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Screening Methodology: Visualization in Digital Humanities[1]

ABSTRACT
The paper problematizes methodological status of visualization in digital humanities.
Digital humanities offer a critical comprehension of the social, epistemological and methodological effects of using computer in contemporary humanities. The process of knowledge production is considered here in the light of computation. It turns out to be shared between human thinking, technologies, digital networks, working of algorithms and program code. In such conditions visualization becomes a point of junction between a human and a computer. The production of meanings and interpretations here becomes especially intensive. At the same time orders and strategies of visualization used in various disciplines of humanities are often not comprehended critically by the scholars. In such situation posing methodological questions to digital visualization from the point of constructionism is especially timely.
The starting point for this paper was the challenges we faced in the Obninsk digital project. In order to develop visual analytical tools we conducted our research on the existing visualization experience in different digital humanities projects. With the help of comparative analysis we identified and described the main problems and effects of digital visualization use. Basing on the results of the analysis, we will show how turning to the idea of data visualization reduces epistemological potential of digital visualization in the humanities, and how new visual technologies change practices of work with visualizations. We will show also how using multidisciplinary approach, the order and methodology of knowledge production can be changed through visualization technologies.
Key words: *digital humanities, visualization, methodology, data, capta, fuzzy logic.*

Introduction. In the age of common distribution of digital technologies the issue of visualization acquires a new meaning for the scholars in humanities. Mere reflection is not enough to meet the challenges of the present: culture of interface, rapid development of visual representation technologies, increasing density and dynamics of visualization of knowledge in most various areas of human activity; the change of actual knowledge production practices is needed. Search for new forms and orders of visualization is currently on the agenda for both social science with its long tradition of applying mathematical apparatus and its specific visual resources, and the humanities concentrated mainly on the textual, descriptive knowledge production modes.

Model of digital visualization of knowledge in the humanities along with computer code semantics, social effects of algorithms and digitalization of education are problematised within the Second wave of digital humanities, where the focus is displaced from the pragmatics of sources digitization and automatisation of their analysis towards the crossing of non-numerical knowledge and computer (Berry, 2011; Presner, 2010). As new technologies keep penetrating the scholarship community, visualization becomes a new epistemological principle, while the point of maximum concentration of analytical efforts is gradually moving from conventional data processing orders towards visual interface, where data represented in a special way contacts with a look and gesture of an analyst.

Technology is changing methodology. The main technological challenges are: processing huge amounts of data (the phenomenon of big data), automated methods of processing, storage and analysis, interfaces constantly improving, increasing complexity of the software, networking and cloud storage principles and analytics, speed of information exchange constantly increasing (Borodkin, 2009; Zhuravleva, 2011). Under these conditions, the visualization issues in the humanities are far beyond simply rhetorical forms.

The Obninsk Digital Project

As for the author of this article, the starting point for his methodological search in the area of visualization in digital humanities was empirical research tasks performed by the team of the Obninsk digital project.

Obninsk digital project is an actual form of a long-term research initiative, implemented on the basis of the School for Advanced Humanities, Russian Academy for National Economy and Public Administration. The project started in 2012 with a large-scale research on the experience of those used to live and work in the Soviet nuclear science, as it was represented in a series of in-depth biographical interviews with former and current employees of the research institutes of the town of Obninsk. At present the project members are engaged in digitizing of field data (transcribing interviews, processing documents, photos and newspapers) to prepare it for opensource digital publication, and developing a web-site for uploading the project's database.

The concept of the Obninsk project digital version changed significantly as the project was unfolding. Initially it was supposed to be an open access database presenting materials along with certain analytic elements, while analytics itself was to be performed with the help of external software tools. But then the project team turned to elaborating an analytical platform supporting the full cycle of research activities (storage, analysis and representation of results). Integrating the tools necessary to fulfill these tasks in the future website architecture will enable users to take part in the Obninsk digital project development or perform their own research scenarios using the data and tools of the platform. The website currently under construction will be accessible here: http:// obninsk-project.net.

