QUALIFYING PAPER

For the degree of

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topic: Development of a social network user base analyzer module

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Ministry of Education and Science of Ukraine
Ternopil Ivan Puluj National Technical University

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ASSIGNMENT

for QUALIFYING PAPER

for the degree of   Bachelor
<div align="center">(degree name)</div>

specialty   122 Computer science
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1. Paper topic   Development of a social network user base analyzer module

Paper supervisor   Zolotyi R.Z., PhD
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2. Student's paper submission deadline   10.07.2023

3. Initial data for the paper Literature sources about architecture, principles of operation and development of Web-resource.

4. Paper contents (list of issues to be developed)

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Chapter	Advisor's surname, initials and position	Signature, date	
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Life safety, basics of labor protection			

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TIME SCHEDULE

LN	Paper stages	Paper stages deadlines	Notes
1	Analysis of the task for qualifying work. Selection and work with literary sources.		*Completed*
2	Writing chapter 1		*Completed*
3	Writing chapter 2		*Completed*
4	Writing chapter 3		*Completed*
5	Writing chapter 4		*Completed*
6	Standartization control		*Completed*
7	Plagiarism check		*Completed*
8	Preliminary defense of qualifying paper		*Completed*
9	Defense of qualifying paper		

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ANNOTATION

Development of a social network user base analyzer module // Diploma thesis Bachelor degree // Aropet Clinton Samuel // Ternopil' Ivan Puluj National Technical University, Faculty of Computer Information System and Software Engineering, Department of Computer Science // Ternopil', 2023 // P. __, Fig. – __, Tables – __, Annexes – __, References – __.

Keywords: analyzer, application, server, social network.

In the diploma project, an application-analyzer of the user base of the social network was designed. The designed application provides an opportunity to receive information about subscribers and unsubscribers, quickly process data about users, analyze accounts of the Instagram social network, and performs the functions of a program for promoting the account.

In addition, the rationale for the choice of the used technologies is given and an analysis of similar applications for processing data about social network users is carried out..

LIST OF SYMBOLS, UNITS, ABBREVIATIONS AND TERMS

DB – database.

IS - information system.

ISUP - project management information system.

IT - information technology.

OS – operating system.

PC – personal computer.

DBMS – database management system.

CONTENTS

ANNEXES

INTRODUCTION

Relevance of work. Many of us find it hard to imagine life without social networks. Thus, according to the research results of the Yandex company, more than 40 million Ukrainian accounts are registered in the four most popular social networks (Instagram, Facebook and Twitter).

But the realities of these accounts remain unknown. Instagram promotions are such that it doesn't matter how many followers you have, what matters is what your real reach is. An account with 6 thousand subscribers and an active audience can have a reach of up to 3 thousand per post, and the same reach can be in some public account with an audience of 100 thousand.

Low reach for bloggers means that they will have to reduce the cost of advertising integrations, for companies it means a loss of audience and customers.

One way to increase engagement and reach is to clean up invalid accounts (bots) on Instagram.

Today, it is very difficult to collect fakes, bots, commercial and "dead" accounts into a separate list. Running a block from this list and removing the block so as not to block access forever is also not an easy task.

Therefore, to clean the Instagram account from invalid and inactive accounts, you need a high-quality application that would filter and analyze the account pages of popular social networks. Therefore, the topic "Analyzer of the user base of the social network" is relevant today.

1 CHARACTERISTICS AND ANALYSIS OF THE SUBJECT INDUSTRY

1.1 Characteristics of the subject area and object of research

In the middle of the 20th century, as a result of scientific and technological progress, a new type of society began to form, for which scientists (sociologists, economists, political scientists, philosophers) used different terms.

Thus, J. Galbraith spoke about the "new industrial society", E. Toffler called this society "super-industrial society", P. D Rucker - "knowledge society", Z. Brzezinski - "technotronic society", K. Do Lark - "society information and services".

Each interpretation of this new type of society was based on such categories as knowledge and technology. The driving force of progress was not just new technologies, but the information flow that accompanied their introduction into science and practice, revealing to futurologists the prospects for the development of society and the scenarios of the normative or desired future.

J. Galbraith believed that the defining feature of the new industrial society is the "industrial system", which is characterized by the presence of large corporations using modern technology. The industrial system increases the status of teachers and scientists [20], who, using systematized knowledge, train specialists who know how to use modern technology in production.

According to J. Galbraith, "industrial society" needs a highly developed education system, because trained and educated personnel have become a decisive factor in production [20].

Indeed, a new type of society requires a specialist in any field to have new competencies that meet the demands of both production and the service sector, and the main conductor of modern knowledge of the "technotronic society" there are teachers

whose mission is not only to prepare a highly qualified specialist, but also a professional with high adaptive abilities.

In his work "Between Two Ages. The role of America in the technotronic era" Z. Brzezinski, characterizing the technotronic society, says that the formation of the economy, social life and culture of the new society is greatly influenced by the development of technology and electronics, in particular in the field of computing and mass media [18, p. 20], and education in such a society becomes not only general, but it becomes longer and relies on the use of new technical means, including computers, and the flow of new knowledge requires the organization of more and more frequent retraining of specialists [18, p. 22].

In the educational process, such innovations as information educational environment (IOS), Internet portals for data transfer between employees of an educational institution, all kinds of mobile applications that facilitate communication with schoolchildren and students are beginning to be used. Undoubtedly, in such conditions, a mobile teacher begins to master information technologies for education.

These innovations allow us to talk about social stratification on a new basis - mastering the competence of using ICT technologies.

In educational organizations, such teachers are in demand who not only know new information technologies, but also use them in their pedagogical activities for the effectiveness of the educational process.

Those teachers who do not know how to create a presentation, do not use online tests in classes, do not use visual methods of learning through IOS become outsiders of the modern educational space, which means that such teachers are the first to be laid off in the event of layoffs. Teachers who do not use ICT technologies in their professional activities experience difficulties in communicating with schoolchildren and students.

According to many researchers (T. Ztounier, U. D Isard, D. B Ella, E. Toffler, E. Doastels), in the information society knowledge and information become a strategic resource comparable in importance to natural, financial and human resources [8, p. 101-103], more and more attention is paid to the ability to work with information using computer technologies.

E. Toffler believed that in the information society, information is the main type of inexhaustible raw material [5].

M. Castells, analyzing the main trends in the development of the information society, talks about the network structure of the new society and suggests replacing the term "information society" with "network society", i.e. network society [12].

According to M. Castells, knowledge and information in the network society, becoming a technological base for the production of knowledge and information of a higher level, cease to be intrinsic value [12]. The emergence of the Internet gave people mass access to information and communication technologies, allowed to change the forms of communication between people from different countries. In the context of studying education as a system of modern society, remote courses, online broadcasts of scientific events, and virtual universities began to function in the practical activities of teachers.

Thus, the emergence and development of computer technologies made a huge impact not only on industrial production, in which automated control tools were increasingly used, but also on other aspects of social life: education, medicine, culture.

The rapid pace of development of ICT technologies, the use of the Internet in the educational process allow satisfying both the material and spiritual needs of a person related to development and self-actualization.

For many, the computer has become a means of communication with other people, which is carried out through various social networks and forums using the enormous capabilities of the Internet, with the help of e-mail and Skype. In fact,

information and communication technologies allowed to expand the boundaries of information flows, to destroy barriers to the development of educational technologies, to change the attitude to education.

As I. Yu. Zurkiv writes, a new type of interaction is being formed through the creation of virtual reality and the use of resources of the computer parallel world, which, on the one hand, contributes to ensuring social security, and, on the other hand, destroys real interpersonal relationships, hiding by nicknames of users of social networks [8].

The rapid development of information technologies, the emergence of the Internet caused the emergence of social network communities.

It is believed that the term "social network" was introduced into scientific circulation in 1954 by sociologist D. Barnes, who developed J. Moreno's approach to the study of relationships between people using sociograms, that is, visual diagrams in which individuals are represented as points , and the connections between them are in the form of lines. It is no coincidence that the pioneers in the development of the methodology of modern network analysis were anthropologists, for whom it was important to record the differences in the structures of small and traditional societies and to develop methods for their empirical research [5].

A. Radcliffe-Brown [8] was the first to use the terminology of network research and called for considering the public structure as a network of social relations. Subsequently, the main directions of the research of network communities were laid down in the methodological apparatus of P. Lazarsfeld, J. Moreno, J. Homans, F. Heizer, A. Beyvlas, J. Coleman, S. Naidel, S. Milgram, M. Granovetter.

In Ukrainian research practice, the topic of network and virtual communities is also becoming relevant, in particular, in the field of sociology [1, 3, 5] and pedagogy [8].

Social networks, as we can see, are currently one of the most visited resources on the Internet [1, 2, 3]. According to research company comScore, they are used by

about 85% of all Internet users in the world. According to a number of scientists, the educational paradigm of the 21st century includes a triad of the biggest fundamental problems - continuity, mass and quality [4]. It was technological innovations (including the modernization of web platforms) that made it possible to organize mass and continuous training in a new way [5]. In this light, special scientific significance is played by professional continuous training / self- training), which will provide a new stage in the evolution of self-awareness and self- formation of information culture [5].

A social network is a social structure consisting of a group of nodes, which are social objects (people, groups of people, communities, organizations) and connections between them (social relationships) [9]. In the general sense, a social network is a community of people united by common interests, a common cause or other reasons for direct communication with each other. In the philosophical approach, a social network is understood as a set of social objects and a certain set of relationships between them [10].

Ellison and Boyd [11] defined a social Internet network as a web service that allows users to:

a)   create open (public) or partially open user profiles;

b)   create a list of users with whom they are in social contact;

c)   view and "trace" your list of connections and similar lists of other users within the same system.

According to O.D. According to Patarkin, social networks are platforms on the basis of which participants can establish relationships with each other [12]. So, a social Internet network is an interactive multi-user website that has a number of mandatory qualities [11]:

-       the content (content) of the site is created exclusively or mainly by him by users;

- the site is an automated environment, within which users have the opportunity to create connections with other users (social connections) or social objects (thematic groups);

- users have the opportunity to receive static and dynamic information about objects that exist in this social environment, about social connections between them;

- users users and social objects.

Available functionsь communication with by others.

If we consider the evolution of social networks, then the first prototype appeared in 1995. Randy Konrads created a prototype of social networks - the American portal Classmates.com, which is a kind of database. Personal profiles were not created on this site, but access to lists of students in a certain educational institution was presented. To date, Classmates.com has been improved, it is possible to create accounts, and this resource is used by more than 50 million people from the USA, Canada, France, Sweden, Germany and Austria [Ovchinnikova, Pal].

In 1997, Andrew Weinreich organized the site SixDegrees.com, which allows users to create both personal pages and lists of their friends. This project existed until 2001, and it had the same functionality that we are used to using in modern social networks.

The boom of social networks began in 2003, when such sites as LinkedIn, MySpace, Hi5, Facebook appeared.

The LinkedIn social network, created by Reed Garrett Hoffman in December 2002, and launched only in May 2003, was intended for finding and establishing business contacts.

"LinkedIn" can be called a professional community, where users can not only find the job of their dreams, hire the best specialists, but also promote their business, establishing stronger relationships with clients and potential buyers.

This site is very popular in the USA, Europe, India, it is available in 23 languages of the world, but since August 2016, "LinkedIn" has become the first Internet service for which, in accordance with the law "On Personal Data", restrictions have been imposed on the territory of Russia.

The creators of the social network "MySpace", which appeared in 2003, Tom Anderson and Chris De Wolff offered a new service for Internet users: to create their own virtual space based on real social contacts.

Community members could not only create personal profiles and communities of interest, post photo and video content, but also blog and listen to popular artists.

From 2005 to 2008, MySpace was considered the largest social network connecting music artists and their listeners. MySpace is a typical example of a social network focused on the dominant (according to Maslow) human needs for self-expression.

Initially, the social network Hi5, created by Ramu Yalamanchi in 2003, was a social network for new acquaintances. Users could create their profile by specifying certain information about themselves (age, interests, hometown); could upload photos, creating personal albums; could send friend requests by e-mail to other users. Community members could accept or reject one's request, could leave comments under their friends' photos, could block any user.

Since 2009, Hi5, being the most popular social network in 25 countries of Latin America, Europe, Asia and Africa, has refocused on social games and entertainment for young people.

Initially, the Facebook website, founded in 2004 by Mark Zuckerberg, was intended only for students at Harvard University. Gradually, the audience of users expanded: first, students from other universities in Boston could register in this community, and then students from any educational institution in the United States with an email address in the edu domain.

Since 2006, the Facebook social network has become available to all Internet users over the age of 13 who have e-mail.

The difference between Facebook and other social networks (Classmates.com, MySpace, Hi5) is that only real surnames, names and photos can be used in profiles here, not nicknames and avatars.

The main function of the Twitter service, created by Jack Dorsey in 2006, is the ability to quickly exchange short messages with friends.

Initially, Twitter was used by employees of the Odeo company - as a kind of chat for public exchange of messages between employees.

Thanks to Twitter, a new direction appeared on the Internet - microblogging, which allows the user to write and publish short notes that can be viewed and commented on by everyone or a limited group of certain users. Twitter is constantly updated, providing the user with new services: it became possible to add and view photos and videos, developed applications for smartphones.

A free application with elements of the social network Instagram, created by Kevin Systrom and Mike Krieger in 2010, provided the opportunity for users to share photos, leave comments on them, put "likes" on favorite photos.

The developers of Instagram are trying to improve the functions of this service: there are new possibilities for editing photos, now community members can post not only their photo albums, but also small videos, the function of searching for photos and users by hashtag has been added.

The main difference between Instagram and other social networks is the function of synchronizing the Instagram profile with other profiles created on Facebook and Twitter.

