

Digitization of Cultural Heritage: model an integral, three-dimensional spatio temporal thesaurus

RIMVYDAS LAUŽIKAS

University of Vilnius Faculty of Communication, Institute of Library and Information Science, PhD student, astro @moletai.omnitel.net

ABSTRACT

Perhaps the most important parameters characterizing cultural heritage are historical space and historical time. But we do not have any wider systems of presentation and classification of historical space and time designed for digitalization of cultural heritage in Lithuania. Object of this article is the models of historical geography and historical chronology applied in digitalization of cultural heritage. Aim of the article is presentation and substantiation of the model of space and time thesaurus (standard) of Lithuanian systems of digitalization of cultural heritage.

In fact, Lithuanian thesaurus of historical space and time would be a three-dimensional system of axes where horizontal axes X and Y would be an expression of geographical latitude and longitude in degrees, and the vertical axis Z would be meant for time. Each object of cultural heritage would be expressed through space, time and relation between space and time. Depending on the relation of the object with place and time, in this system of axes it would look like a point (changed neither in space nor in time), segment (changed only in space or in time) or curve (changed in space as well as in time). An integral thesaurus of historical space and time would be a standard of digitalization of cultural heritage as well as a model of computer studies of information on cultural heritage and a digitalized value of cultural heritage.

1. INTRODUCTION

Digital technologies developed during the recent decades little by little are penetrating into all the fields of human life. These technologies give possibilities to create new research methods and models of practical activities, to develop interdisciplinary studies. Birth of digital technologies substantially changes the processes of accumulation, custody, record and investigation of cultural heritage as well as the processes of spread of information on cultural heritage. At the same time the role of institutions protecting cultural heritage (museums, archives, libraries, other state and non-governmental organizations engaged in documentation, study, conservation, restoration of cultural heritage and spread of information on cultural heritage) in these processes and the attitude of the society towards cultural heritage and institutions protecting it is changing (Glosiene and Manzikh, 2003, p. 16).

In summary of current situation of digitization of Lithuanian cultural heritage its several basic features can be singled out. They are: a) great wishes of many institutions to digitize their data; b) financial problems of digitization; c) absence of national strategy; d) low level of inter-institutional collaboration; e) low level of standardization; f) absence of theoretical works on the subject of digitization of cultural heritage. Taking into account the last four features of current situation we can forecast that sooner or later (if the situation remains the same) Lithuanian systems of digital information of cultural heritage will be confronted with the problem of usage efficiency that is closely related with the level of standardization (absence of national strategy and theoretical works and poor inter-institutional collaboration makes the problem deeper). Data incompatibility caused by insufficient standardization, complicated search and problems of data migration may completely derange the activities of digital information systems. Standards should be technical (file format, methods of compression, encoding, metadata presentation); documentation (material structure) standards; thesauri classifiers and other standards of description and presentation of material (Digitization, 1998, p. 36). In digitization of cultural heritage one of the most important standards is a standard of historical chronology and historical geography – each object of cultural heritage takes a certain place in time and space (these are one of the most important parameters describing heritage).

The subject models applicable in digitization of cultural heritage have never been analyzed in Lithuania. The object of this article is the models of historical geography and historical chronology applied in digitization of cultural heritage. The aim of this article is presentation and substantiation of, perhaps, the first in Lithuania model of spatio-temporal thesaurus (standard) of Lithuanian systems of digitization of cultural heritage. This model is possible applicant for digitization data of the cultural heritage in other countries.

2. MODEL OF INTEGRAL, THREE-DIMENSIONAL SPATIO TEMPORAL THESAURUS

The whole present digitization of Lithuanian cultural heritage is based on present place names and present administrative distribution. But in the past Lithuanian administrative distribution was changing too frequently (just during the 20th cent. not less than 6-8 reforms of territorial – administrative distribution can be counted); moreover, administrative subordination of a territory itself was changing (e.g. just during the 20th cent. Vilnius belonged to Russian Empire, Kaiser Germany, Bolshevik Lithuania, independent interwar Republic of Lithuania, Republic of Poland, Soviet Lithuania, Nazi Germany,