[1] *The research is in the framework of the collective project «Digital Scholarship: Technique, Methodology and Ethics of an Open Research Database Creation in Humanities» (directed by Andrey Zorin and Galina Orlova) based on the Center for Advanced Humanities (RANEPA)*

To manage such a huge amount of heterogeneous data as accumulated by the project, developing a great variety of digital tools is required. These tools must support different regimes of representation and analysis and work with various textual sources, images, and metadata. Thus a project's programmer Pavel Kolesnikov is currently developing a unique program for visualizing different modes of existence of a digital text within one interface. His software tool demonstrates contributions (different kinds of editing) made by informant and interviewer to the development of an interview's transcript in the process of its approval for further publication. So a transcript often perceived as unproblematic unity immediately reproducing a story narrated, can be problematized and revised. The research group of Galina Orlova, Aleksandra Ivanova, Eugeny Pronenko, & Egor Shevelev is working on a set of tools for visualization of interviews. We need such models of visualization that would be able both to perform navigation in the database and represent the results of initial analysis of interviews (mainly analytical coding).

In order to find an optimal methodological basis for digital visualization in the new digital regimes of knowledge production we want to perform, we have analyzed the digital humanities experience in developing and applying software analytical tools for data visualization, as well as special visual surfaces created to meet the needs of a particular project or research. We looked through 37 visualization tools and 61 examples of visualizations made for the humanities found in the Internet from January to August 2014 with the help of Google search. The following search queries were used: «digital +humanities visualisation | tools», «data | digital +visualisation», «цифровые +гуманитарные науки +визуализация», «визуализация данных». Both Russian and international web sources and periodicals in digital humanities were explored.

Here the main trends in elaboration of visualization in digital humanities will be described and estimated, basing on comparative analysis of our Google-search results with a special focus on their methodological implications. This paper will show that in current digital humanities visualizations switch from rhetoric to interpretation, and changing traditional visual models makes visual interface more complex, while technological and methodological transformation in digital visualization leads to gradual merging of user-spectator and user-analyst, and visual surface becomes an integrator of different methodologies existing in the multidisciplinary field of the digital humanities project.

From data to capta

In the framework of the First wave of digital humanities the main areas of a computer application were digitizing physical sources, organizing databases and electronic repositories, as well as attempts to employ computational methods for analysis of a wide range of sources in order to minimize efforts of a researcher (Berry, 2011). In general early digital humanities followed the path of e-science development, lagging a bit behind though (Gardner & Manduchi, 2007).

The key issue of that period was how to process any type of data quicker and in larger amounts, than it used to be in the pre-computer era before. This trend resulted in the common interest to big data that came to digital humanities from natural and economic science (Alvaro, 2013). However the idea of using big data per se in the humanities is currently under critique. Digital humanities folks offer another transformation of data processing methodology based on intellectualization of data. The main difficulties that working with big data implies, are as follows: managing huge data arrays, high costs and technical complexity of creating analytical systems for processing really big data sets, complex issues arising in the zone of contact between a human mind and intellectual data processing software (Cherniak, 2011). Today we can see the turn to smart data in many fields of knowledge production. The main feature of smart data is its intellectual component, i.e. primary analytical markup that accompanies data and allows employing more complex data processing and representation regimes, than those typical of working with big data (Schöch, 2013).

The ways of visual representation design (first of all graphs and diagrams) typical of the first wave of digital humanities, followed the logic of the positivist methodology brought by computational methods they assimilated. J. Drukker (2001) argues that digital humanities are tolerable to such interventions of positivism mainly because of the undisclosed orientation of classical computational approaches to work with what is usually called "data".

