

Content Analysis Method for Cut Formation of Human Psychological State

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Abstract—Negative factors in shaping the content complicate the process of finding the necessary data when scanning various sources. Increase in volume and change of relevance or dynamics of the content streams (systematic and irregular updates) leads to duplication, information pollution and redundant results in content search. Comprehension and generalization of large dynamic content streams which are continuously generated by Internet resources requires new methods/approaches to search such as content monitoring. Input information for content monitoring is a text in any natural language presented as a sequence of symbols, whilst output information is provided as tables of sections, sentences and lexemes of the analyzed text.

Keywords—analysis of information resources, content-analysis, rating evaluation, content management system.

I. INTRODUCTION

Nowadays the evolution of Internet-resources, which presently displace television, newspapers and magazines, is taking place [1-3]. This is why the need to create an information product targeted to user's needs and satisfaction increases. There are many information resources providing information about world and local news, but many of them are not adaptive or easy to use [4-7]. Foreign resources are much more informative and easier to use than the Ukrainian ones, which are cluttered with excessive content and advertisements. Currently there are not many Ukrainian resources and their development and improvement is important for users. Most of them do not have adaptive layout, which greatly reduces the number of users, as nowadays not only personal computers have Internet access, but also electronic media with different screen resolutions, such as mobile phones, smartphones, tablets, etc are equipped with one. Fewer and fewer new systems and software products are being ordered, as there are many different and similar systems or programs on the market. Therefore, ready system models or their templates enter mass market. However, questions related to the area of expertise of an enterprise or a person and the field of science or industry almost always arise [8-10]. This creates demand for improving existing systems and programs. In order to improve information systems for Formation of Psychological State of Human (ISFPSH) mathematical linguistics and content analysis of text data sets are used. The problem is

the lack of common standardized approach to architecture design and the development of ISFPSH as well as the data processing within system [11-12]. The absence of a general classification leads to issues with defining and forming unified methods for processing data, which in turn causes the problem of creating appropriate software [13-20]. This justifies the purpose, topicality, expediency and direction of research. The peculiarities of the use of ISFPSH are as follows: openness - access for all companies as well as users; globalism - access from anywhere in the world; absence of time restrictions - access at any time; directness - low barriers for entering market; direct user interaction - reduction of distribution channels and the elimination of intermediaries; automatic processing of requests. The urgency of implementing ISFPSH is due to the following factors: globalization leads to business information needs and quick access to this information for a successful business; time savings in obtaining the necessary content, e-commerce content personalization, integration of ISFPSH. The importance and urgency of building an ISFPSH require the theoretical foundations investigation and practical summaries and proposals development. The aim is to develop an information resource with automatic filling content according to user requirements, the need to set the following tasks: automatic generation of commercial content; Automatic collection and content creation; automatic formatting of content; key words and concepts identification; categorization of content; duplicate content identification; digest content formation; selective dissemination of content. It is necessary to develop a general structure of analysis system of social networks users' profiles and their activities to form a cut of individual's psychological state on the basis of "Big Five" model [11]. To complete this, it is advisable to use methods and means of information resources processing on the Internet environment. [12].

II. A FORMAL MODEL OF THE SYSTEM OF FORMATION OF THE STATUS OF PSYCHOLOGICAL STATE OF A PERSON

We will present the system model S of the status development of psychological state of a person based on the content analysis of the text data sets of this individual (for example, comments in social networks) by the tuple [12, 21-25]

$$S = \langle X, Ident, C, ContProc, Q, Const, PrCont, PersPref, AutAd, ContIntegr, Y \rangle \quad (1)$$

where X is the incoming data from personalities of social networks, the psychological state of whom is analyzed (history, profile, posts, comments, likes, community, etc.), $Ident$ is the process of identification of the system users and personalization of personalities, C is the content of the system, $ContProc$ is the process of initial processing of the content (content and spam filtering, spam identification, analysis, saving, elimination of duplication, content blocking, etc.), Q are the requests from users, $Const$ is the process of provision of consistency of the content, $PrCont$ is the provision of analysis of private content, $PersPref$ is the analysis of personal preferences and personal data of the user, $AutAd$ is the provision of analysis of automatic settings and user profile updates, $ContIntegr$ is the provision of integration of data from other systems, including those from other social networks, Y are the results of the users' queries concerning the status of psychological state of a human/person/individual.