The development of social networks in Russia began much later than in America, Germany and other countries, so many projects are analogues of foreign social

networks: Classmates.com - "Classmates", MySpace - "My World", Facebook - "VKontakte", although the creator himself, P. Durov, says that this is not so.

Starting from 2006, Runet users began to register on popular sites - "VKontakte", "Classmates". The social network "VKontakte", founded in the fall of 2006, was initially available only to students of St. Petersburg State University, then began to unite students and graduates of Russian universities, now this social network is available to everyone. Pavlo Durov, the developer of VKontakte, says that in order to register on this site, you need to fill out a small questionnaire, indicating your real personal data.

A special feature of the VKontakte social network is that, in addition to communication and exchange of photos, audio and video, the opportunity to play various games together, there is also an opportunity for learning, which is used by teachers.

Albert Popov, the author and developer of the Odnoklassniki project, made a significant contribution to the recreation and entertainment industry of Runet. The Odnoklassniki social network, launched in 2006, also allows you to communicate with friends, exchange photos and read news feeds. In addition, the site has many applications with games that will help brighten up your leisure time and take a break from everyday worries.

The creators of "Odnoklasniki" believe that this site is not only an entertainment portal, but also a tool that helps those who find themselves in a difficult life situation. On the network, you can find requests for help: for example, if a child needs an urgent, expensive operation, parents turn to an audience of millions, and there will surely be people who can help them.

The popularity of social networks is increasing: every year, more and more people, registering in social networks, become their active users.

After all, such sites as Twitter, Facebook and others provide people with various ways to exchange information with each other: personal correspondence, posting

photos or videos, discussion in forums, comments, establishing with community members any what types of relationships (friendship, kinship, business relationships), communication using a mobile phone or Skype, providing assistance to those who find themselves in a difficult situation (searching for missing persons, collecting funds for an expensive operation, and much more).

Social networks implement the following functions:

- informative - communicating in social networks, people exchange various information, which may contain both elements of a personal nature (personal data, personal successes and achievements, photos), and elements of a news, cognitive, educational nature;

- communication - using social networks, people interact with each other, establishing various contacts: friendly, business, professional;

- entertainment - many social networks provide the following services: the user can watch any movie or TV show he likes, find music to his taste, choose a game according to his interests;

- identification - social networks allow participants to vary degree of anonymity. On the one hand, the user profile can contain real data (surname, first name, patronymic), or it can be represented by a fictitious nickname. Each person decides for himself whether his profile will be open to all members of the social network or only a certain group can view it - for example, classmates, relatives, friends;

- self-actualizing - it is in social networks that a person can to realize certain qualities of his "I", which may not coincide with his real social roles in life;

- socializing - thanks to communication in social networks users can create a wide circle of communication, which allows for the exchange of situational emotional states and moods, the desire to stand out from the crowd is realized, as well as the desire to join a reference group, share group values and feel protected, social competence

develops [12, p. 62-63], and for people with disabilities opportunities, social networks become a new tool that helps to lead a fulfilling life.

The following main effects and properties can be identified for real social networks [15]:

- availability of users' own opinions;

- change of opinion under the influence of other members of the social network;

- different importance of opinions (influence, trust) of some users for others;

- different degrees of susceptibility of members of the social network to influence;

- the existence of indirect influence in the chain of social contacts; the existence of - "opinion leaders";

- the existence of a threshold of sensitivity to changing the opinion of others;

- localization of groups ("by interests", with close opinions);

- accounting for "social correlation" factors;

- the existence of (usually less significant) external influencing factors (advertising, marketing campaigns) and, accordingly, external agents (mass media, product manufacturers, etc.);

- presence of avalanche-like effects;

- influence of structural properties of social networks on dynamics thoughts;

- the possibility of forming coalitions;

- game interaction of users; information management in social networks.

Speaking about the positive sides of social networks, we cannot help but say about the dangers that social networks hide in themselves.

Participants of social networks, posting their personal data, posting their various photos, should remember that not only relatives and friends, but any person who has

access to his personal page, may be interested in this information. It can be employers who control their employees, and bailiffs looking for non-payers, and various fraudsters.

All these groups can use confidential information about the user in their interests.

Social networks host a huge amount of information, which is rapidly distributed by users with the help of likes, posts and reposts. For example, very often on the pages of social networks there are all kinds of requests for help for sick children, but this information is not checked by anyone, which means that it can be known to be false.

By participating in various forums and chats, users may encounter such phenomena as trolling and flame. But the main danger faced by the majority of participants of social networks is wasted time on viewing the news feed on Facebook, "Classmates", "VKontakte", reading tweets on Twitter and publications on Instagram.

Thus, we can conclude that social networks play a big role in the social and spiritual sphere of public life, form new structures of interactions, form a new special social institution.

The interaction of the social environment and education contributes to the creation of social networks. After all, many social networks, originally designed for communication between colleagues (Twitter) or students (Facebook), are becoming available to a huge number of people around the world.

Social networks help people establish various contacts with each other (friendly, family, professional); expand the free exchange of information, help self-realization. While talking about the benefits of social media, we cannot forget about the threats that social media users face. On the one hand, the prevalence and demand of social networks attracts an increasing number of people to these social networks, but, on the other hand, the problem of privacy arises. The private life of any community member can become public property due to hacking or password cracking, there is a possibility of the

appearance of virtual doubles that can discredit the real user in front of his friends or colleagues.

Modern approaches to the study of social networks were formed under the influence of the long-term development of sociology, social anthropology, set theory, statistics, mathematical linguistics, etc. A significant increase in the number of users of social networks on the Internet provides an information base that allows at a qualitatively new level to provide research in the field of sociodynamics - an interdisciplinary scientific direction based on the combination of mathematical methods with the concepts of social sciences, on the basis of which a systematic approach to modeling a wide class of collective social processes in various sectors of society [2, p. 19].

Currently, the development of an automated research toolkit, which allows conducting sociometric research in social networks, is a rather urgent task [4].

On the one hand, traditional sociological methods based on sample formation and selective research are used in the research of online communities. On the other hand, the development of application software and means of computer analysis of textual information led to the creation of new research tools based on the automated analysis of cyberspace texts - analyzer services.

Experts from research centers and companies around the world use data from social networks to model social, economic, political and other processes from the personal to the state level, to develop mechanisms of influence on these processes, as well as to create innovative analytical and business applications and services.

However, when working with social data, factors such as the instability of the quality of user-defined content (spam and false accounts), problems with ensuring the confidentiality of user personal data during its storage and processing, and frequent updates of user and functional models must be taken into account. All this requires

constant improvement of algorithms for solving various analytical and business tasks [2].

The processing of social data also requires the development of appropriate algorithmic and infrastructural solutions that allow them to be taken into account. For example, the social networking site Facebook today has more than 1 billion user accounts and more than 100 billion connections between them. Every day, users add more than 200 million photos and leave more than 2 billion comments on various network objects.

To date, most of the existing algorithms that allow effective solving of current problems are not able to process data of this size in an acceptable time. In this regard, there is a need for new solutions that allow for the distribution of data processing and storage without significant loss of quality results.

Web interfaces for social networks are real-time data sources and are designed to view and interact with social network pages in a web browser or to use user data with specialized applications. Since scripts for using social networking interfaces do not automatically collect data from multiple users to build a social graph, there are a number of challenges:

- confidentiality;
- weak structure;
- access restrictions;
- the dimensionality of the data requires a parallel method of data collection, and as well as methods of obtaining a representative sample of social network users (sample).

When filling out their profile on a social network, users often falsely or intentionally fill in some fields or give false information about the facts of their biography, interests and preferences. In addition, a user-defined profile in content

networks (Twitter, YouTube, Instagram) is often limited to a set of basic attributes that are not sufficient to solve many tasks that lead to personalization of results.

Thus, methods of partial identification of the authors of messages based on the values of their demographic characteristics are relevant. In particular, in the systems and recommendations of Internet marketing, the determination of the demographic attributes of the user is of particular importance for the purposeful promotion of goods and services in groups of users with the same attribute values. In addition to Internet services, such demographic characteristics are used in various disciplines: sociology, psychology, criminology, economics, human resource management, etc.

Demographic characteristics can be divided into categorical (gender, nationality, race, marital status, level of education, profession, employment, religious and political views) and numerical (age, income level) [3].

Social media messages are a significant part of the textual content of today's Internet. In addition, social networks often act as informal mass media, where any user can publish news about what is happening (information discs).

However, the task of automatically loading a set of messages about unknown events in advance is not trivial due to the following factors:

- a large amount of input data (for example, Twitter users publish several thousand messages every second);

- a large number of irrelevant / uninformative messages;

- users can describe the same event in different ways

- different events may coincide in time;

- the difficulty of dividing the event and its events (for example, the Olympic Games and a separate football match within this championship) [4].

The next step is to enrich the user data on the route of social media behavior analysis. Behavior refers to the user's access to various resources and objects of social networks, for example:

- community;

- blogs of other users;

- articles;

- discussion;

- video and audio materials, etc

Analysis of the history of user behavior in the network allows to identify the most visited resources of users, the time of their visits, interesting content topics, etc. All this information allows you to significantly improve the profile of the network user and restore his missing data about him.

A similar method of data enrichment is relevant for unregistered users if they have cookies and visit logs.

In order to provide individual presentation of information to guests, users need to collect and enrich information about them as much as possible.

Profiles do not exist for this category of users, and their preferences, interests, social circle, etc. are not exactly known, but it is possible to indirectly extract this information by analyzing cookies and server log files.

The following data is available for analysis first:

- name and version of the operating system.

- browser name and version.

- IP addresses (where you can get a physical address, information about supplier)

- node content of the resource.

- the number of visits to the resource.

- path, etc.

Analysis of the content of cookies and logs probably identifies with a certain probability user interests, region of residence, time visiting resources and other things, which in turn will help to form an approximate portrait of the user.

It is important to understand that the information about users and guests of the network, obtained as a result of enrichment, is probabilistic.

The use of such services will make the social network more effective and attractive for the end user. It will be much easier for the user to find exactly what he needs among thousands of articles, discussions and accounts, without wasting time looking at unnecessary information. This, in turn, will increase user loyalty, and therefore the value of the network as a whole.

A potential application area is finding and compiling short infographics of users' reactions to unknown or predetermined events online and on the Internet. Examples of such events could be the next episode of a television show, sporting events, natural disasters, political events, the launch of a new service for users of a social network, etc.

A natural feature of human society is the tendency to unite in different communities. A similar picture is observed in social networks, where users are explicitly united (using network tools to create groups and interact in them) or implicitly - by establishing connections based on common or similar actions, roles, social circles, interests or other properties.

The search for user communities is an important tool for the study and analysis of social networks, allowing to explore the modular organization of the network and to use the information to solve different problems. For example, knowledge of the structure of communities is indispensable for predicting connections and attributes of users, calculating the proximity of users in a social graph, optimizing data flows in a social network, some analytical applications, etc.

Information about the community (modular structure) of the social network at the global level is used in recommendation systems, spam filtering and many other applications.

Automatically identified communities of users' closest contacts in the social network may be used to optimize the flow of incoming and outgoing information (send

messages only to the "Colleagues" community, read news only from the "Close Friends" community), or may not be valid social network accounts or profiles , which act as spam to block and spam real account profiles [5].

Thus, the analysis of profiles of participants in social networks is a promising direction of research, which requires a combination of methods of network analysis, computer linguistics and machine learning. Achieved solutions to the current tasks of this industry will allow creating innovative and cost-effective services and applications in the IT industry.

1.2 Analysis of literary sources and practical experience of use information systems and technologies in the subject area

At the moment, the research toolkit of social network analysis includes a number of programs focused on text analysis, the use of content analysis and discourse analysis methods (AutoMap, Discourse Network Analyzer).

The Discourse Network Analyzer program supports text file formats for analysis and serves two main purposes: it allows you to manually encode text data to validate communication agents and to export networks from this structured data. The program also allows you to use dynamic algorithms of longitudinal discourse analysis.

The AutoMap program allows you to work with .txt format files, contains a built-in text analysis tool, selects three types of information for analysis: content, semantic networks, and ontologically closed networks.

A certain set of software products is focused on building models of researched processes in social networks (CFinder, EveSim, SONIVIS).

The CFinder program allows you to highlight communities and their intersections. EveSim is a collaborative platform for interdisciplinary research, acting as a basis for participants' understanding, visualization and presentation of the concept.

The SONIVIS program is a Java-based tool. The functionality of the program consists of three main components: analysis, modeling and statistics. In addition to various wiki techniques and other network analysis metrics, the tool provides a user-defined graphical interface.

A number of software products for the analysis, as rule, of social networks are focused on the use of statistical tools. For example, the STOCNET program is designed for statistical analysis of SN and uses probabilistic (stochastic) models.

The development of the company Analytic Technologies - UCINET serves for the analysis of social networks - identification of bottlenecks in the network and information flows, checking their integrity, etc. UCINET uses a number of methods to analyze social networks: identification of subgroups, role analysis, elementary functions of graph theory, basic functions of statistical analysis. In addition, the product supports matrix analysis of functions, in particular, matrix algebra and multivariate statistics. The NetDraw program integrated in UCINET is used to visualize the social network.

There are a number of services that combine various tools and provide visualization services of sociodynamic processes. Gephi is the best of the considered interactive visualization tools, as well as a research platform for the study of all types of networks and, as rule, complex systems, dynamic and hierarchical graphs. Users properly have the ability to change structures, shapes and colors, as usually, in order to reveal hidden properties.

It is also necessary to note the functionality of freely distributed programs, in particular, the specific capabilities of the Pajek program are its focus on the analysis and visualization of large social networks consisting of millions of nodes. It should also

be mentioned the InFlow tool, which supports, in addition to visualization, analysis based on the scenario "what if?" - the user changes the network structure and receives new metric values.