The principle of collecting data is based on the notion of objectivity of the world, where information is given as it is (cf. data as derived from the lat. datum, 'what is given') . So all one needs is to find a right way of getting it, and then the formed data set can be evaluated in terms of its correspondence to reality. However, according to constructionists every act of selection of information is interpretative. A strong and clearly articulated critical position has been developed in the postmodern humanities concerning the textual modes of knowledge production. It problematizes the very possibility of representing some objective reality. Yet, when it comes to visualizatons produced in the field of humanities, such criticism is not always applied.

As a possible solution, Johanna Drukker offers to reject taking the materials humanities work with as Data. As an alternative she proposes the concept of Capta[2] introduced by P. Checkland who created the methodology of soft system (Checkland & Holwell, 1997). Unlike Data, Capta problematizes the role of a researcher's attitudes and preferences in the organization of the data set he or she selects for analysis. Data refers to the practices of collecting information typical of natural science. Due to standardized and often automatized procedures of its selection, scientific information is often by default taken as representative and objective. Capta is always more or less arbitrarily selected, but limited part of the whole information massive. What becomes Capta, depends, among other factors, on a researcher's methodological approach. It means that articulation of methodological implications of a capta selection strongly increases analytical potential of a research. For Drukker the turn from visualization of data to visualization of capta implies visual articulation of reasons and specific features that determine soft logic of selecting capta. Drukker also notes the difficulties of developing visual representations intended for work with capta: search for new forms encounters obvious resistance of the established visual tradition.

This point is essentially important for our analysis. The turn from classical non-reflexive forms of visual representation implies growing complexity of visual orders tending to articulate the methodology that formed the information represented. This move to complication of visual surfaces as they come to represent methodological implications corresponds, on the one hand, to the move from big data to smart data and, on other hand, to the shift of analytics from algorithmic orders hidden inside software to the visual interface. This is actually the effect described by Ron Burnett in his book "How images think": in the digital age intellectual effort comes to be distributed between human and digital visualization (Burnett, 2005).

[2] *Derived from the lat. capere — 'what is taken'.*

Complication of Visualization

Criticizing the digital humanities people for their non-reflexive acceptance of the visual methodology of positivism, Drukker identifies a common tendency in the field of digital humanities. However, there is quite a number of projects (some of them started a long time ago), which concentrate on looking for special forms and regimes of visual representations that would be specifically oriented to the needs of the humanities. Such projects are implemented primarily in the field of various texts visualization, but some are able to work with non-textual materials as well.

Comparative analysis of the visualization for the humanities tools available or just described in the Internet, and particular visualizations undertaken within wider projects shows the main methodological tendencies of their development. These tools and visualizations can be more or less arbitrarily divided into two large groups.

The first group consists of the visual products and tools using statistical mathematical apparatus to build a visual surface[3]. Here the visual component mainly looks like modified graphs and diagrams. Mathematical operations are the key, while the function of a visual surface is mostly rhetorical. The core representatives of the group are the programs showing text as a word cloud. The output is a visual surface of multidirectional and variously sized words illustrating frequency composition of the text being visualized. Such programs are usually very easy to work with for any user. A typical representative of the line is the Vojant-tools.org project that offers several more ways of text visualization besides building tag clouds. The resource combines maximal simplicity and intuitiveness of interface with quite a rigid methodology based on different regimes of frequency analysis of text.

A common property of visualizations created using mathematical algorithms and frequency analysis in particular, is their search for such aestheticization that would intensify rhetorical functions of an image. Thus, most software products for a tag cloud building tightly pack the words selected into a visual surface, providing a total overview of the whole word set, but not giving access to its smaller elements. So the elements best seen gain a stronger rhetorical stance. It corresponds to the idea of significance of their weight parameters in a visualized massive. While micro-plots, the elements with a low weight values, are left outside analysis because of their marginal position in the visual field. What is going on here is in fact differentiation of analytical content into significant and insignificant at the visualization level. The main problem is that rhetorical effects of an image are not or very little reflected.

The second group of visual tools is more extensive but less homogeneous. The common feature of the products and resources that can be included in this group is that their creators try more or less successfully to find such a way of visual organization that would fit best for the humanities research tasks.