USSR, Republic of Lithuania); Lithuanian place names were recorded in different languages (just during the 20th cent. – in Lithuanian, Russian, Latin, Polish, German) and in different forms¹. Mere Lithuanian historical cultural heritage covers the 13th-21st cent., and what if 12,000 years of prehistory is added? Furthermore, all objects of cultural heritage coexisted (coexist) in space and time, i.e. each of them is related with wider historical processes and the most of them are related with each other. Presentation of the object of cultural heritage in context and by expressing links with other objects of cultural heritage is much more useful than presentation of the object of cultural heritage taken from the context or presentation of a context next to the object of cultural heritage. Other problems of digitization of cultural heritage are the following²: general indetermination and laxity of Lithuanian historical terminology (cp. different names of the same period – Copper Age, the Bronze Age, Early Metal Period; each of them has different definitions and a little bit different (partially coincident) periodization (Jovaiša, 1998; Jovaiša, 1999); complexity of definitions, conclusions, features and interpretations (cp. the problem – when the towns were born in Lithuania?; related with different interpretations of the conception of town); strong influence of personal (very often different) interpretations of famous researchers of the past (cp. opinions regarding the dating of early archaeological strata in Vilnius; indetermination of many historical processes in time and space; lack of collaboration between different institutions and specialists (especially in standardization of terminology) (Jovaiša, 2002).

Perhaps the best way-out to solve all the problems of Lithuanian (and not only Lithuanian) space and time presentation in digital (and not only in digital) environment is an integral thesaurus of Lithuanian historical space and time created taking into account CIDOC – CRM references³, where the three-dimensional spatio-temporal model would be applied. The basis of this thesaurus would be made of space and time integration (spatio-temporal continuum, spatial time) idea borrowed from natural sciences (H. Minkovsky, A. Einstein) and adapted to history.

The basic aims of such thesaurus would be:

1. Creation of universal method of presentation of historical space and time in digital environment.
2. Consolidation of general scheme of periodization and historical geography (standard) (to finish the specialists' disputes on this subject).
3. Standardization of space and time presentation in digital environment.
4. Organization of administration of digital information on cultural heritage.
5. Geographical and chronological classification of the objects of cultural heritage.
6. Integration of all historical geographical data in one system, which becomes the form of digital cultural heritage.
7. Digitization of the data of different objects of cultural heritage in united and integral form.
8. Analysis and dating of information on the objects of cultural heritage.
9. Creation of schemes of cultural development.

Lithuanian spatio-temporal thesaurus would basically be a three-dimensional system of axes where horizontal axes X and Y would be an expression of geographical latitude and longitude in degrees (if geographical object is small enough – then in degrees, minutes and seconds or even in split seconds), and vertical axis Z would be meant only for time. Each historical event, object of cultural heritage, archaeological find, museum-piece, place name, historical document, personality, process or other kind of the object of cultural heritage would be expressed through space, time and through the spatio-temporal relation. Depending on the relation of the object with place and time, in reality it would look like a point in the system of axes (changed neither in space nor in time), segment (changed in space only but not in time) or curve (changed in space only or in time only).

Seeking to integrate in system all the objects of cultural heritage and seeking to reflect all conceivable possibilities of dating the objects of cultural heritage hierarchic scheme of Lithuanian historical chronology thesaurus (axis Z) like this can be suggested. The scheme is worked out basing on two basic principles: possibilities of data presentation and stability of the system. Seeking for as great possibilities of data presentation as possible all dating methods applied in substantive historical and archaeological practice were included into the scheme: exact dates (year, month, day); approximate dating (age and part of age or millennium and part of millennium) and dating according to archaeological and historical periods (the Middle Neolithic Age, the Middle Ages, etc.). Seeking for the stability of the system it is proposed to interrelate and unify all the parts of the scheme though some of them are absolutely needless (e.g. dating to the years and, especially, to the months and days in the Stone and Bronze Ages). For the same purpose the dates of beginning and end of the periods are equalized.

In practical dating of an object of cultural heritage at least one chronological and geographical link of each object would be fixed. Dating should be carried out by filling the fields describing the object with the selected data of thesaurus that could

1 It was noticed even by *TGN* compilers (TGN, 2000).

2 Further list of problems is adapted to Lithuania according to the general list of the problems of digitization of cultural heritage. (Doerr, 2004).

