Technical and technological progress has created conditions for the formation and development of a new formation using standard and designing new cryptographic algorithms for protecting information in computer systems and networks, implementing an information security system in communication systems. The dynamic development and introduction of new information and communication technologies has provoked significant social and digital transformations.

Recently, any activity of society is inextricably linked with information and information technology. Therefore, the issues of information security, the security of operating systems and databases, anti-virus protection, the security of Web services and Cloud systems, the use of modern artificial intelligence technologies, the security of network communications based on the application of modern principles, methods and methods of the theory of secure systems require both constant monitoring, and modern ways of their improvement and modernization.

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GRAPH REPRESENTATION OF WEBSITE STRUCTURE: MODEL AND ALGORITHM

This article examines the fundamental principles of building web sites and structural construction of web pages. The task is to develop ways to represent the site for subsequent manipulation with it as an object of a certain type and to introduce a list of possible operations for working with such an object. To solve this problem, the fundamental principles of structural construction of websites and some possible models for the effective representation of their structure are considered.

In the context of this task, the formalization of information about the structure of the site in the form of a directed graph is proposed, and an algorithm for forming the desired graph based on HTML pages placed on the server is developed.

A website is composed of a series of pages, making the minimum unit of web data − a web page [5, p. 2]. Any program designed for Internet navigation allows viewing of web pages and searching through them. However, lately, the focus has shifted from individual web pages to web sites as a whole, and gradually the concept of a web site has become an independent entity. This trend enables the identification of a site as a separate data object and facilitates the handling of the entire site, rather than individual pages.

Each web site comprises a set of pages, with a main page that initiates further navigation throughout the site. Nearly every site is organized as a set of pages, accessible through links [2, p. 4; 3, p. 153], Based on this structure, several models for site representation can be distinguished:

1) a list representation;

2) a graph representation.

When describing a website as a list, it is necessary to display all the information about the website in the form of a list, including a list of web pages with their contents. If a website is represented as a graph, then the vertices of the graph will be web pages, and the edges will be hyperlinks.

The graph representing the structure of the web site is shown in Figure 1. The site structure graph consists of a set of vertices A = $\{A_i\}$, $i = 1, 2\ldots n$, where vertex A_i represents a web page of the site, and n is the number of pages. The main page of the site is always A_1[4, p. 4].

$A_i \rightarrow E_i$, which means that each vertex A_i is associated with a set of outgoing edges $E_i = \{a_{ij}\}$, $i = 1, 2\ldots n$; $j \in \{1, 2\ldots n\}$. Edge a_{ij} connects vertex A_i and A_j and corresponds to a hyperlink to web page A_j located on web page A_i.

Based on the analysis of the website structure, it is possible to determine the general algorithm for constructing the graph of its structure [1, p.10644].

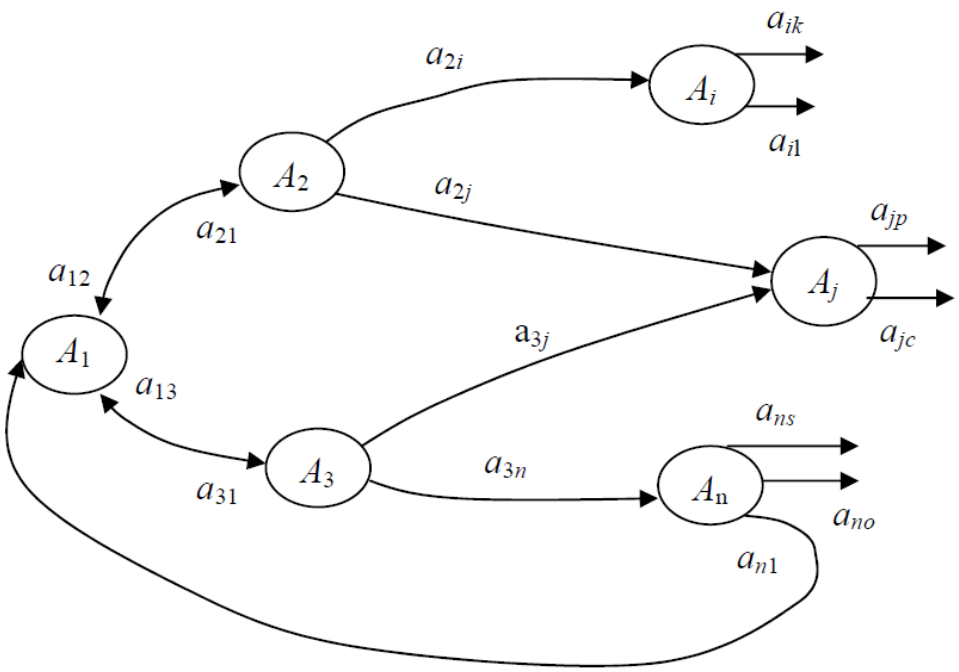

Fig. 1 – Graph representing the site structure

The algorithm begins by constructing the main page of the website A_1. A request is sent to the main page of the website (the result of the request is an HTML document). A_1 is constructed based on the received information.

The search for hyperlinks is performed in a loop. Each found link a_{ij} is checked for belonging to the considered server. If this condition is satisfied, then it is checked whether the resulting page A_j already exists. If not, A_j is created and placed in the Q queue for further processing. If A_j already exists, then the link a_{ij} is added to the currently considered page, and the search continues.

After all the links a_{ij} of the page A_i are found, a new address A_j is extracted from the Q queue, a request is sent again, and the next iteration of the algorithm cycle is performed until the Q queue is empty.

As a result of the algorithm's work, an object representing the website model is formed, which can be used for various operations such as comparison, sorting, searching, etc.

After parsing the website structure and representing it as a graph, the website can be saved in a relational database for further processing [1, p.10646]. Thus, it becomes possible to save a set of websites in the database for further analysis,

search, comparison, identification of identical pages and link structures, and other operations.

If all the properties of each web page A_i are saved in the database, the website can be fully restored to the form in which it was saved in the database.

The structure of web sites has been studied and several possible models for their representation have been proposed, such as the list model and the graph representation. The representation of a website model as a graph has been formalized, and an algorithm for constructing the graph based on the website has been developed. To implement the algorithm, the structural elements of a website, namely the page and the link, have been identified.

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«HOW TO BECOME A MILLIONAIRE?» OR THE SEVEN PROBLEMS OF THE MILLENNIUM

Who wants to become a millionaire? For this, you do not need to buy a lottery ticket or do any tricks. The Clay Mathematical Institute in the USA is gladly ready to pay a million to someone who simply solves at least one of their mathematical problems. It sounds simple, but who can solve even one of them?

In 1900, at the International Mathematical Congress in Paris, David Hilbert announced 23 mathematical problems that, in his opinion, should be solved in