As an alternative to mathematical data processing they mostly offer more or less adaptive and detailed logic of a text markup. For example, widely used an html-markup once gave start to development of many services and tools enabling user to visualize data automatically in more or less complex graphic tree maps.[4] The principles underlying the design and reading of a treelike visual model are essentially different from statistical transformations and actually go back to the medieval tradition of visualizing taxonomical structures as trees. Such visualization, whether a parallax tree[5] or a treemap[6], problematizes the structure of material and primarily hierarchical relations, i.e. relationships between parts and the whole at the different organization levels.

Work with such visualizations is first of all interpretative. It is not a coincidence that the Nvivo, a powerful research software tool created by the QSR International (http://www.qsrinternational.com/) as early as 1999 (first versions) and oriented to the methodological needs of the grounded theory, works with this kind of visual model.

A fundamentally different order of representation appears, when the logic of hierarchic markup changes to the network logic. Development of the potential of horizontal links between the elements of a markup resulted in introduction of visual browsers — a group of analytical instruments that turn organization and reading of a visual surface into the main analytical action. InfoCristal (Spoerri, 1993), a tool launched in 1995 by MIT to visualize systems of connected objects in the Boolean logic, was a first one in the series of such products. This tool allowed representing graphically systems of links between different elements of the visualized whole, including the option of graphical interactive building of flexible queries.

One of the most impressive representatives of this kind of tools is the Mandala Browser Project. High potential of the Mandala browser as a visual analytics tool is provided by its elaborated system of material markup with a wide range of options of making horizontal links and semantically difficult system of representing the links in a common visual surface. For example, having visualized the dialogues of Shakespeare's characters with Mandala, one is able to show the degree and nature of their participation in the production of the basic categories of "love" and "die" in the "Romeo and Juliette" play.[7]

The Mandala is also a perfect illustration of an important peculiarity of such products: they are mostly really difficult to learn and use. Thus, analyzing the experience of using the Mandala browser to work with "Orlando", a large database of English women-writers, the authors of the paper «Reading Orlando with the Mandala Browser» (Brown, Ruecker, Antoniuk, Farnel, et al., 2011) note that understanding a text through the graphical transformation is possible only if one understands how such transformation works. In other words, if a scholar wants to make text visualizations, he or she needs to understand both theoretical principles of text visualization and specific technologies of its reorganization into a graphical surface. A scholar should know at least, how a text is segmented, and how taxonomies and hierarchical links between marked elements are represented in the framework of a particular software product (for example, he or she may need to understand the HTML-markup principles).

To conclude, rejection of classical math visualization models in favour of semantic markup of material involves the complication of graphical interface resulting in the increase of requirements to the visual competencies of an observer, who now needs to understand the basic methodological principles of visual field design in the framework of a particular project.

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[3] *For example, such services for work with text as Tagul (https://tagul.com/), Tag Crowds (http://tagcrowd.com/), VocabGrabber (https://www.visualthesaurus.com/vocabgrabber/), Wordle (http://www.wordle.net/), DocuBurst (http://labs.booklamp.org/), ListWord — HTML om TAPoR (http://taporware.ualberta.ca/~taporware/htmlTools/listword.shtml), the Sentiment Viewer tool from BookLamp Labs (http://labs.booklamp.org/), visualizations elaborated by Jeff Clark for the project Neoformix (http://neoformix.com/) etc.*

[4] *See, for example, HTML Graph (http://www.aharef.info/), Visual Understanding Environment (http://vue.tufts.edu/), Inxight Tree Studio (http://www.inxight.com/), XML 3D Node Diagram (http://lukelab.com/lab/noder/), AquaBrowser: Qeens Library (http://aqua.queenslibrary.org/), Visual Thesaurus (http://www.visualthesaurus.com), etc.*

[5] *See, for example, Radial Tree Viewer (http://iv.slis.indiana.edu/ref/iv03contest/index.html)*