3 CIDOC-CRM. Does not investigate any specific terminology matters but the references to time and space links in this model can easily be found. (Crofts, 2004).

be relatively called: "Beginning"; "Changes"; "End"⁴. It should be noted that any term in thesaurus could be used for filling chronological fields. The only limitation executed by the system would be limitation of possibilities to select terms to the only possibility to move throughout thesaurus only to horizontal direction. Depending on the object of cultural object, type of personality or process, birth (personality), construction (building), production (article), creation (piece of art), the first mentioning (place name), rise (towns, Christianity, serfdom and other processes), etc. should be reflected in the field "Beginning". Depending on the object of cultural object, type of personality or process, death (personality), destruction (building), decay (article), the last mentioning (place name), end (process), etc. should be reflected in the field "End". In the field "Changes" double information should be reflected depending on the object of cultural object, type of personality or process. First of all, they are basic events related with the object: reconstructions (building), migration (personality), repainting, restoration (piece of art), place name changes (e.g. Starapolė – Marijampolė – Kapsukas – Marijampolė) and auxiliary events related with the object: research, finding, gift, restoration, description. Depending on the needs of the described object of cultural heritage the user of the system should have possibilities to generate an unlimited number of the fields "Changes".

Next to each field of chronological description of the object of cultural heritage there should be a compulsory field of geographical description that could relatively be called "Place". So, space as well as time would be divided into sectors linked to chronology that could relatively be called "Beginning – Place", "Changes – Place" and "End – Place". The system should have possibilities to describe geographical situation of the object in four ways: according to its address (Lithuania, Utena County, Molėtai Municipality, Čiulėnai Neighborhood, Kulionys Village); according to the place name chosen from thesaurus (Kulionys); according to identification number (ID) of the place name and according to geographical map references. In the structure of the system these four ways should be interrelated. For instance, when a place name is entered the system should link it to geographical map references, ID and administrative – territorial structure (address) of a certain historical period and to the contemporary one. In case of several same place names the system should give several possible versions of the structure of administrative – territorial distribution and geographical map references. It is important that geographical map references describing a place name of any level of thesaurus would be exhaustive enough but not particular. They should depend on the area of locality. It is necessary that map references would cover all the area named by toponym (Europe, Lithuania, Vilnius, Utena County, etc.) – from the southernmost to the northernmost as well as from the easternmost to the westernmost point of locality. It would be not good if only point references linked to a certain place only (e.g. to the centre of town) are given. Such presentation of geographical map references (area, not point) is necessary seeking for reverse link, i.e. exact links of GPS references with place names, seeking to establish exactly, for instance, administrative – territorial subordination of the place of a fixed immovable object of cultural heritage or archaeological research. When a user of the system enters the references of the object (cult building, place of archaeological research or other) he wants to receive an exact answer in which locality the building is (was). Geographical part of spatio – temporal thesaurus as well as its chronological part should be based on hierarchic structure of presentation of material. This hierarchic structure should depend on the structure of administrative distribution of the territory in each specific chronological period (chosen by the user of the system). Just because of that, in this thesaurus it is necessary to enter chronological data of the object of cultural heritage first of all.

In such a way, by linking geographical space and time we are necessarily confronted with three subgroups of geographical part of the spatio – temporal thesaurus. They are: present place names, extinct place names and ancient place names having their equivalents in present times⁵. The simplest subgroup is a subgroup of present place names – this material is well-known and easily linked with the network of geographical map references, administrative – territorial structures and chronology. A little bit more complicated is the situation with the old place names that are known only from written sources of history. Moreover, the situation should be brightened by the fact that each place name of the spatio – temporal thesaurus will have an individual identification number (ID) in this system, and the most important place names will be linked to *TGN* as an auxiliary measure of geographical onomastics of historical spatio – temporal thesaurus (*TGN*, 2000). Presentation of *TGN* in the model of Lithuanian historical spatio – temporal thesaurus and links of Lithuanian geographical onomastics with *TGN* (via geographical map references as well as via ID numbers) are also important from the aspect of presentation of Lithuanian cultural heritage abroad and integration of Lithuanian systems of digital cultural heritage into global systems of digital cultural heritage.

Geographical and chronological information in the spatio – temporal thesaurus should also be linked through the maps. Each administrative distribution (chronologically marked on axis Z) should be reflected on horizontal map (axes X and Y). This could be a simple digital administrative map with the marked centers of administrative distribution and boundaries of administrative units of certain period.

So, integral historical spatio – temporal thesaurus would be not only a standard of digitization of cultural heritage but a model of computer studies of information of cultural heritage and, of itself, a digitalized value of cultural heritage as well.