The Cytoscape platform is an integrator of data, tools for their analysis and visualization, where each researcher can add his own tools. Cytoscape is used by social science researchers to visualize and analyze large social networks of interpersonal relationships, to collect data about social networks from spreadsheets and other formats, to aggregate social interactions using various web services and a built-in crawler, to calculate network statistics and other tasks .

Social Networks Visualizer (SocNetV), a tool for analyzing and visualizing social networks, allows you to construct networks in the form of mathematical graphs or download data, supporting various formats (GraphViz, GraphML, Adjacency, Pajek, UCINET, etc.). And modify them according to the needs of the researcher. The service also has a built-in crawler that allows you to automatically collect information about networks on the Internet.

Also, to date, a large number of software applications for the analysis of social networks have been developed, designed to represent the structure of networks in the form of a graph. Let's briefly consider some of them.

MentionMapp is a web service designed for flash visualization of a graph of connections between users of the Twitter network who use the same hashtags in a stream of tweet messages, while the number of mentions affects the strength of connections - the thickness of the lines (figure 1.1).

NodeXL - a plug-in for working with Microsoft Excel, allows you to import, process data and graphically present complex social structures in Twitter, Flickr, YouTube, Facebook networks. NodeXL numerically displays key network parameters: user clusters (groups), node ranks, graph density.

Figure 1.1 - An example of the connection graph of the MentionMapp service.

Twiangulate is a web service designed to compare groups of Twitter followers. Offers several options for visualization of results - in the form of a graph of social connections or in the form of a table. When constructing the graph, "one-sided" and "mutual" friendships are displayed in different colors. As an example, Figure 1.2 shows a directed graph of social connections. The service evaluates the "authority" of individual accounts or several selected users (this information can be provided by the Euler-Venn diagram). Authority user is determined by the ratio of the number of followers / followings and the number of tweets / retweets. Users with a higher authority

will have a significantly higher entry degree compared to the original one, that is, they will be known by significantly more participants than they know themselves.
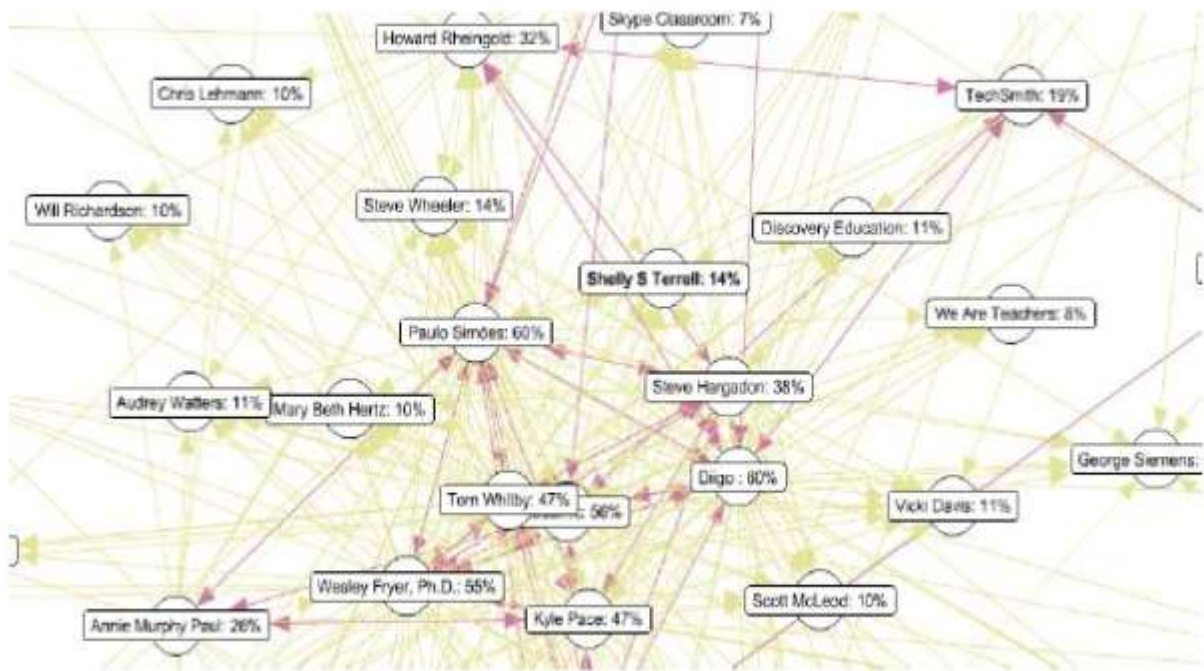
Figure 1.2 - Directed (oriented) graph of social connections: arrows show one-way and two-way connections between participants (service twiangulate)

InMaps is a service designed for interactive representation of the LinkedIn social graph. The graph allows the user to see which groups his professional connections are divided into, how his business contacts are related to each other. Among the additional functions is the ability to find people with the strongest connections, which represent a kind of centers of business activity.

TouchGraph - a web application that allows you to view a graph of a user's social connections on the Facebook network.

There are other means of automatic analysis of social connections, among them: Visualization of VKontakte friends, SNAP, NetworkX, NetMiner, ORA, Cytoscape, etc.

As an example, Figure 1.3 shows the graph of communications in the Facebook social network, built by the Yasiv service.

Itudent society, young people studying, colleagues at work

A network of professional contacts for scientific work

Personal contacts, friends, fellow students

Virtual media and society
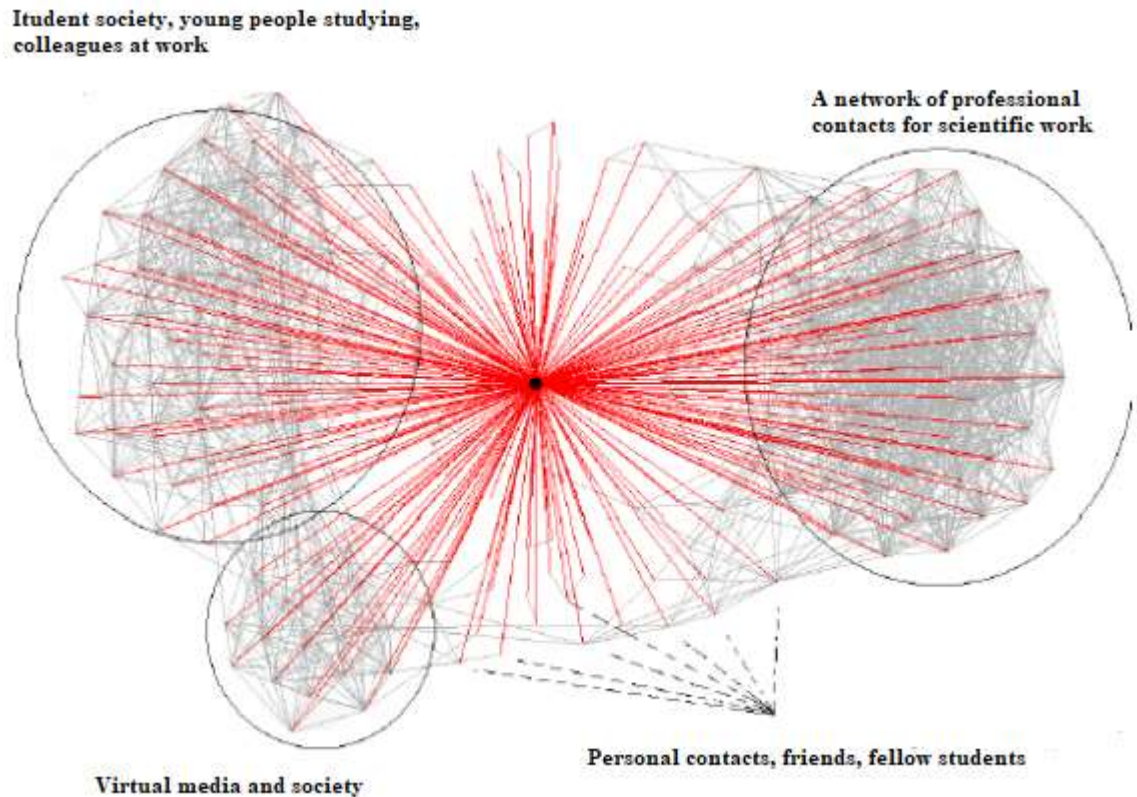
Figure 1.3 - Visualization of the structure of the personal network of an account in the social network Facebook - 224 nodes, built by the Yasiv service

There are also social network user analyzers for phones. For example, Social Unfollowers + is an application that provides analysis of a social account, including a list of:

-       Are not subscribers - people who do not follow you in social networks.

-       Fans are people you are not following on social networks.

-       White list – you can add your favorite users to the white list list by clicking the whitelist button and they will not appear in the unsubscriber list.

-       Unsubscribe from users in one click

-       Mutual - People who follow you and you follow them back.

-       Subscribe and unsubscribe (mass unsubscribe from users) - Follow / unsubscribe from a mass number of users.

App Unfollowers for Instagram. Instafollow is an Instagram account management tool. With Instafollow, you can analyze users who come to your account, but do not subscribe to it, and you can also monitor users who are subscribed to an account in the social network. Networks.

The functions of the application include:

-       unsubscribing from your Instagram page.

-       it is possible to follow users on Instagram.

-       viewing the list of subscribers.

-       a list of people you monitor.

-       it is possible to filter the results according to any list in the application.

-       it is possible to disable advertising using the cellular networkdata communication.

StarComment - the service works with social networks Vkontakte, Instagram, Facebook, Odnoklassniki and others. It allows you to monitor the comments of subscribers in your own or other people's groups, search for mentions of the account by keywords, check personal messages and direct messages, monitor comments on a specific record, and download user IDs. The system promises instant notifications of new comments and messages.

Figure 1.4 – Work panel of the StarComment service.

Figure 1.5 – Creating a task for the StarComment service

Chotam supports VKontakte, Facebook, Instagram, Odnoklassniki, YouTube and Twitter. It works only with comments, the filter allows you to configure which comments need to be tracked: in a certain group or account, on a separate post in the social network.
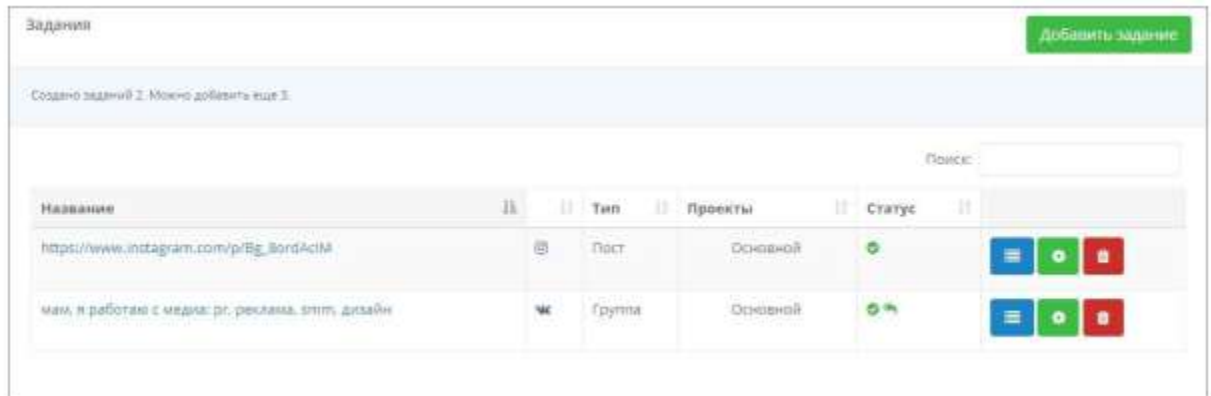

Figure 1.6 - Chotam service dashboard with two tasks

Socialkit Online is an online service for tracking comments and messages with the function of delayed posting. Allows you to track comments from competitors, send messages to direct mail, and in particular to all new subscribers. Works with VKontakte, Instagram, Facebook and Odnoklassniki.
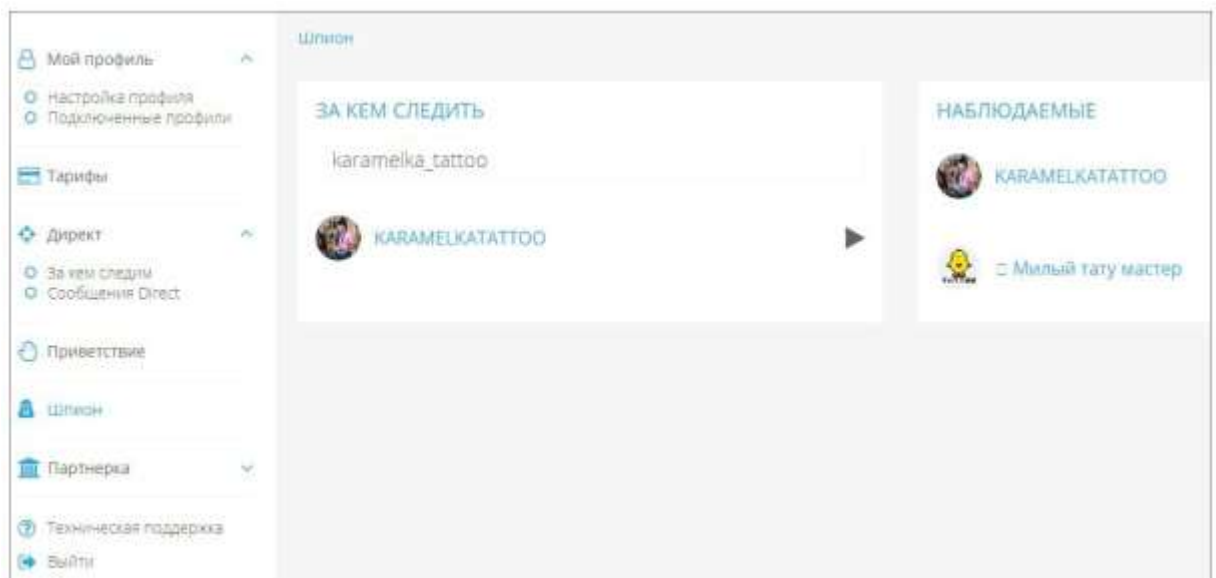

Figure 1.7 – Work panel of the Socialkit Online service

The program from the same service has greater functionality and includes, for example, audience collection. A complete list of opportunities is available on the website https://socialkit.ru/opportunities (Figure 1.8).

