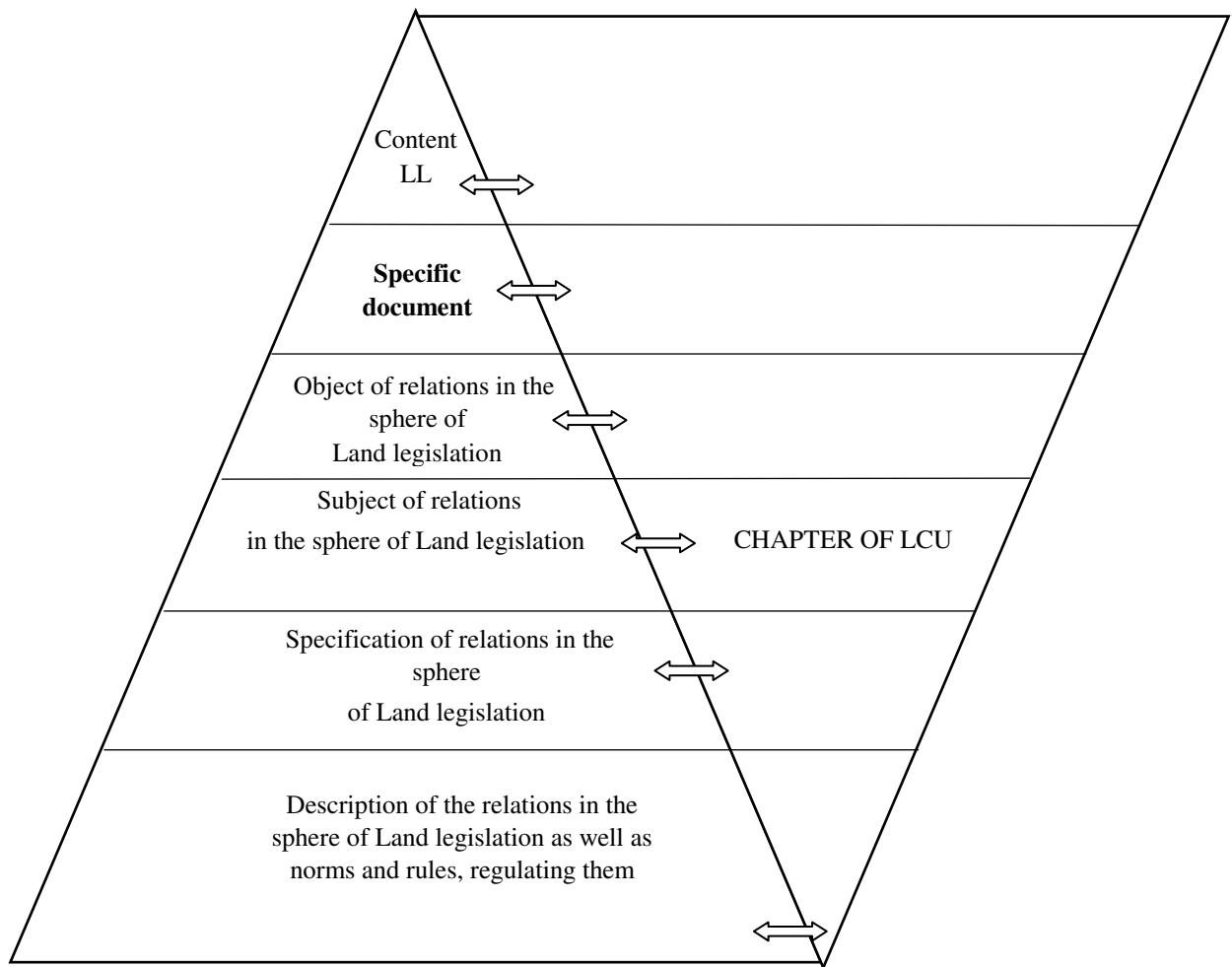
Fig. 2. Generalized hierarchical model of text corpora correspondence, that shows the degree of text semantics generalization

Fig. 2 shows that with the increase of the detalization degree the of text corpora semantic loading in revealing of complex land relations increases.

Modeling of Land Code of Ukraine clauses and their presentation in knowledge base