1. Algorithm 1. Cut Formation of Psychological State for Person.
2. User authorization/authentication. Program completion in case of authentication error.
3. New research start.
4. Search for user. If the user is not found, it is necessary to carry out re-search or to complete process.
5. Search for information. If the access is closed, it is necessary to carry out re-search of another user or to complete process.
6. Information gathering.
7. Analysis of the psychological state of a person simultaneously in six categories.
8. Results representation on the screen.
9. Obtaining findings and recommendations.
10. Work completion.

The process of generating answer for the user S in the form of the status of psychological state of the analyzed human/person/individual by the main characteristics of the big five is described by superposition of the main functions (input data of one function are the original data of another one) from (1) as follows

$$Y = ContProc \circ PersPref \circ Const \circ AutAd \circ ContIntegr \circ Ident, \quad (2)$$

in this case, the main process is $ContProc$, which is described by the formula

$$Y = ContProc(X, Q, C) = ContAnal \circ ContSav \circ ContBlock \circ ContDupl \circ ContSpFilt \circ Spldent, \quad (3)$$

where $ContAnal$ is the content analysis, input data/requests, $ContSav$ is the saving of content/results, $ContBlock$ is the

content blocking, $ContDupl$ is the elimination of duplication, $ContSpFilt$ is the filtration of content/spam, $Spldent$ is the identification of content/spam. We suggest using the algorithms of analysis of the syntax of the Ukrainian and English-language text for processing and content analysis (algorithm 2) of large arrays of text data for finding and analyzing the marked words [21-25].

We will focus on the features of this particular social network as the source of data for analysis and determination of personality dispositions. With this purpose we will present the main processes of the S system as $PersPref$, $AutAd$, $Ident$ and will detail them by superposition

$$C^{St} = PersPref \circ Const \circ AutAd \circ ContIntegr \circ Ident, \quad (4)$$

where C^{St} is the content as a result of statistical data of the activity of a personality.

The process $PersPref$ of the analysis of personal preferences and personal data of the user will be represented by superposition

$$C^S = PersPref(X, Q, C^{Pf}, C^{Pl}, C^{Sp}, C^{US}, C^{Pc}, C^{Mr}) = MatchPred \circ GamPred \circ ProfProc \circ SitChan \circ GamModer \circ SitAdm, \quad (5)$$

where $C^{Mr} \subseteq C$ is the set of marked words in the content of analyzed personality, $ProfProc$ stands for processing the user profile and the profiles of participants of the experiment, $SitChan$ is the editing of dictionaries, $GamModer$ is the moderation of the rules of content monitoring of text data arrays of a specific individual, content analysis to find the marked words, analysis of the text's syntax and semantics, as well as the rules of formation of the status of psychological state of a personality, $SitAdm$ is the system administration, $GamPred$ is the obtaining of result of formation of the status of psychological state of a personality based on the associative rules, $MatchPred$ is the formation of the status of psychological state of a personality based on associative rules [11-12].

The component of the rules of content-monitoring $GamModer$ is the content search and content analysis of the text. The content analysis is aimed at searching for the content in the data set by universal linguistic units. The unit of account is a quantitative measure of the unit of analysis, which allows registering the frequency (regularity) of occurrence of indicator of the category of analysis in the text. Then the text is analyzed for the presence of certain marked words and the results are categorized according to psychological metrics (consciousness, friendliness, extraversion, emotionality and openness to experience) [12], namely

$$C^S = MatchPred(X, Q, C, P, D, B) = Opn \circ Cns \circ Ext \circ Agr \circ Nrt \circ Filt, \quad (6)$$

where $Filt$ is the process of filtration of the original text, P is the glossary of rules, D are the dictionaries for classification of the text by psychological dispositions of a personality, B is the dictionary of blocked words, C^S is the result of analysis