Figure 1.8 - Workspace of the Socialkit Online program

Thus, it can be stated that there are several alternative packages in each direction in the considered subject area; at the same time, mastering them all is probably beyond the power of one user.

In the first section justified topicality application of information technologies in the implementation of the application, which is responsible for the analysis of the user base of the social network.

An analysis of the current state of IT use was carried out, including when solving tasks related to the analysis of users of social networks. An analysis of the modern development of IT in different countries of the world was carried out.

2 STATEMENT OF THE PROBLEM AND RESEARCH METHODS

2.1 Statement of the problem

Nowadays, information technologies make it possible to optimize, and in many cases, automate information processes, which in recent years have taken up more and more space in the life of human society.

It is advisable to use IT to develop an application for analyzing the user base of a social network. The application development process will be solved by several scientific methods, which are given below.

With the help of analysis and synthesis methods, a data model was created, which will contain defined data, namely: new subscribers, existing subscribers and unsubscribed users. And data comparison with existing users in the database was also carried out.

With the help of the modeling method, the analyzer application project will be designed, which will implement the proposed system. And at the final stage, an analyzer-application is being developed, with the help of which it is possible to analyze the user base of the social network.

Also, the proposed analyzer application performs the functions of an account promotion program, i.e., the Instagram application has such a limitation that if a user's account has 1,000 or more followers, he will automatically be shadow banned and receive a limit on the number of views per post, due to this in account subpet number of views and audience size. This also applies to those accounts that have few followers, but have subscribers with accounts with a large number of followers. With the help of this developed application, we will track all the information and improve the promotion of the account.

Also, with the help of the application, it will be possible to view the number of subscriptions in a certain account, that is, an account.

The results of the work can be used by users of the social network for analysis, monitoring, promotion, bypassing Instagram account blocking.

2.2 Analysis and specification of application requirements

To create the program, it was decided to use the TypeScript language. It is a language translated into JavaScript, which, unlike JavaScript, has static typing. Back-end works on the node.js platform, run programs written in JavaScript on the computer. The work was carried out in the WebStorm IDE.

It was decided to use the SPA (Single Page Application) architecture on the front-end. Applications built according to the SPA architecture represent a single page on which the script is connected.

An empty page with a connected script is loaded from the server, which, in turn, forms a graphical user interface. The main advantage of this architecture is that the page is loaded from the server all at once, and when interacting with the application, the user does not need to wait for the page to load.

The app uses the ReactJS library to render the user interface. Data exchange between the client and the server is carried out via AJAX.

Back-end development. First of all, we started working on the back-end. The instagram-private-api package was used, which represents ready-made instagram query functions written in TypeScript.

First of all, authentication in Instagram was implemented. The user sends the data for authorization to Instagram to the server, the server processes the authorization to Instagram and, in case of successful authorization, receives the user's id and the user's cookies. Cookies and user id are stored in the database for further requests.

Account analysis consists of three parts:

a) getting a list of all subscribers, new subscribers and those who unsubscribed;

b) receiving the number of likes of each subscriber; receiving information about the number of subscriptions from subscribers.

At the first stage, the application receives a list of all followers from the Instagram API. For each subscriber, the existence of a record in the database is checked. If there is no record, the subscriber will be added to the new list and a record will be created in the database.

Additionally, if there are records in the database that are not in Instagram's response, those records are removed and users are placed on the unsubscribe list.

At the second stage, the application receives a list of all account posts from the Instagram API. For each publication, a list of users who liked it is downloaded. The application cycles through these lists and each time increases the number of likes from subscribers.

The third stage of the review of Instagram API limits on the number of requests takes place separately from the first two after clicking on a special button. The application receives information about the subscriber's account from the Instagram API and shows the user the number of accounts to which he is subscribed.

Due to the limitations of the Instagram API, account analysis takes a lot of time and it is not rational to conduct it every time you use the program.

Therefore, the analysis report is stored in the database. When using the program again, the user receives a ready-made report from the database. In order to get up-to-date information, the application has a button that starts a re-analysis.

While working on the application, a problem appeared - for the security of the Instagram account, which blocks authentication from a previously unknown IP address. In this case, the server asks to send the user a confirmation code via SMS or Email, and the user is shown a form for entering the code. When the user enters the code,

authentication is confirmed and the server receives cookies and the ID of the authenticated user.

The front-end consists of several elements:

a) authorization form visible only to unauthorized users;

b) a form for entering a confirmation code, which is visible only if necessary;

c) a panel with information about the report and a button to start re-analysis;

d) a panel with the results of account analysis;

e) session termination button.

All this is collected by the webpack utility. The development also used webpack-dev-server, a utility that automatically starts the assembly and reloads the page when the code is changed.

In the second chapter, the purpose of the work, the specification of requirements, the setting of the task for the information system and the justification of the choice of methods for developing the application for the analysis of the social network user base are formulated.

3 DEVELOPMENT OF APPLICATION MODELS

3.1 Development of a data model of the analyzer application

Implementation of the application process in the form of an analyzer requires the availability of technical and software tools for data collection, storage and processing. The process of storing and processing data about users involves downloading their accounts from the social network Instagram or when entering automation data.

The application data model in the form of a social network user base analyzer is presented in Figure 3.1.
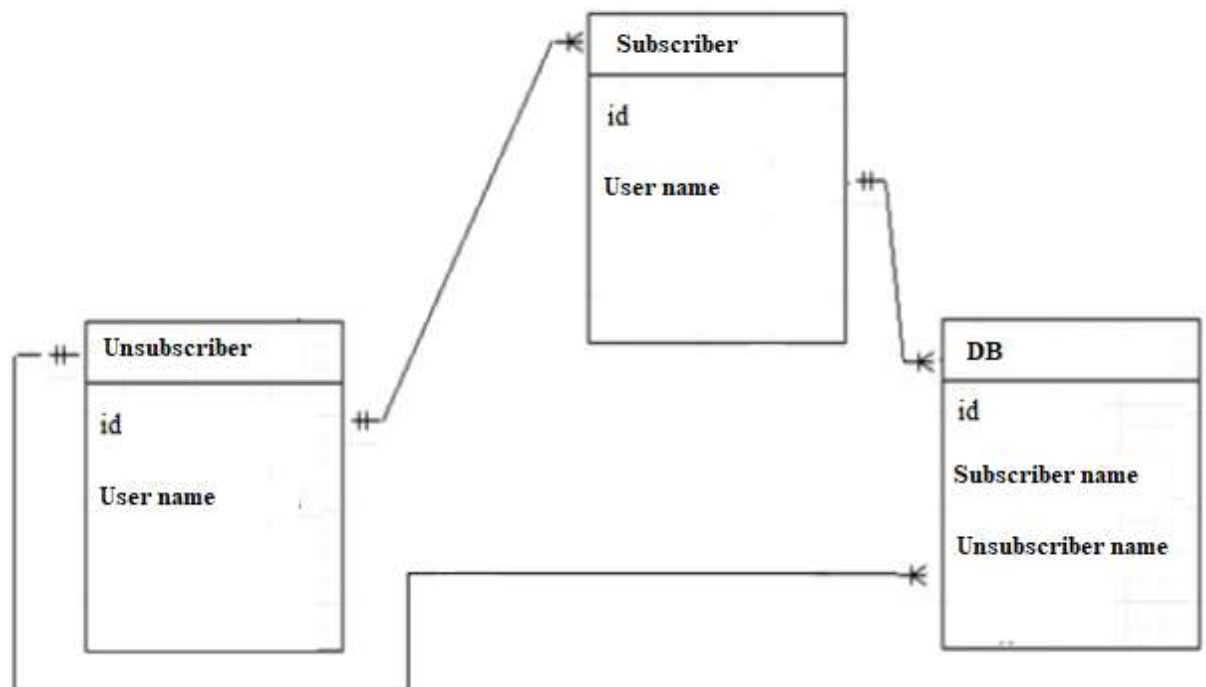
Figure 3.1 - Application data model

One of the components of the decision support process is an application in the form of a user base analyzer.

The application for user analysis is based on such principles as the implementation of real-time data storage and visualization, which ensures efficiency of data collection; minimizing the risk of collecting erroneous data; availability of algorithms for processing the collected data; presentation of data on request.

In this case, the application system is aimed at the implementation of functions consisting in the collection of data entered by users, placement of collected data in the database, visualization of data in the form of tables.

Figure 3.2 shows the process diagram of the user base analysis application in general.
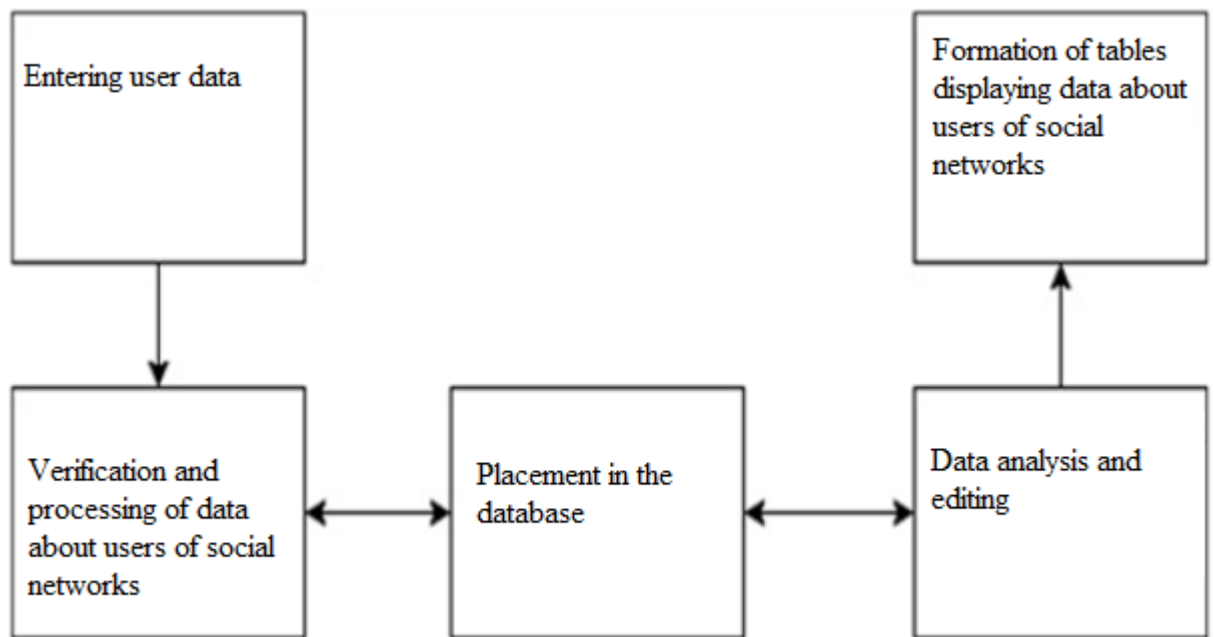

Figure 3.2 - Application process diagram for the user base analyzer in general

To achieve the goal of an effective application for analyzing the user base, complete and timely information is necessary, which must be monitored from the Instagram application. In this regard, it is necessary to develop a system that allows to form a single information service from the database for the analysis of the user base of the social network.

The development of such a system is intended to solve the following tasks:

- to ensure reception and processing of data from social users networks in real time from users;

- to ensure the possibility of working with specialized predictive and data processing analytical programs;

- form data tables of social network users. The technical implementation of the program took place: Back-end:

- JavaScript (TypeScript);

- node.js;

- SQLite.

- Front-end:

- JavaScript;

- ReactJs;

- Material-UI.

MySql database was used to store large volumes of social network user data. The NGINX server was used to transfer data in the shortest possible time.

3.2 Model of options for using the application

The concept of a use case (precedent) was first introduced by Ivar Jakobson and gave it such significance that currently the use case has turned into the main element of project development and planning.

A use case is a sequence of actions (transactions) performed by the system in response to an event initiated by some external object (actor).

A use case describes a typical interaction between a user and a system. In the simplest case, the use case is determined in the process of discussing with the user the functions that he would like to implement.