[6] *Treemap from the Human-computer interaction Lab (http://www.cs.umd.edu/hcil/treemap/).*

[7] *https://dhs.stanford.edu/wp-content/uploads/2011/06/mandala.png*

Imposing an analytical attitude

The current situation in the digital humanities community makes some of its members take aesthetization of knowledge-making process in the digital age as an important element of their politics. On the one hand it is a part of a common "beautiful data" trend[8], on the other, it is conditioned by administrative and economical factors like grants distribution, citation indexes, etc. Nevertheless the digital humanities people apply significant efforts to make their discipline and the objects they produce as attractive as possible. A privileged consumer of such visualization is an observer in the sense as J. Crary puts it in: (Crary, 1992), where he distinguishes between active observer and passive spectator: analytical pleasure becomes a part of aesthetics, and analytical work becomes inseparable from observing an attractive visual image. At the same time constant complication of the principles of visual surface organization in digital humanities requires from an observer mastering a set of specific visual competences and skills, new orders and practices of viewing.

Zoom technology is a good illustration of how aesthetic and analytical components of visualization are merging. It is introduced increasingly widely, especially after tablets with a touchscreens became common.

As an element of interface, zoom belongs to the dimensions of ergonomics and aesthetics. At the same time as a specific practice of supplemented gaze zoom is analytically loaded. Hierarchization of visible, possibility of interactive moving from one level of observing to another, framing a set of elements in the visualized field, which is inevitable when one zooms, makes zoom a tool imposing certain analytical optics on its user.

A visual model offered by "Chronozoom", the project implemented at the Moscow State University with the support of the Microsoft Corporation (Walter, Berezin, & Teredesai, 2013), is an example of using zoom as a key analytical tool. The project is aimed to create a visualization of global history process that would allow any degree of detailization and binding to the one historical scale. The basic function of such time visualization is demonstration. (The main function of the project is educational: it visualizes big history; though there is also a regime allowing user to create his or her own presentations.) However, when one moves from one level of zooming to another, markup and framing of historical process occurs immediately in the field of vision, while the games of visible and invisible determine contextualization, showing (or not showing) contents as a particular element of the whole. So selecting and zooming of a certain timescale interval is actually a sorting operation; further zooming of a selected element corresponds to the deductive logic of moving from the whole to the part.

Another way to involve users-observers in analytical process is offered by storytelling. It is a pragmatically oriented branch of data visualization with the main idea that visualization needs to be supplemented by a narrative dimension (Kosara, & Mackinlay, 2013). They are constantly in search for conceptual and technical ways to bring the narrative dimension to visualizations. Storytelling can be actually used working with both scientific and humanities data. What is interesting for us in this branch is first of all its special attention to the role of narration in representation. From the storytelling viewpoint, the picture is dead until it is narrated. It means that visual surface acquires temporal dimension. When a narrative is packed into visual representation, the user cannot just view it anymore. Now he or she has to share with the author of representation the intellectual effort of assembling graphical and narrative orders in one visual field. Temporality introduced somehow or other in a visual field, is in any case a sticking point for the gaze that works in synchronous regime. Unwrapping visual perception to the diachronic act, storytelling constructs the position of an observer who asks visualized data about its orders and temporal structure. The more difficult are the ways to introduce temporality the authors choose, the more intensive interpretative efforts are demanded.

Thus, the modern ways of digital visualization increasingly demand user involvement in the process of interpretation production. In the case of digital humanities it turns out as transmission of methodology principles through the properties and orders of visualization.