According to recommendations given in works [12, 13] we will present the generalized situational model of land relations (see Fig. 3). In this Figure the method of the decomposition of complex relations in land management sphere is illustrated: S – is the set of relations that could emerge between the set of subjects (C – is the set of the land plots holders); the set of objects (Z – are land plots) on the base of ownership rights (v), use rights (p) and land administration rights (r). Semantics of these relations is set by the corpus of the clause text.
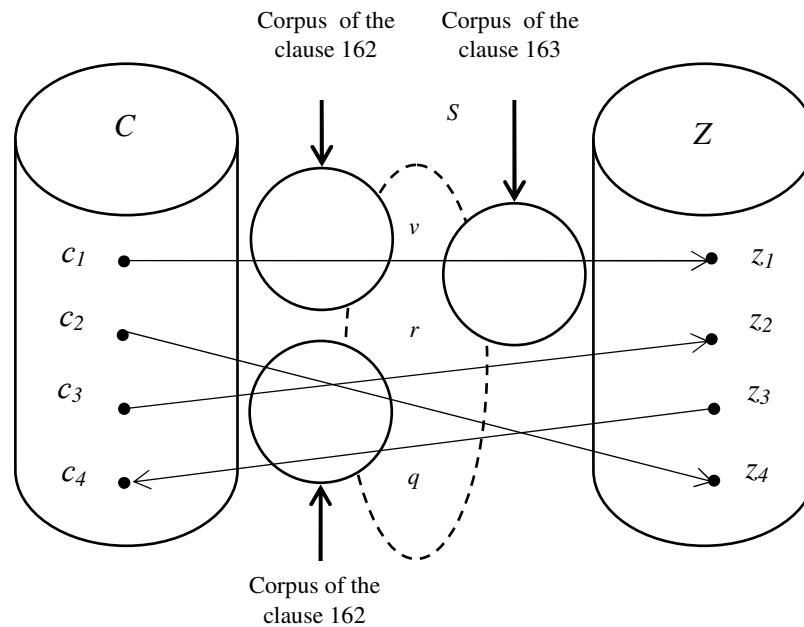
Fig. 3. Example of the generalized situational model of land relations

In terms of corpus - based linguistics the clause of the Land Code of Ukraine is the corpus that contains main semantic loading in revealing the essence of various land relations.

Each corpus of the clause text, depending on its meaning, can be decomposed into separate small corpora of the text.

For instance, section 6 of the Land code of Ukraine contains Chapter 26 «Tasks, content and order of land protection» [5], that consists of 7 clauses, written on 7 pages (from 162 to 168).

Clause 162 «Notion of land protection» [5] gives definition but does not set the functional part of land relations and does not require decomposition.

Clause 163 is the description of the set of complex relations and is to be decomposed with the aim of their presentation in knowledge base (KB), as it is shown in Fig. 3.

The examples of the considered clauses of the Land Code of Ukraine show that separate clauses require detailed analysis for allocation and formalization of land relations and their presentation in knowledge base (see Fig. 4).
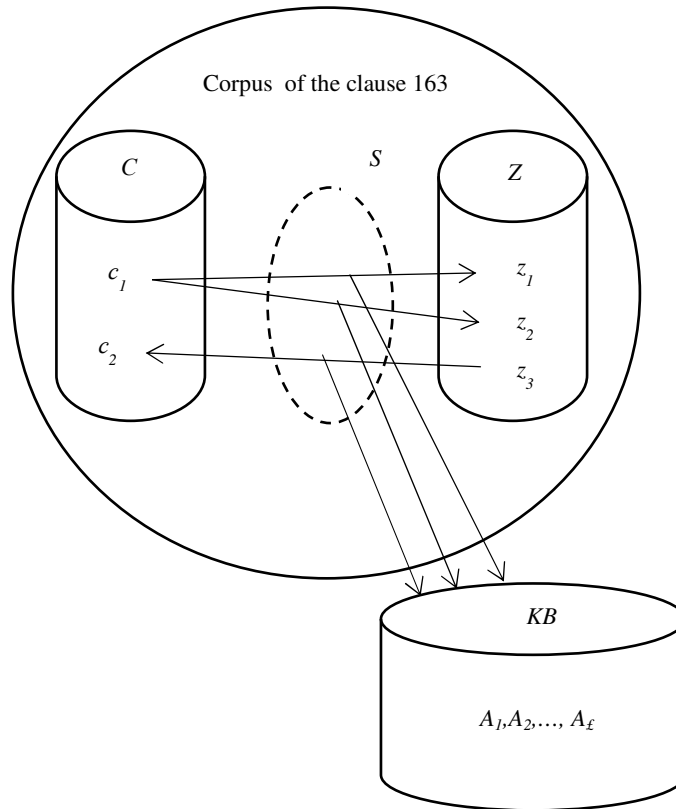
Fig. 4. Example of the generalized model of knowledge base filling

Each relation, described in the clause, could be presented in knowledge base. And each similar $A_£$ component of knowledge base will correspond to the corpus of the clause of the Land code of Ukraine.

For instance, the last element of the Land code of Ukraine hierarchy is the clause 162 «Notion of land protection», that consists of linguistic corpora, that could be presented by means of calculation of predicates :

– $A_{162}^{a} \sim (\, Z \in ((z_i \in C\,) \vee (\, A^{Pz} \in C\,)))$ – substantiation and provision of reaching the rational land management;

– $A_{162}^{b} \sim ((\, z_q \in Z_1\,) \vee (\, z_q \notin Z_{2–9}\,)) \vee ((\, z_w \in Z_2\,) \vee (\, z_w \notin Z_{1,3–9}\,)) \vee ... \vee ((\, z_n \in Z_9\,) \vee (\, z_n \notin Z_{1–8}\,))$ – protection of arable lands, forest and wildlands, bushes against groundless removal for other purposes;