The main functions of the application for the analysis of the user base of the social network are presented in Figure 3.3 in the form of a UML diagram of use cases.
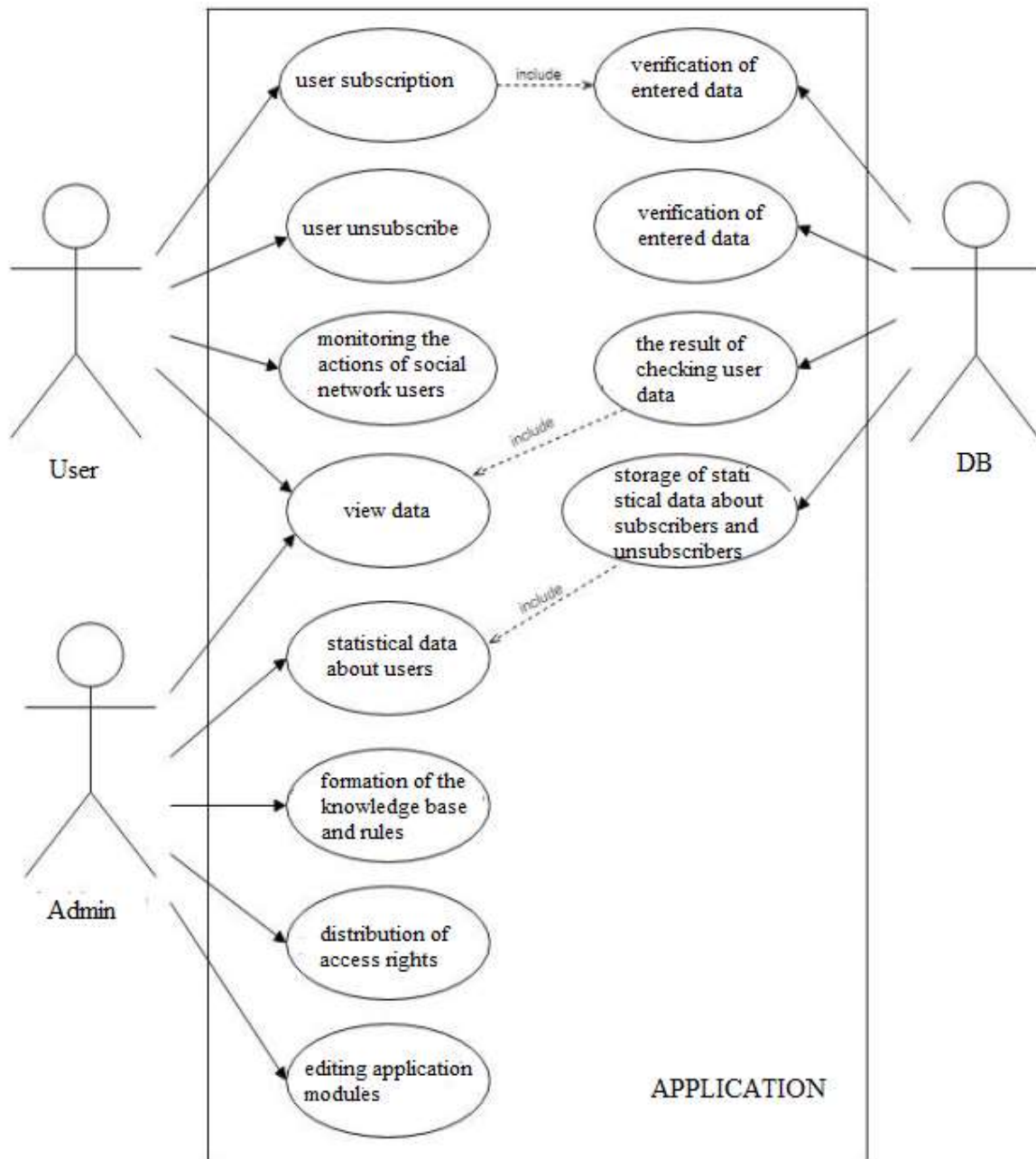

Figure 3.3 - Diagram of options for using the database application users

In the application for the analysis of the user base of the social network, the main actors are the administrator, the user and the database.

The user can conduct control procedures of subscribers, unsubscribers and users of the social network almost online. The collection of data about users is carried out by the method of users clicking on another user's page. The user must enter authorization data in the system. You can also view data about users' actions on Instagram.

The administrator has full rights to manage the application. He distributes access rights to the application, has the right to add, edit and delete all statistical data of indicators about users and their actions in the application. Also, the administrator is responsible for filling the pages of the IT application with information.

The database contains data about application users, subscribers and unsubscribers, verifies data about users, and checks whether they are entered in the database. Also, the database contains previously saved and analyzed statistical indicators of users and the results of checking data about subscribers and unsubscribers.

3.3 Diagrams of classes, components and structural-functional model application

A class diagram is used to represent the static structure of a system model in the terminology of object-oriented programming classes.

A class diagram can reflect, in particular, various relationships between individual entities of the subject area, such as objects and subsystems, and also describes their internal structure (fields, methods, etc.) and types of relationships (inheritance, implementation of interfaces, etc.).

This diagram does not indicate information about the temporary aspects of the system's functioning. From this point of view, the class diagram is a further

development of the conceptual model of the designed system. At this stage, knowledge of the OOP approach and design patterns is essential.

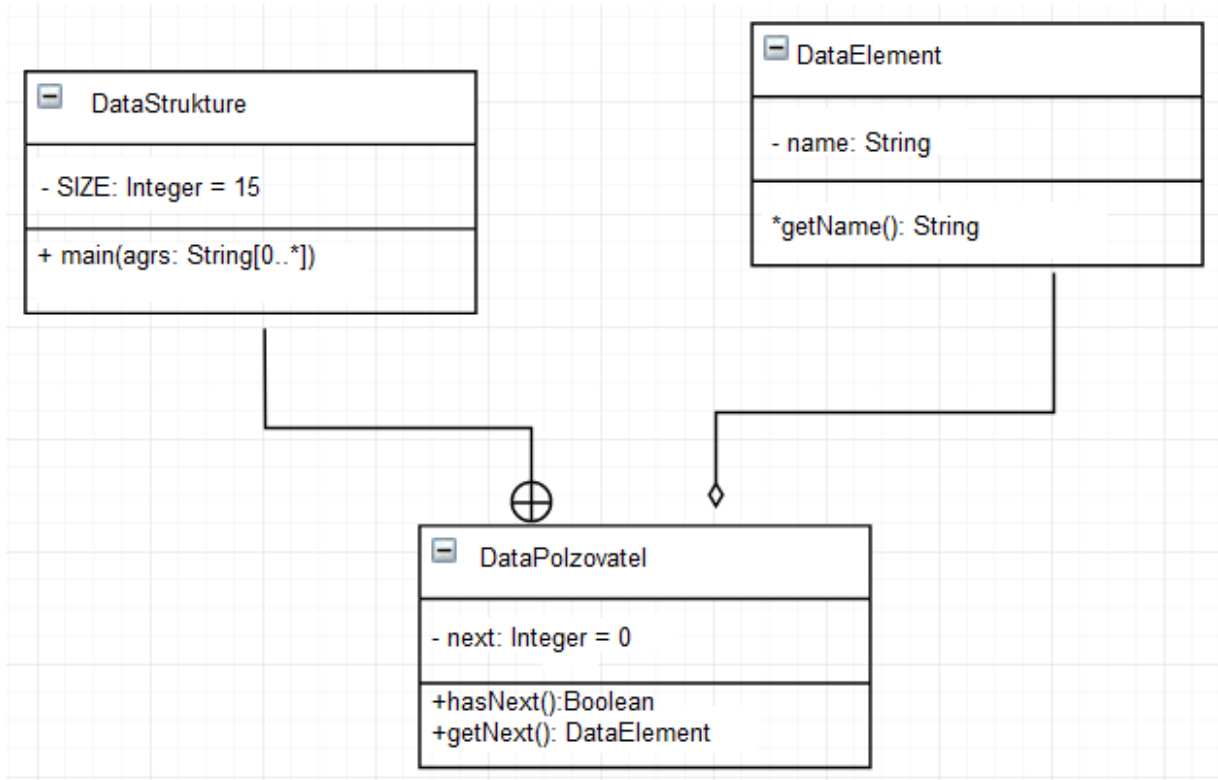The class diagram of the analyzer application is presented in Figure 3.4.

Figure 3.4 – User base application usage class diagram

The component diagram describes the features of the physical representation of the system. The component diagram allows you to define the architecture of the developed system by establishing dependencies between software components, which can be played by source, binary, and executable code.

In many development environments, a module or component corresponds to a file. The arrows connecting the modules show interdependence relationships similar to those that occur when compiling the initial program code. The main graphic elements of the component diagram are components, interfaces and dependencies between them.

The diagram of the components of the social network user base analyzer application is presented in Figure 3.5.
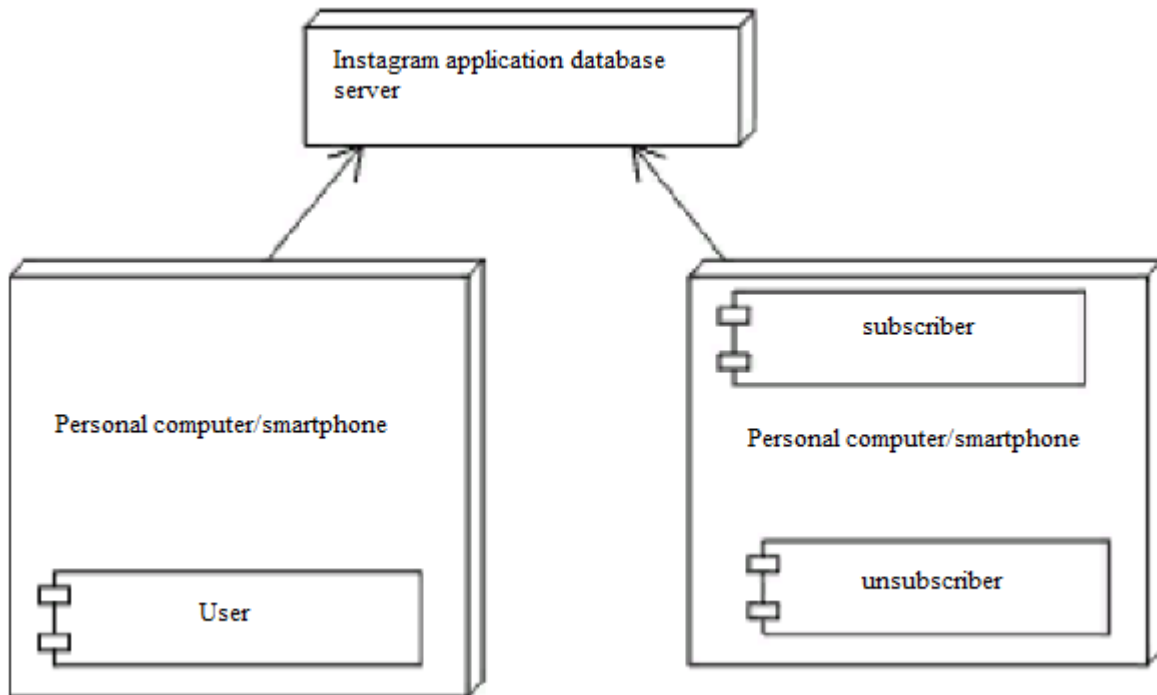
Figure 3.5 – User base application components diagram

As can be seen from the diagram, the application will process user requests for subscriber or unfollower data from a personal computer or smartphone, sending requests to the Instagram database server.

Next, we will simulate the structural-functional model. A functional model describes the calculations in the system. It shows how the output data is calculated from the input data, without considering the order and method of implementation of the calculations.

A functional model consists of a set of data flow diagrams that show the flow of values from external inputs through operations and internal data stores to external outputs. The functional model describes the meaning of object model operations and dynamic model actions, as well as restrictions on the object model. Non-interactive programs (for example, compilers) have a trivial dynamic model: their goal is to calculate the value of some function. The main model of such programs is the functional

model (although if the program has non-trivial data structures, the object model is also important for it).

The SADT (IDEF0) method (Structured Analysis and Design Technique) is considered a classic method of a process approach to management. The main principle of the process approach consists in structuring the organization's activities according to its business processes, and not the organizational staff structure. It is the business processes that form a significant result for the consumer that represent value, and it is their improvement that should be pursued in the future.

The model based on the organizational staff structure can only demonstrate the chaos prevailing in the organization (which, in principle, the management is already aware of, otherwise it would not have initiated the appropriate work), based on it, it is only possible to make proposals to change this structure. On the other hand, the model based on business processes also includes the organizational and staff structure of the enterprise.

The SADT method is a set of rules and procedures designed to build a functional model of an object in any subject area. The SADT functional model reflects the functional structure of the object, i.e. the actions performed by it and the relationship between these actions. The main elements of this method are based on the following concepts:

-       Graphic representation of block modeling. Graphics of blocks and arcs of the SADT diagram represent the function in the form of a block, and input / output interfaces are represented by arcs that enter and exit the block, respectively. The interaction of blocks with each other is described using interface arcs that express "constraints", which in turn determine when and how functions are executed and controlled.

-       Strictness and accuracy. Compliance with the SADT rules requires sufficient rigor and accuracy, without at the same time imposing excessive restrictions

on the analyst's actions. SADT rules include: limiting the number of blocks at each level of decomposition (the rule of 3-6 blocks is a limitation of the power of short-term human memory), connectivity of diagrams (numbers of blocks), uniqueness of labels and names (absence of repeated names),

syntactic rules for graphics (blocks and arcs), division of inputs and controls (rules for determining the role of data).

- Separation of the organization from the function, that is, exclusion of influence administrative structure of the organization on the functional model.

The SADT method can be used for a wide variety of procemssoedsealinndg systems. In existing systems, the SADT method can be used to analyze the functions performed by the system and indicate the mechanisms by which they are performed.

The result of the application of the SADT method is a model that consists of diagrams, text fragments and a glossary that have links to each other. Diagrams are the main components of the model, all organizational functions and interfaces are represented on them as blocks and arcs, respectively. The place of connection of the arc with the block determines the type of interface. The control information enters the block from the top, while the input information to be processed is shown on the left side of the block and the results (output) are shown on the right side. The mechanism (human or automated system) that performs the operation is represented by an arc entering the block from below.