of text arrays data and construction of the "Big Five" model [11], i.e. the hierarchical model of a personality by the five features. In particular, such features are *the openness to experience* $C^{Opn}=Opn(C^{Filt}, U^{Opn}, P, D)$ through parameters U^{Opn} (u_1^{Opn} is the frequency of occurrence of words associated with benevolence/malevolence, u_2^{Opn} is the frequency of occurrence of words associated with trust/mistrust, u_3^{Opn} is the frequency of occurrence of words associated with warmth/hostility, u_4^{Opn} is the frequency of occurrence of words associated with sincerity/selfishness); *integrity* $C^{Cns}=Cns(C^{Filt}, U^{Cns}, P, D)$ through parameters U^{Cn} (u_1^{Cns} is the spontaneity/deliberation, u_2^{Cns} is the creativity/narrow-mindedness, u_3^{Cns} is the distinction/mediocrity, u_4^{Cns} is the liberality/parochialism); *extraversion* $C^{Ext}=Ext(C^{Filt}, U^{Ext}, P, D)$ through parameters U^{Ext} (u_1^{Ext} is the

sociability/unsociability, u_2^{Ext} is the assertiveness/tranquility, u_3^{Ext} is the activity/passivity); *amiability* $C^{Arg}=Arg(C^{Filt}, U^{Arg}, P, D)$ through parameters U^{Arg} (u_1^{Arg} is the orderliness/negligence, u_2^{Arg} is the thoroughness/carelessness, u_3^{Arg} is the unreliability/reliability) and *neuroticism* $C^{Nrt}=Nrt(C^{Filt}, U^{Nrt}, P, D)$ through parameters U^{Nrt} (u_1^{Nrt} is the relaxation/nervousness, u_2^{Nrt} is the poise/depression, u_3^{Nrt} is the resistance/irritability) [12].

The use cases diagram (Fig. 1) uses two basic types of entities: use cases and actors, among which are the following types of relationships: association — between actor and use case; generalization between actors; synthesis between use cases; inclusion between use cases.

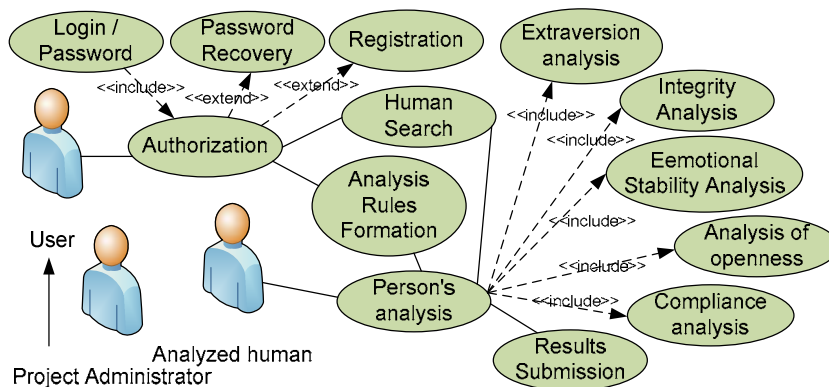


Fig. 1. Use case diagram

There are generalization relationships between project administrator and user. There are association relationships between user and use cases, as well as between investigated person and use cases (i.e. authorization, search, and analysis of individual and results representation). There are generalization relationships between use cases. Inclusion relationships are presented between authorization, password recovery and registration; between person and specific analysis. On the Fig. 2, there is an example of annotated UML-diagram of packets with dependency relationship, which reflects a typical architecture of WEB-based software system to work with the database and decision-making system logic.

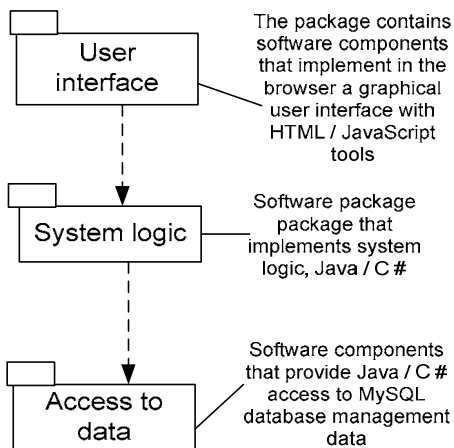


Fig. 2. Package diagram

On sequence diagram (Fig. 3), there is a description of psychological analysis of personality, which is triggered by a particular user of the system [26-37].