– $A_{162}^{s} \sim (\, Z \notin n.processes\,)$ – protection of land against errosion, midslides, flooding, bogging, resalinization, draining, compaction, pollution with waste products, chemical and radioactive substances and against other unfavorable natural and industrial processes (n. processes);

– $A_{162}^{z} \sim (\, Z_{8\,pvb} \in Z_{8\,pvb}\,)$ – conservation of wetlands (pvb);

– $A_{162}^{r} \sim (\, Z_{al} \in Z_{al}\,)$ prevention of deterioration of aesthetic state and ecological role of anthropogenic landscapes (al);

– $A_{162}^{∂} \sim ((\, Z_{1deg} \in Z_{1deg}\,) \vee (\, Z_{1malp} \in Z_{1malp}\,))$ conservation of degradated(deg) and low output arable lands (malp);

where A_{162} – is clause 162 of the Land Code of Ukraine; A^{Pz} – are principles of land legislation; $Z = \{Z_1,..., Z_9\}$ – is set of land categories, from arable lands to industrial lands, lands for transport, communication, power engineering, defence and other applications; $Z_1 = \{z_q\}$ – is the

set of land plots, designated for agricultural use; $Z_8 = \{z_o\}$ – is the set of land plots of state water fund; $C = \{c_1,...,c_\kappa\}$ – is the set of the subjects of land relations.

The set of such formulas, derived from linguistic corpora of the Land Code of Ukraine will compose the knowledge base.

Conclusions

The knowledge base, that will become the basis for the development of intelligent information technologies in land administration, can be created within the limits of the Land Code of Ukraine, dividing it into linguistic objects.

REFERENCES

1. Land Administration Systems – managing rights, restrictions and responsibilities in land [Electronic resource] / Stig Enemark // Map World Forum, Hyedrabad, India. – 10 – 13 February 2009. – Access mode : https://www.fig.net/organisation/council/council_2007-2010/council_members/enemark_papers/2009/hyderabad_enemark_paper_feb_2009.pdf.

2. Conceptual provisions of GIS administration system creation for the solution of land management problems [Electronic resource] / M. A. Kukhar // Urban public utilities. – 2015. – №124. – Access mode to the journal : http://eprints.kname.edu.ua/43118/1/18.pdf. (Ukr).

3. Comparative analysis of land administration in Ukraine and European Union [Electronic resource] / K. A. Meteshkin, M. A. Kukhar // Urban public utilities, 2017. – № 135. – Access mode to the journal : http://khg.kname.edu.ua/index.php/khg/article/viewFile/5044/4995. (Rus).

4. Analysis of the possibility of land relations formalization [Electronic resource] / K. A. Meteshkin, M. A. Kukhar // Radioelectronic computer systems, 2017. – № 82. – Access mode to the journal : https://www.khai.edu/csp/nauchportal/Arhiv/REKS/2017/REKS217/Meteshkin.pdf. (Ukr).

5. Land Code of Ukraine [Electronic resource] / Verkhovna Rada of Ukraine. – Access mode : http://zakon2.rada.gov.ua/laws/show/2768-14. (Ukr).

6. Manko D. G. Technologies of Law formalization / D. G. Manko // Bulletin of International Humanities University. Server : Jurisprudence. – 2013. – № 5. – P. 18 – 21. (Ukr).

7. Formalization as the method of legal phenomena study [Electronic resource] / R. I. Radeiko // Lviv : Institute of Law and Psychology of National University «Lvivska Polytechnica». – 2014. – № 810. – P. 86 – 93. – Access mode to the journal : http://science.lp.edu.ua/sites/default/files/Papers/radeyko.pdf. (Ukr).

8. Theoretical and practical aspects of law formalization problem solution [Electronic resource] / R. I. Radeiko // Lviv: Law and society, 2013. – № 6 (2). – P. 42 – 46. – Access mode to the journal : http://pravoisuspilstvo.org.ua/archive/2013/6-2_2013/10.pdf. (Ukr).

9. Shirokov V. A. Information theory of lexicographical systems / V. A. Shirokov. – K. : Dovira, 1998. – 331 p. (Ukr).

10. Shirokov V. A. Phenomenology of lexicographical systems : monograph / V. A. Shirokov. – Kyiv : Naukova Dymka, 2004. – 327 p. (Ukr).

11. Modern tools of technical translator [Electronic resource] / A. V. Leonova, N. A. Snopkova. – Irkutsk National Research Technical University, 2012. – Access mode : www.istu.edu/docs/science_periodical/mvestnik/Leonova%20.doc. (Rus).

12. Meteshkin K. A. Cornestones of knowledge pyramid of research-pedagogical staff. XXI century : manual / K. A. Meteshkin. – Kh. : Kharkiv National Academy of Municipal, 2012. – 335 p. (Rus).

13. Meteshkin K. A. Cybernetic Pedagogics: theoretical fundamentals of education administration on the base of integrated intelligence : monograph / K. A. Meteshkin. – Kharkov : International Slavonic University, 2004. – 400 p. (Rus).

Kukhar Maksym – Post Graduate with the Department of Land Administration and Geoinformation Systems.

Kharkiv O. M. Beketov National University of Municipal Economy.