The context diagram of the structural and functional model of the application is presented in Figure 3.6.
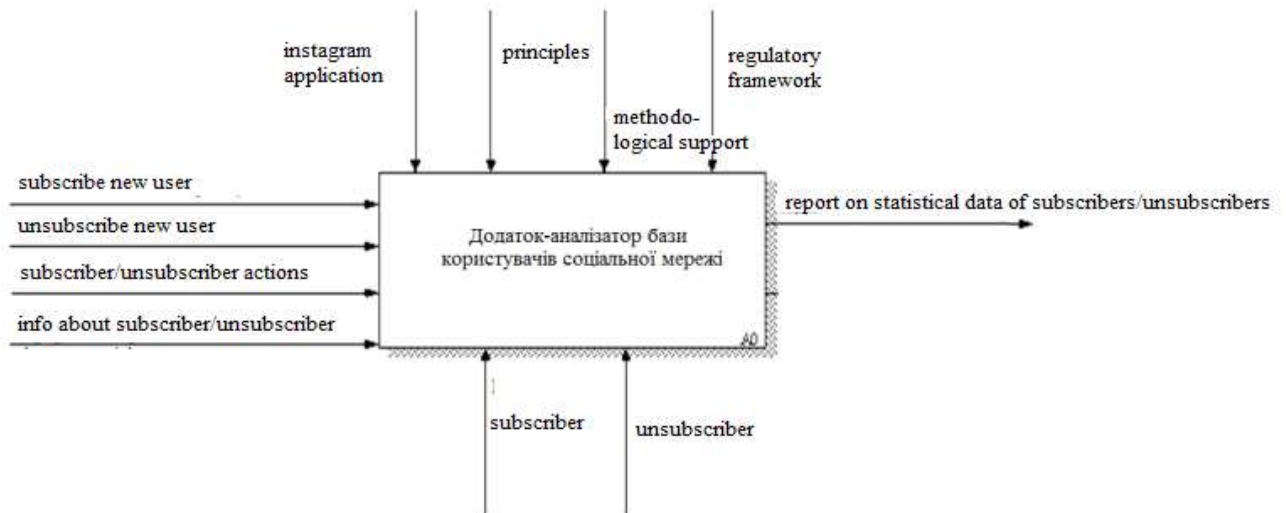
Figure 3.6 – Structural and functional model of the application

3.4 General architecture of the application

The application for analyzing the user base of the social network is implemented on the basis of a three-level client-server architecture for building web applications.

The generalized architecture of the application, which includes data storage and data manipulation tools (DB server), server, workstation, as well as a set of software modules implementing data processing, is presented in Figure 3.7.

The use of the application in the form of a social network user base analyzer, built on the basis of the presented architecture, provides prompt monitoring of current user data, as well as information provision of the social network user base.
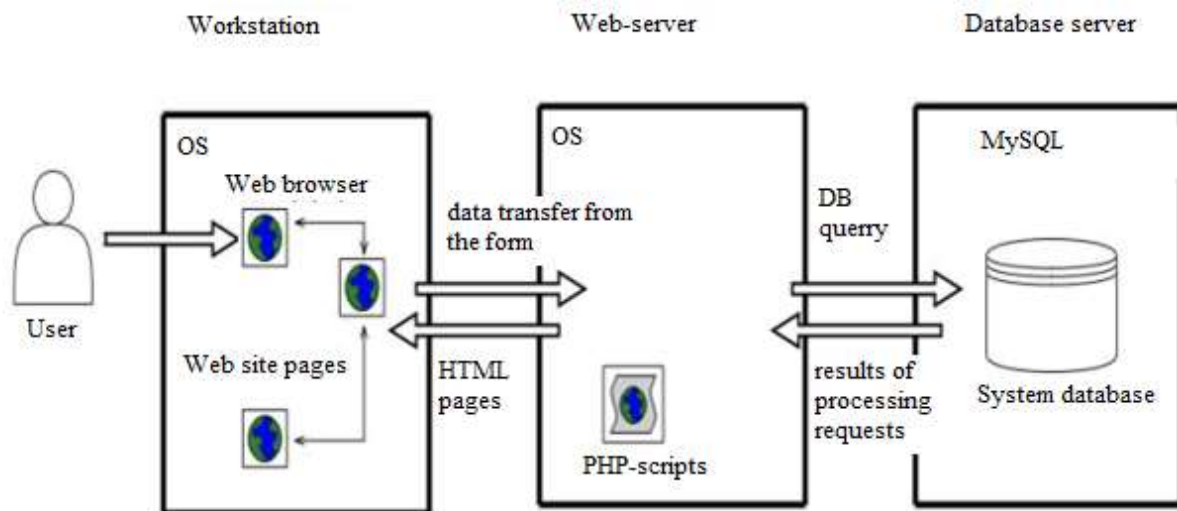
Figure 3.7 - General architecture of the IS analyzer

3.5 Designing the application system

In accordance with the task, we suggest using the application in the form of a social network user analyzer, presented in Figure 3.8.

An application for the analysis of social network users must combine the system with the application of project elements and data stored in the database.

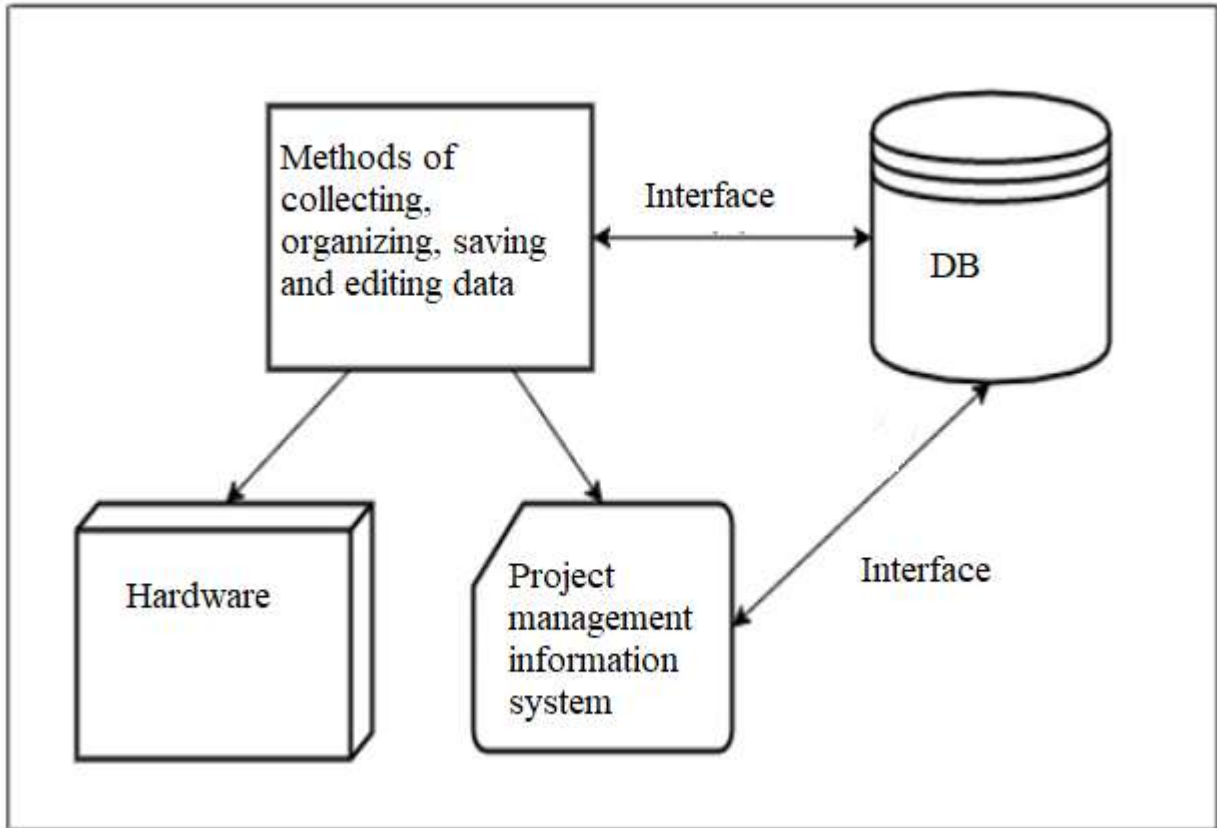For the convenience of the user, an ergonomic interface should be created.

Figure 3.8 - Structure of the application for users of the social network

The components of the information support system of the social network user analyzer application are shown in Figure 3.9.
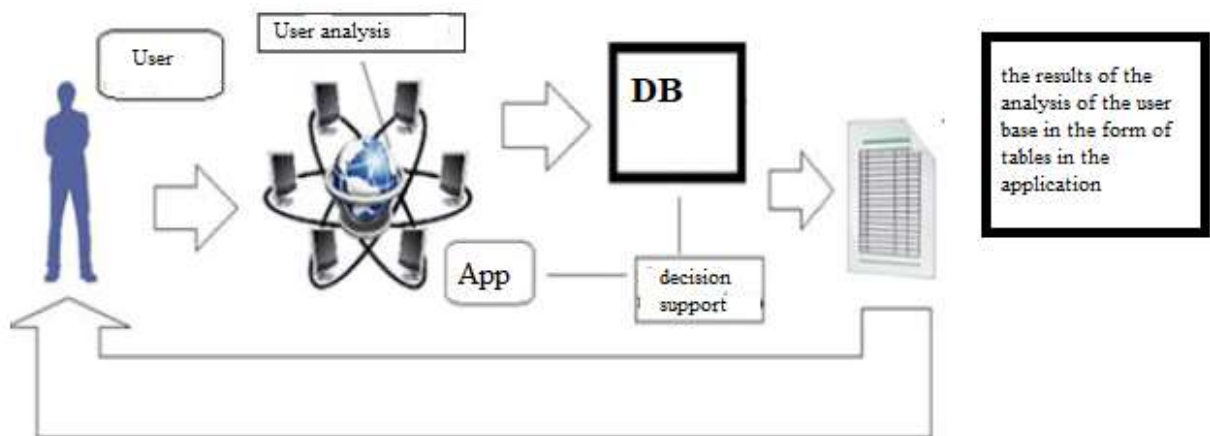

Figure 3.9 - Components of information provision of the support process decision-making application for analyzing the user base

The application is developed for the purpose of solving scientific and applied tasks on saving and managing the analysis data of social network users.

The main requirements for the application and its system are completeness, coverage of all aspects of information, software, and technical support that occur during the operation of the system.

The system should be comprehensive. The main advantages of such an application in comparison with traditional methods are the possibilities of joint analysis of large groups of data and their interconnection. The designed application should simulate the research technology. The application system should be open, providing ease of modification and operation to new conditions to maintain it at a modern level.

The application in the form of an analyzer of any resources should provide certain information in a way that is convenient for the user in relation to the data customer. Such systems are analyzer applications.

To save, visualize and analyze users of the social network, an application was developed for processing data stored in a database. An ergonomic interface is being developed for user convenience.

Spatial data and their connections with tabular data are poorly described by the relational model, so the complete data model in the application (Figure 3.10) has a mixed character, while the semantic information of objects will be represented by relational tables.

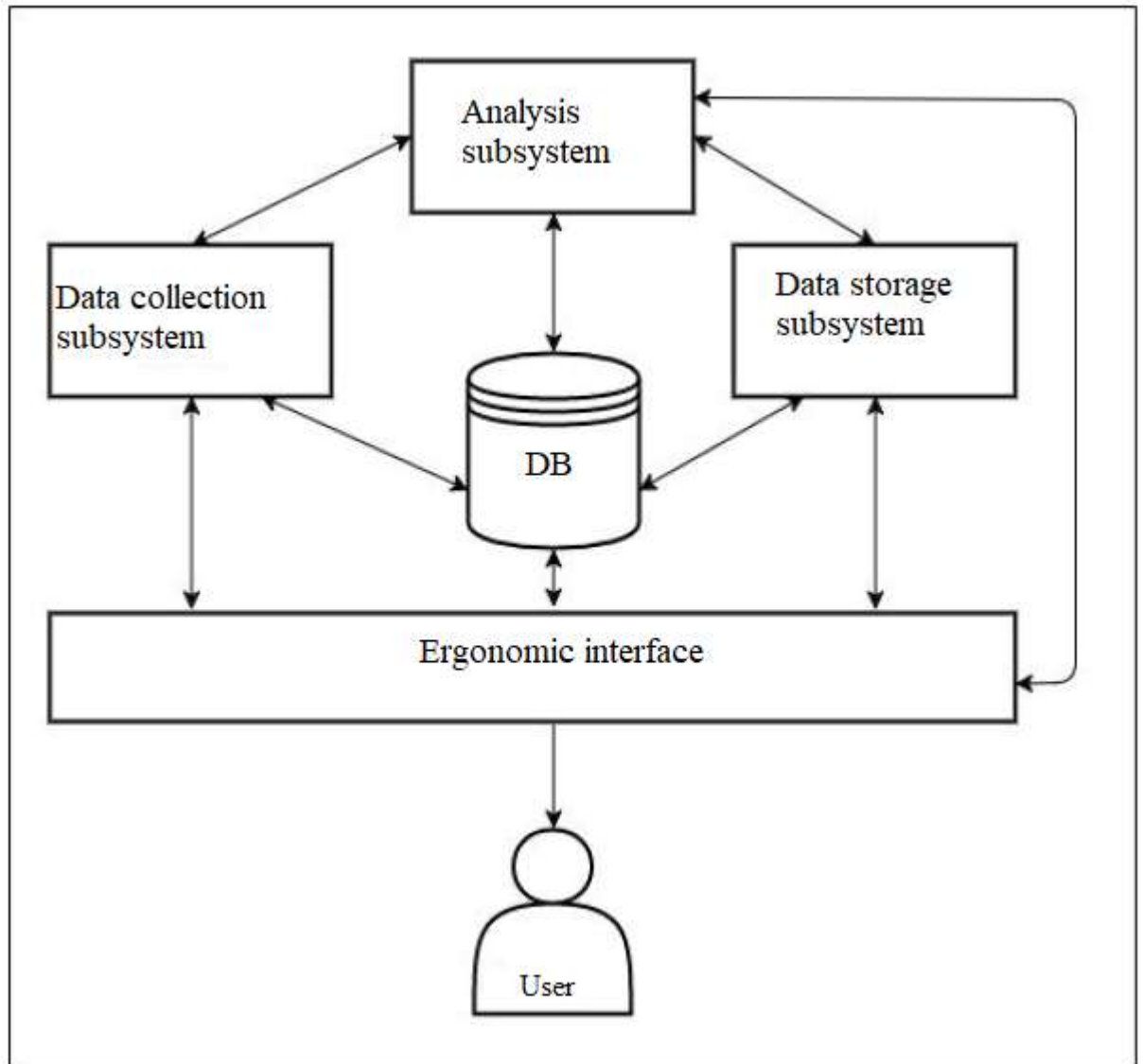Figure 3.10 - Structure of the user base analysis application social network

The analyzer data model used must satisfy the following conditions:

-       The database should be easily expandable during reorganization and expansion subject area;

-       The database should be easy to change when changing software and hardware environment;

-       Data before inclusion in the database should be checked for reliability;

- Access to the data placed in the database should only be granted persons with relevant authority;

- Data must be in formats accessible to developed analyzer application.