Methodology on a Screen

Considering the methodology of digital visualization in the humanities, it is important to understand that methodological loading of image is a kind of metaphor-container bringing together the principles of organization of a new type of the humanities knowledge production. What we are talking about is multidisciplinary methodological assemblage concentrated and shaped on the surface of a digital visual interface, rather than some special orders of image organization. It is not a coincidence that having skills in IT and coding is often claimed compulsory to become a member of digital humanities community (Gold, 2012). Digital humanities are the area, where the two logics clash: the one of knowledge production in the humanities and the one of highly complex digital system functioning. The latter includes the logic of algorithms, the logic of technologies applied, and at last the logic of math model used for software production. As a basically multidisciplinary field, digital humanities are not limited to the ways of the humanities knowledge production in their methodological search. The ways of implementation of a theory and its limitations are determined by the technological basis referred to in the very title of this research area. The question of how digital orders and technologies influence knowledge production in the digital age falls in the area of the digital humanities research interests as well. A member of this community is ready for comprehensive reflection of knowledge production process as far as he or she masters both languages of the humanities and computational methodology. At the same time visual interface as a zone of the closest user-computer contact appears to be an assemblage point for multidisciplinary contents.

The fuzzy set theory applied to the humanities can serve as an example of what kind of perspectives the junction of the humanities and techno-mathematical methodologies is able to offer. The fuzzy set theory appeared as early as 1965, and since then it has been applied in many areas of human activity (Paklin, 2010). Of late fuzzy set theory and fuzzy logic has been most intensively applied in the IT developments, while there are authors (see e.g. Vershinin, & Vershinina, 2007) who suggest using the principles of fuzzy logic in the sphere of the humanities. They argue that fuzzy mathematical models are optimal for relative, flexible and descriptive contents, which the scholars of humanities usually work with.

How the principles of fuzzy logic can be applied in visual software developed in the framework of digital humanities? There is such a tool at the early stage of its development in the Obninsk digital project. Among many other specific tasks of the project there is the task of analytical visualization of a narrative (interview).[9] We want to show a set of key concepts and basic thematic categories of an informant's story. Graphically these concepts and categories will be displayed as many-colored polygons located in one visual field, adjoining, crossing and overlapping each other according to the discursive system of coherence developed in an informant's story.

[8] *The concept is offered by Orit Halpern in her forthcoming book «Beautiful data: A History of Vision and Reason since 1945" (see the introduction at the author's web-site: http://www.orithalpern.net/)*

When the concept of future interface was discussed, the question of analytical model appropriate for the polygons design caused mach controversy. The logic of frequency analysis seemed naturally fit, but it was rejected as not relevant to our qualitative methodological attitude. There was also the idea to assign weighting coefficients to different thematic blocks of an interview, so that the polygons with the corresponding thematic kernels could be drawn automatically on the basis of those numbers. It was rejected as well, because the tool using specific quantification system acting from beyond the analyzed data would be too rigid. Finally we decided to design the interface following the model of a graphical editor, so that a researcher would be able to draw his or her own interpretations (of course, within the general visual model of interface, in a semiautomatic regime).

Such a solution is fully consistent with the fuzzy set methodology, where the object belonging to a set or sets can be only very relatively defined in any sort of quantification terms. It is the level of visual interface, where one of the main problems of fuzzy set theory in computations turns out to be solved: the continuum determining an object belonging to a set must be sooner or later fixed as a certain number for digital processing. Using visual interface directly for saving and representing interpretations (omitting rigid table forms and algorithms of math processing) allows generating representations best fit to the data that is hard to formalize, and at the same time creating metadata able to be adapted for processing in any mathematical logic. Thus, visual surface of interface becomes the place, where the two methodologies merge creating conditions for increment of knowledge.

Conclusion. Judging from the trends in the humanities knowledge production in the digital world, the importance of visualization technologies will most probably be growing further. It is partly connected to the growing extension of digital visual media. Partly — to the special methodological status of visualization in digital humanities. In a multidisciplinary situation it is often visual surface that becomes a contact zone for different methodologies, providing an effective combination of the humanities knowledge production orders and software and computational logic. At the same time visual interface becomes a point of concentration of analytic efforts at the junction of a human and a computer.