4 The model of describing the object of cultural heritage via event is recommended in CIDOC CRM. In this model there is well-developed hierarchic structure of the fields "Beginning", "End" and "Changes". (Crofts, 2004).

5 Here I want to say many thanks to Dr. Vykintas Vaitkevičius and Dr. Daiva Vaitkevičienė as the idea of three parts of geographical onomastics was crystallized in the discussions with them.

CONCLUSIONS

The processes of digitization of cultural heritage are intensifying in Lithuania but there is neither proper national strategy nor standards nor proper inter-institutional collaboration. In future it may become one of the most important reasons of disorders of digital systems.

One of the most important parameters describing cultural heritage is historical space and historical time but in Lithuania there are no universal systems of description and classification of historical space and time applied to digitization of cultural heritage.

Due to specificity of historical development of Lithuanian cultural heritage none of the models of thesaurus of historical space and time presentation that are known in the world suit us.

The best way out would be creation of our own, integral, three-dimensional thesaurus of Lithuanian historical space and time. In the thesaurus all dating methods applied in practice, all known place names as well as the structures of administrative – territorial distribution would be reflected.

Integral historical spatio – temporal thesaurus would be not only a standard of digitization of cultural heritage but a model of computer studies of information of cultural heritage and, of itself, a digitalized value of cultural heritage as well.

REFERENCES

CROFTS, N. (2004) – *Definition of the CIDOC Conceptual Reference Model*. [interactive]. CIDOC CRM Special Interest Group. Internet address: <<http://cidoc.ics.forth.gr/scope.html>>.

Digitisation. A Project Planning Checklist. (1998). [interactive]. London: Arts and Humanities Data Service (AHDS). Internet address: <<http://ahds.ac.uk/checklist.htm>>.

GLOSIENE, A.; MANZUKH, Z. (2003) – *Lithuania: Cultural Heritage Digitisation Initiatives in Lithuanian Memory Institutions*. In *eCulture*. December 2003. vol. 4. issue 5.

JOVAIŠA, E. (1998) – *Žvilgsnis į "Aukso amžių" ("Golden Age" in Lithuanian archaeology)*. In Lithuanian. [CD-ROM]. Vilnius: Elektroninės leidybos namai.

JOVAIŠA, E. (1999) – *Lietuva iki Mindaugo. (Lithuania before Mindaugas)*. In Lithuanian, Russian, Polish and English. Vilnius: Elektroninės leidybos namai.

JOVAIŠA, E. (2002) – *Gimtoji istorija. Lietuvos istorijos vadovėlis nuo 7 iki 12 klasės. (Native history, Digital manual for History of Lithuania)*. In Lithuanian. [CD-ROM]. Vilnius: Elektroninės leidybos namai.

TGN. Getty Thesaurus of Geographic names. (2000). [interactive]. Los Angeles: J. Paul Getty Trust. Internet address: <http://www.getty.edu/research/conducting_research/vocabularies/tgn/>.

FIGURES

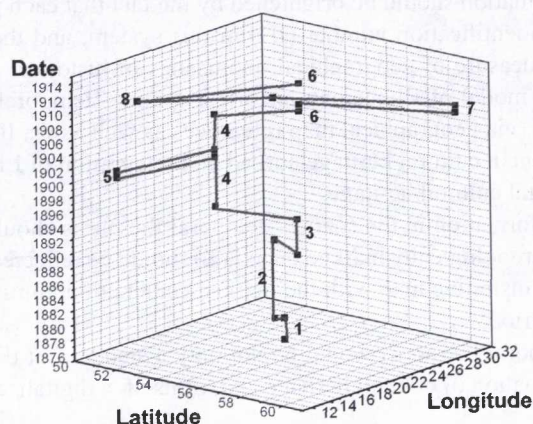


Fig. 1 – Graphic visualization of data of integral, tridimensional historical spatio – temporal thesaurus, personality: Life of Lithuanian painter M. K. Čiurlionis. The lower point of the graph means his birth, the upper one – his death. Numbers show localities: Varėna (1), Druskininkai (2), Plungė (3), Warszawa (4), Leipzig (5), Vilnius (6), St Petersburg (7), Pustelnik (8). Curve shows the movement of the personality in time and space. Made with data processing program Origin 6.1., one of possible graph projections.