The process of monitoring user indicators involves the performance of functions of entering and searching for information about the status of subscribers, unsubscribers and user actions.

In the section, the data model of the analyzer application is presented in the form of a database. The application has a three-level architecture. A description of the functionality of the developed application is given, the use cases are presented in the form of a UML diagram of the use cases.

3.6 Design and implementation of application components

The application has a rather complex structure and is considered as a complex of hardware, software and information support.

Information support consists of:

- aggregates of arrays of information,

- coding systems,

- classification of information.

Information support is implemented solutions by types, volumes, placement and forms of information organization, in particular, search and evaluation of data sources, a set of data entry methods, database design, their management and meta- support.

User data is processed in the process of connecting to the Instagram API server, or in the process of transforming and synthesizing the spatial data infrastructure.

Technical support consists of a complex of hardware used in the functioning of IT/application:

- personal computer (PC),

- information input-output devices,
- data processing and storage devices,
- means of telecommunication - smartphone.

The PC is the core of any information system and is designed to manage IT work and perform data processing processes based on computational or logical operations. The created application is capable of quickly processing arrays of information and visualizing the results.

Data entry is implemented using technical means and methods:

- from the keyboard,
- with the help of a digitizer,
- through external computer systems.

Spatial data is obtained by inputting data to the Instagram API.

Devices for data processing and storage are concentrated in the system unit, which includes a central processor, RAM, external storage devices and a user interface.

Data output devices provide a visual display of results on a computer or phone monitor.

The analyzer requires the following technical support with the following minimum characteristics:

The server part of the PC:

- A computer with an Intel Pentium 4 / Athlon 64 processor or later versions with SSE2 support;
- RAM 1 GB (recommended from 2 GB)
- Hard disk space from 1 GB

Exact technical characteristics of the server will be specified after the completion of the system and extensive testing of all modules of the portal.

PC client part:

- A computer with a Pentium IV 1 GHz processor (recommended from 1.5 GHz)

- RAM 256 MB (recommended from 512 MB)

The server part of the Smartphone:

Core type Cortex-A73 (64bit) + Cortex-A53 (64bit) and similar in terms of characteristics;

Video core ARM Mali-G51 MP4 and similar in terms of characteristics; The number of cores is 4 + 4;

Frequency 2.2 GHz + 1.7 GHz.

The software consists of a set of software tools that realize the functionality of the application and software documents necessary for their operation.

Structural software of the analyzer application includes basic and application software.

Basic software includes:

- operating systems (OS),

- software environments,

- network software,

- database management systems (DBMS).

Operating systems are designed to manage computer resources and processes that use these resources.

The social network analyzer application works with spatial data. For their management, the software contains a DBMS, as well as modules for managing data input and output, a data visualization system, and modules for performing spatial analysis.

Applied software tools are designed to solve specialized problems and are implemented in the form of separate programs and utilities.

For optimal efficiency, we advise you to adhere to the following information system requirements:

Server-side software requirements. The following software is required for the system to function:

1)   for PC:

-       Operating system - Windows XP with update package 2 +,

Windows Vista, Windows 7, Windows 8, Windows 10;

-       Web server - Apache version no lower than 1.3.26;

-       DBMS - MySQL version no lower than 3.23.

Client software requirements. The system must be available for full functionality viewing using the following browsers:

-       MS IE 5.0 and above;

-       Opera 6.0 and above;

-       Mozilla Firefox 1.0;

-       Mozilla 1.7.

2)   Android 9.0 operating system (EMUI 9.0.1)

The system must be functional (the information located in it must be available) when flash and JavaScript support is disabled in the browser.

Implementation of the main functions of the application

Working with the web interface of the social network user base analyzer application begins with authorization, where you need to enter a username and password (Figure 3.11).
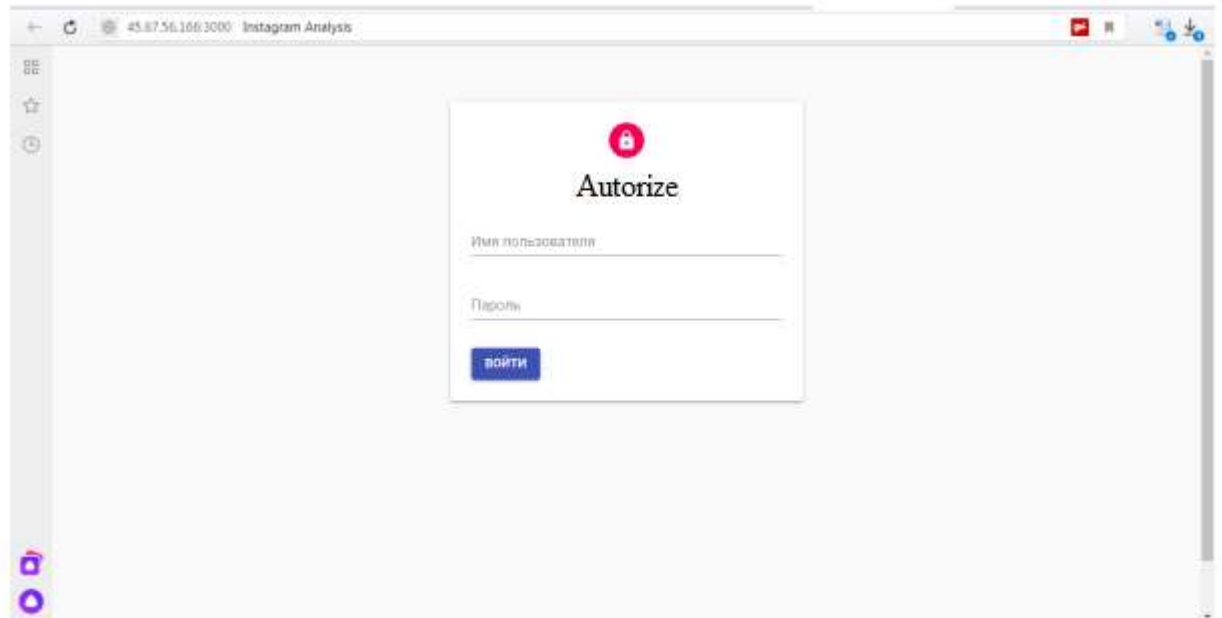
Figure 3.11 - User base analyzer authorization page

After authorization, the user enters the login and password from his Instagram account. The application uses the Instagram API to analyze the user account and provide the user with the following information:

- New account subscribers (Figure 3.12);

- User unsubscribes from the account (Figure 3.13);

- For each subscriber, the number of account publications is displayed, which he liked;

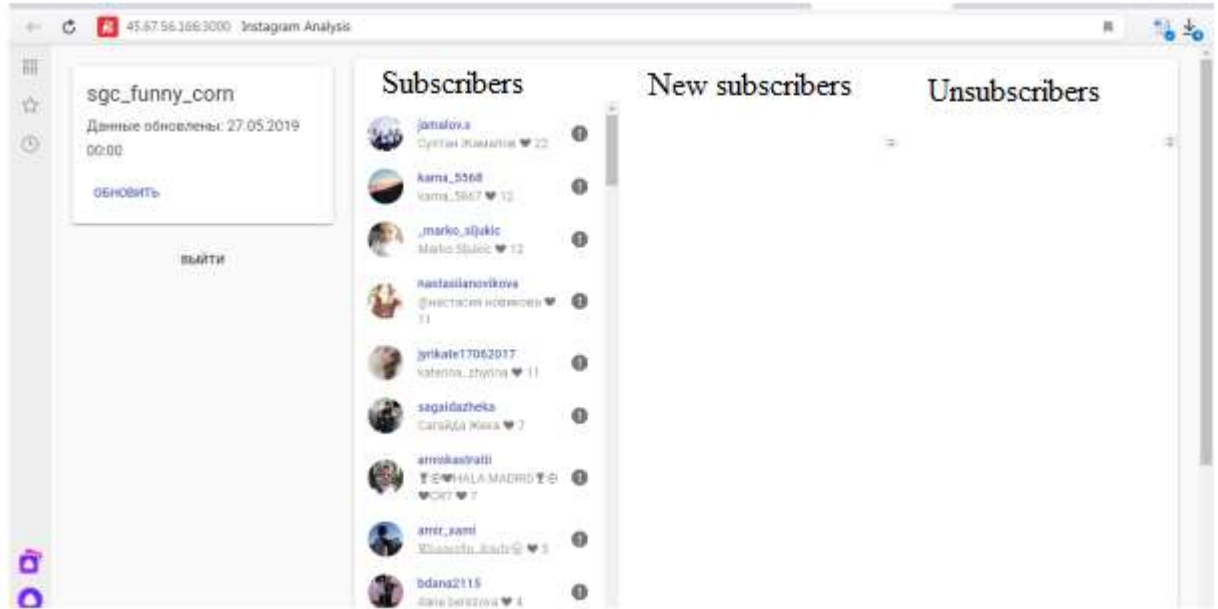- For each subscriber, the number of his subscriptions is displayed.

Figure 3.12 - User analyzer account page
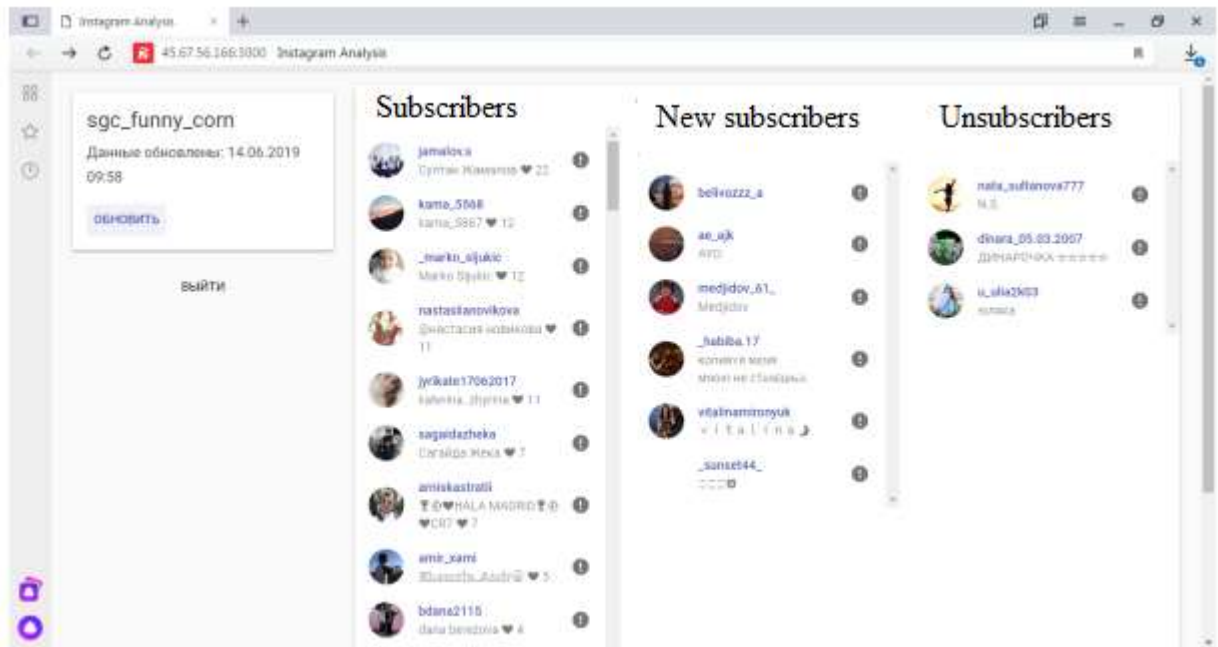
(with subscribers only)

Figure 3.13 - Display of the updated page of the analyzer (with updated data of new subscribers and unsubscribed subscribers)

It is also possible to view the number of followers of each account in the application. To do this, you need to click on the "exclamation mark" of the corresponding account (Figure 3.14).

And next to the username and statistics of the number of likes, data about the number of followers of the user will appear.