Our analysis of actual visualization practices in digital humanities shows that there are two conflicting tendencies. On the one hand, methodological search in this area leads to the rejection of conventional visual canon, which, in its turn, entails ever increasing complexity of interfaces. On the other hand, specificity of technologies and visual forms used leads to gradual merge of the two possible attitudes to digital visualizations in the humanities: a spectator has to become an analyst, because this kind of optics is imposed on him or her by the visual orders he or she is included in. In such situation the specific requirements to the visual competence of anyone resorting to the contemporary digital visualization forms in digital humanities, are steadily growing. It means that further search in the area of methodology of representation of digital knowledge is essentially important to form a trajectory of its further development in the context of digital culture.

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References:

1. Alvaro, S. (2013). Big data and digital humanities: from social computing to the challenges of connected culture. Retrieved from: http://blogs.cccb.org/lab/en/article_big-data-i-humanitats-digitals-de-la-computacio-social-als-reptes-de-la-cultura-connectada/
2. Berry, D. M. (2011). The computational turn: Thinking about the digital humanities. *Culture Machine,* 12(0).
3. Brown, S., Ruecker, S., Antoniuk, J., Farnel, S., Gooding, M., Sinclair, S., … & Gabriele, S. (2011). Reading Orlando with the Mandala Browser: A case study in algorithmic criticism via experimental visualization. *Digital Studies/Le champ numérique, 2*(1).
4. Burnett, R. (2005). *How images think.* MIT Press.
5. Checkland, P., & Holwell, S. (1997). Information, systems and information systems: making sense of the field.
6. Crary, J. (1992). *Techniques of the observer: on vision and modernity in the nineteenth century.* MIT Press.
7. Drucker, J. (2011). Humanities approaches to graphical display. *Digital Humanities Quarterly, 5*(1).
8. Gardner, H., & Manduchi, G. (2007). *Design Patterns for E-science.* Berlin: Springer
9. Gold, M. K. (Ed.). (2012). Debates in the digital humanities. U of Minnesota Press.
10. Kosara, R., & Mackinlay, J. (2013). Storytelling: The next step for visualization.*Computer,* 46(5), 44-50.
11. Paklin, N. (2010). Nechetkaia logika — matematicheskie osnovy [Fuzzy logic and mathematical foundations]. *BaseGroup Labs http://www. basegroup. ru/fuzzylogic/math. ht m.*
12. Presner T. Digital Humanities 2.0: a report on knowledge //Connexions Project. — 2010.
13. Schöch, C. (2013). Big? Smart? Clean? Messy? Data in the Humanities. *Journal of Digital Humanities, 2*(3), 2-13.
14. Spoerri, A. (1993, December). InfoCrystal: A visual tool for information retrieval & management. In *Proceedings of the second international conference on Information and knowledge management* (pp. 11-20). ACM.
15. Vershinin, M. I., & Vershinina, L. P. (2007). Primenenie nechetkoi logiki v gumanitarnykh issledovaniiakh [Application of fuzzy logic in the human studies]. Bibliosfera, (4).
16. Walter, R. L., Berezin, S., & Teredesai, A. (2013, October). ChronoZoom: travel through time for education, exploration, and information technology research. In*Proceedings of the 2nd annual conference on Research in information technology*(pp. 31-36). ACM.
17. Borodkin L.I. (2009). Setevye struktury gumanitarnoj informatiki: tehnologii e-humanities [Network structures humanitarian Informatics: Technology e-humanities]. *Gumanitarnaja informatika: Sb.statej.* Tomsk, 23-32.
18. Zhuravleva E.Iu. (2011). Sovremennye modeli razvitiia gumanitarnykh nauk v tsifrovoi srede [Current models for the Humanities in the digital environment]. *Voprosy filosofii,* 5, 91–98
19. Cherniak, L. (2011). Bol'shie dannye-novaia teoriia i praktika [Big data-new theory and practice]. *Otkrytye sistemy,*10.

[9] *The tool is developed by the research group engaged with the tasks of analytical coding of interviews: Galina Orlova, Aleksandra Ivanova, Eugeny Pronenko, Egor Shevelev.*