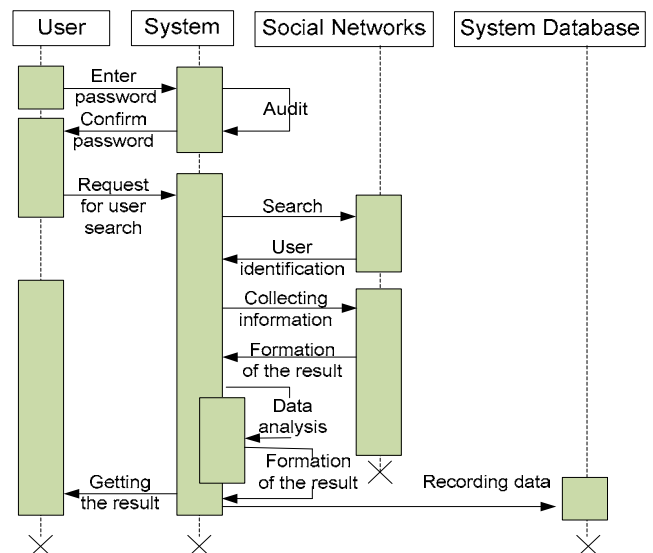


Fig. 3. Sequence diagram

He/she passes authorization and submits a request to search a necessary person in the database. The system finds this person, works out his/her data, and returns the desired result [38-44]. Before shutting, the system makes a record of the given session to the database.

The following diagram needed is activity diagram (Fig. 4) with the following sequence of actions [45-64]:

1. User authorization/authentication. Program completion in case of authentication error.
2. New research start.
3. Search for user. If the user is not found, it is necessary to carry out re-search or complete process.
4. Search for information. If the access is closed, it is necessary to carry out re-search of another user or complete process.
5. Information gathering.
6. Analysis of the psychological state of a person simultaneously in six categories.
7. Results representation on the screen.
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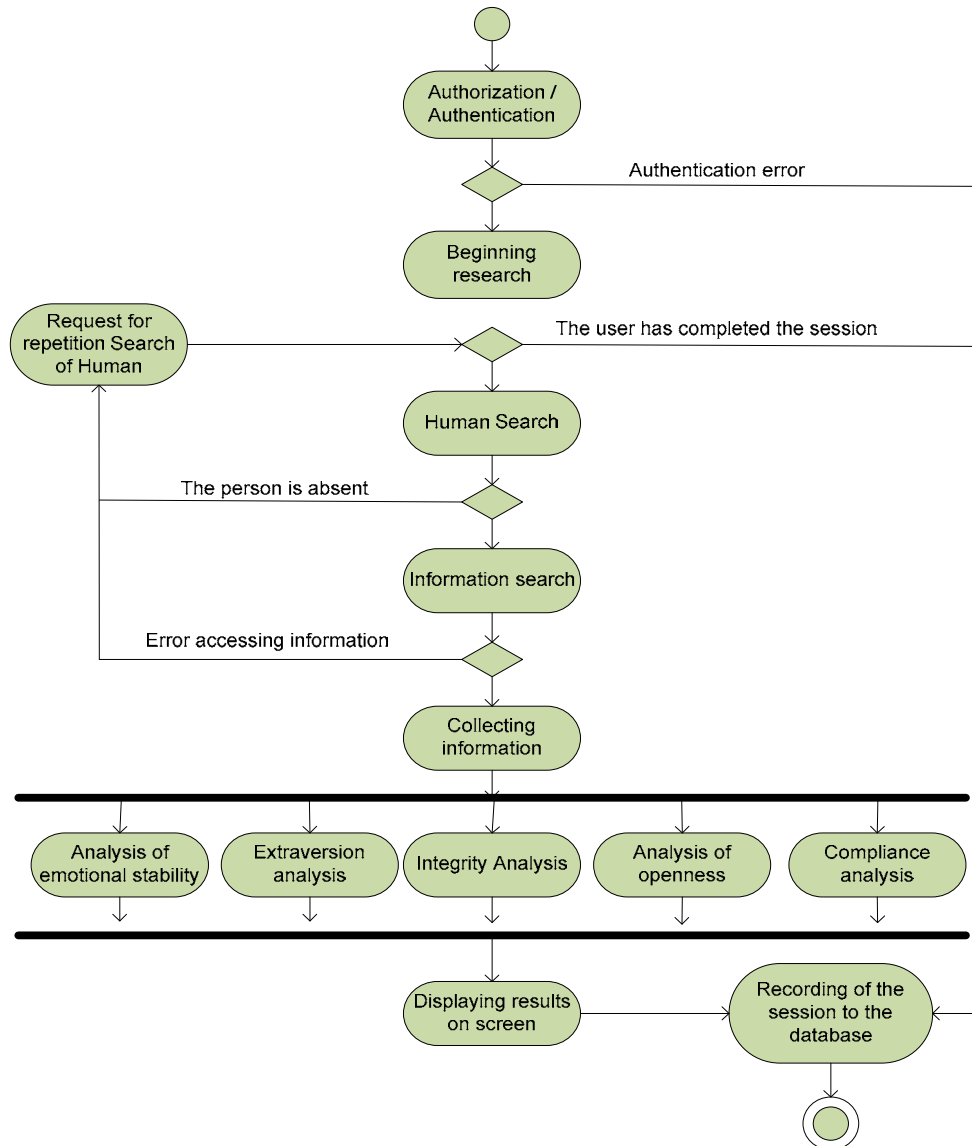


Fig. 4. Activity diagram

This IS is focused on the use of the Internet. Hence, when choosing instruments and means of implementation attention was paid to those technologies that will allow necessary software implementation. During the development of IS, one can face some problems, since for a long time there was no single and a recognized standard for all the Internet technologies. Sure, with the advent of HTML5 and CSS3, as well as MS Edge browser release by Microsoft situation has changed. However, the problem of backward compatibility of sites still remains. When selecting architectural solutions, it is necessary to use two parts: server and client. Server side

is a computer or server that contains a database which stores the necessary information and software components that will implement certain features of the system.

Client side is the environment (browser) that allows displaying the requested information. In this case, it allows displaying website, its pages, content, etc. Both parts are closely related to each other and function as one.

In this case, server hardware will constitute a remote server. In this case, there is no need to create separate server for the project, as there are no data in the program working

process, which could be handled on the server side. Just in future, its implementation is necessary. The client side will be included in the user's device (PC, laptop, tablet, or other device) and will appear in the browser. When developing this service, it is necessary to consider how it will behave on different devices with different screen size and different browsers. Recently, tablets and smartphones have gained special popularity as the most mobile devices. This led to the fact that for viewing content on the site one had to use the zoom, which does not often reflect the content correctly. Therefore, to solve these problems, they apply so-called cross-platform and cross-browser compatibility.

Cross-platform ability allowed to adapt the website to the small screens with diagonals and concentrated at the most desired content only. This reduces the load time of web pages, which became one of the key points. Cross-platform ability may be achieved through using media queries and use of "rubber" layouts.

Cross-browser compatibility is designed to make it possible for site to appear the same on all popular browsers, since each browser had its own certain functions implementation technologies. Therefore, there are different individual scripts and queries in order to make site look the same in any browser.

III. CONCLUSIONS

The actual task of research and development of methods and means for processing data in intellectual information systems forming content with the use of the classification, mathematical and software means and a generalized system architecture. The necessity for development of methods and means of processing data in intelligent information systems forming content by improving system architecture in order to automate processes of formation, management and marketing of content has been justified. Terminology has been analyzed and a classification of intelligent information systems forming content has been created for determining characteristic patterns, trends, processes of system design and modeling as well as to determine the shortcomings of existing methods and tools for content management. A formal model of an intelligent information system for forming content has been developed, allowing us to develop content lifecycle, generalized typical system architecture and standardized methods for processing information resources. General architecture of an intelligent information system for forming content has been improved when compared to existing ones by adding modules for processing of information resources. A complex method of forming content has been developed as well as an operational method for content management and a complex method for content marketing in order to achieve a working effect at the level of a system developer. General recommendations for the design of system architecture have been developed differing from the existing ones with more details of stages and presence of modules for processing information resources. This allows an easy implementation of effective information resources processing at the level of a system developer. The architecture of system modules has been developed to implement the content lifecycle. Applied software means for formation, management and marketing of content has been developed and implemented in order to achieve effect from working at the level of an owner and user of an intellectual information system for forming content.

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