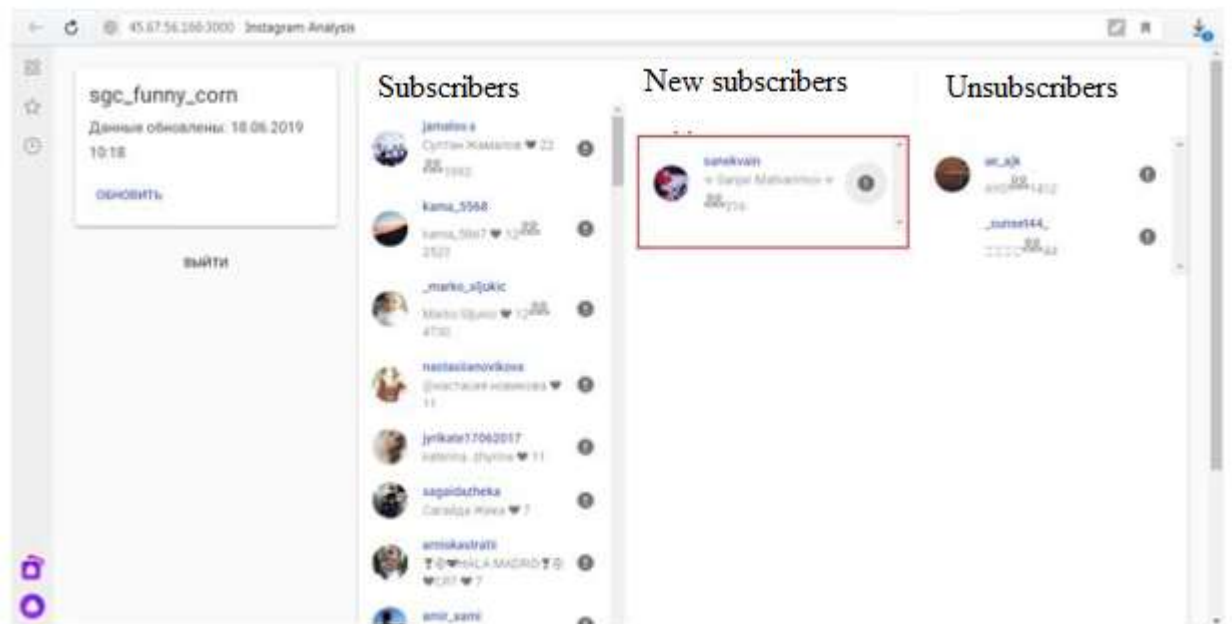Figure 3.14 - Viewing the number of followers of a user

To implement the proposed models and the application, which acts as an analyzer of the user base of the social network, a system has been developed, which is a software complex implemented in the form of an application with a three-level architecture. An image of the graphic interface of the analyzer application when performing these tasks is given.

4 LIFE SAFETY, BASICS OF LABOR PROTECTION

4.1 First aid for shock

Let's consider the procedure that determines the mechanism of providing pre-medical care in case of suspected shock by non-medical workers.

Shock is a state between life and death; a general severe disorder of the body's vital functions, caused by a violation of the nervous regulation of vital processes; characterized by disorders of hemodynamics, breathing, and metabolism.

Signs of shock in the victim:

- pale, cold and moist skin;

- weakness;

- restlessness;

- dry mouth, feeling thirsty;

- frequent breathing (more than 20 breaths per minute);

- disturbance of consciousness; faint.

- Causes of shock can be:

- external bleeding;

- internal bleeding;

- injuries of various genesis;

- burns;

- heart attack, etc.

The sequence of actions in the provision of pre-medical assistance to victims of suspected shock by non-medical workers:

1) make sure there is no danger;

2) conduct an examination of the victim, determine the presence of consciousness, breathing;

3) call an emergency (ambulance) medical team;

4) if the victim is not breathing, start cardiopulmonary resuscitation;

5) eliminate the cause of shock: stop bleeding, immobilize the fracture, etc.;

6) provide the victim with an anti-shock position:

a) transfer the victim to a horizontal position;

b) put a box, a roll of clothes, etc. under the feet of the victim in such a way that the feet are at the level of his chin;

c) put clothes/pillow under the victim's head;

d) cover the victim with a thermal cover/blanket;

7) ensure constant supervision of the victim until the arrival of the emergency (ambulance) medical assistance team;

8) if the victim's condition worsens, call the emergency medical dispatcher again before the emergency (ambulance) medical team arrives.

4.2 Development, design of a room for psychological relief of employees

The tense rhythm of the life of school workers, the intensification of their work against the background of low motor activity create a well-known dissonance between the demands placed on the intellect, the emotional sphere, and the relatively small physical load. The work of the nervous system in this mode often leads to increased tension, the inability to relax, get out of a tense state, and find mental balance. In most cases, people prone to "diseases of the century" - neuroses, hypertension and ischemic heart disease - can record increased muscle tension, loss of the ability to voluntarily relax muscles. In addition, intensive study of some subjects causes the need to relieve mental tension. All this puts before the psychological service of the school the urgent task of creating a psychological relief office (CPR).

The office of psychological relief at the school works in five modes:

- Psychological relaxation of employees and schoolchildren after hard work at the end of the working (school) day or at a specially designated time.

- The psychological mood (mobilization) of those employees and schoolchildren who find it difficult to get into the busy rhythm of work at the beginning of the working day, learning the skills of mobilization under stress (control, exam, etc.).

- Removing the psychological burden of teachers and schoolchildren according to the course prescribed by the psychotherapist.

- Psychoprophylactic work with practically healthy teachers and schoolchildren (teaching relaxation methods, meditation, autogenic training, conflict-free communication skills, communication training, etc.).

- Ensuring the process of intensive training, including the methods of suggestopedia, relaxopedia, hypnopedia, as well as the use of the psychological unloading room as an experimental base for the development of new training methods.

The question of the possibility and necessity of attending sessions of psychological relief is decided by employees of the psychological service on the basis of psychodiagnostic data, depending on the nature of the impact. For individual work, 5 to 30 minutes are allotted for one person, 60 minutes for a group. If there are 12-15 places in the CPR, its capacity is 60-80 people per shift, and up to 200 people can receive course treatment at the same time, since classes are held two or three times a week. When conducting intensive training classes, the passing possibility of CPR decreases, however, persons who undergo an intensive course simultaneously experience a psycho-prophylactic effect.

There are certain technical requirements for the arrangement of the CPR. The office should consist of two interconnected rooms. The first room is simultaneously the office of the psychological service. All the equipment used for psychotherapy sessions and intensive training classes is brought here. In addition, from the operator's room

through a special mirror glass on one side, it is possible to observe the behavior of visitors in the psychotherapy room. Such a hall is equipped with 10-15 soft chairs with high headrests and built-in connectors for connecting individual headphones. The area of the hall should be at least 40

CONCLUSION

Today, the development of IT in the world is a topical topic for research. IT is actively implemented in various spheres of activity, including for the provision of services and user entertainment. The diploma project consists in creating an application for monitoring and analyzing the user base of a social network.

The results of the diploma project are a theoretical generalization of the existing approaches to information provision of the process of data storage and processing, analysis and monitoring of social network users.

1.   An analysis of the current state of development of information technologies for the analysis of the social network user base was carried out.

2.   Analysis of information for the analyzer under development was performed.

3.   The structure of the application for user analysis and the components of information support of the data processing process of the social network user base analyzer are defined

4.   The data model of the application was developed and the functional model of the social network user base analyzer was formed.

5.   On the basis of the developed models and the developed application, a system- analyzer was proposed, for which the architecture was built, designed and the software implementation was carried out.

Thus, the goal of the diploma project was achieved, which consists in theoretically justifying the use of a user base analyzer application for a social network for its implementation, which allows you to receive information about subscribers and unsubscribers, quickly process data and analyze social network accounts.

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ANNEXES

Code Software

```
const body = req.body;
const ig = this.instagramService.getClient();
ig.state.generateDevice(body.username);


let cookies: CookieJar.Serialized = null;
ig.request.end$.subscribe(async () => {
  cookies = await ig.state.serializeCookieJar();
});


await ig.simulate.preLoginFlow();
try {
 const igUser = await ig.account.login(body.username,
body.password);
 process.nextTick(async () => await
ig.simulate.postLoginFlow());


  let user = await this.userRepo.findOne(igUser.pk);
  if (!user) {
    user = this.userRepo.create({
      id: igUser.pk.toString(),
      username: body.username,
    });
  }
  user.cookie = cookies;
  user.username = body.username;
```

```
      await this.userRepo.save(user);

      req.session.userId = user.id;

      res.json(user);
    } catch (e) {
      if (e instanceof IgCheckpointError) {
        await ig.challenge.auto(true);
        session.checkpoint = ig.state.checkpoint;
        session.challenge = ig.state.challenge;
        session.username = body.username;
    session.cookies = await
   ig.state.serializeCookieJar();

      }
      throw e;
    }
```

```typescript
export const analiseFollowers = (followersRepository:
FollowersRepository) =>
 async (collection: Collection<FollowerData>):
Promise<FollowersAnalysisReport> => {
    const followers: FollowerData[] = [];
    const newFollowers: FollowerData[] = [];

    const handleItem = async (item: FollowerData) => {
       followers.push(item);



       if (!(await followersRepository.has(item.id)))

{

          await followersRepository.insert(item);
          newFollowers.push(item);
       }
    };

 await forEachCollectionItem(collection,
handleItem);

 const unfollowers = await
```

```
followersRepository.findExpectingIds(followers.map(({id}) =>
id));

    for (const item of unfollowers) {
      await followersRepository.remove(item.id);
    }

    return {
      followers,
      newFollowers,
      unfollowers,
    };
  };
```

```
export const analiseLikes = (ig: IgApiClient) => async
(collection: Collection<UserFeedResponseItemsItem>):
Promise<LikeReport> => {

  const likes: LikeReport = {};

 const handleItem = async (item:
UserFeedResponseItemsItem) => {
    const likers = await ig.media.likers(item.id);
    for (const user of likers.users) {
      if (likes[user.pk] === undefined) {
        likes[user.pk] = {
          user,
          count: 1,
        };
      } else {
        likes[user.pk].count++;
      }
    }
  };

  await forEachCollectionItem(collection, handleItem);

  return likes;
};
```

Analysis.tsx

```tsx
import * as React from "react";
import {Grid, Paper, Typography, LinearProgress, Link}
from "@material-ui/core";

import {FollowerData, FollowerDataExtended, Report,
ReportData} from "../domains/analysis/types";
import FollowersList from "./FollowersList.new";
import {sortBy} from "lodash";
import followerListItem from "./FollowerListItemHOC"

export type AnalysisProps = {
    getReport: () => any,
    pending: boolean,
    report: Report,
}

const aggregateLikes = (reportData: ReportData) => {
    const followers: FollowerDataExtended[] = [];
    for (const follower of reportData.followers) {
        const likes = reportData.likes[follower.id];
        followers.push({
            ...follower,
            likes: likes ? likes.count : 0
        });
```

```
  }
 return sortBy(followers, [follower => 0 -
follower.likes]);
};



const BasicFollowersListItem =
followerListItem<FollowerData>({
 getPrimaryText: data => <Link variant="subtitle2"
href={`https://www.instagram.com/${data.username}/`}>{data.us
ername}</Link>,
   getSecondaryText: data => data.fullName,
});



const FollowersListItemWithLikes =
followerListItem<FollowerDataExtended>({
 getPrimaryText: data => <Link variant="subtitle2"
href={`https://www.instagram.com/${data.username}/`}>{data.us
ername}</Link>,
   getSecondaryText: data => data.fullName + " ❤ " +
data.likes,
});

export class Analysis extends
React.Component<AnalysisProps> {
```

```
  componentWillMount(): void {
    this.props.getReport();
  }


  render(): React.ReactNode {
    const {report, pending} = this.props;
    return <Paper>
      {pending && <LinearProgress/>}



        <Grid container spacing={16}>
          <Grid item md={4}>
 <Typography variant={"h4"}>Ваши
подписчики</Typography>
 <FollowersList items={report ?
aggregateLikes(report.data) : []}
itemComponent={FollowersListItemWithLikes}/>
          </Grid>
          <Grid item md={4}>
 <Typography variant={"h4"}>Новые
подписчики</Typography>
 <FollowersList items={report ?
this.props.report.data.newFollowers : []}
itemComponent={BasicFollowersListItem}/>
          </Grid>
          <Grid item md={4}>
```

```
                    <Typography variant={"h4"}>От вас
отписались</Typography>
 <FollowersList items={report ?
this.props.report.data.lostFollowers : []}
itemComponent={BasicFollowersListItem}/>
            </Grid>
          </Grid>
        </Paper>
    }


}

export default Analysis;
```

Модуль FollowersListItem.new.tsx

```tsx
import * as React from "react";
import {Avatar, ListItem, ListItemAvatar, ListItemText,
ListItemSecondaryAction, IconButton} from "@material-
ui/core";
import ReportIcon from "@material-ui/icons/Report";
import PeopleIcon from "@material-
ui/icons/PeopleOutline";
import {FollowerData} from "../domains/analysis/types";
import {ReactNode} from "react";
import {api} from "../util/api";
import {UserRepositoryInfoResponseUser} from "instagram-
private-api/dist/responses/user.repository.info.response"

export type FollowersListItemProps<T extends
FollowerData> = {
    data: T,
    getPrimaryText: (data: T) => ReactNode,
    getSecondaryText: (data: T) => ReactNode,
}

type FollowersListItemState = {
    account: UserRepositoryInfoResponseUser
}
```

```
class FollowersListItem<T extends FollowerData> extends
React.Component<FollowersListItemProps<T>,
FollowersListItemState> {



  state = {
    account: null
  };


  onAccountInfoClick = () => {

api().get(`/api/analysis/account/${this.props.data.id}`, {})
      .then((response:
UserRepositoryInfoResponseUser) => {
        this.setState({account: response})
      })
  };


  renderFollowingsInfo(){
    if(!this.state.account)
      return null;


    const {following_count} = this.state.account;
    return <React.Fragment>
      <PeopleIcon/>
      {following_count}
    </React.Fragment>
```

```
    }

  render() {
    const {data, getPrimaryText, getSecondaryText} =
this.props;
    return <ListItem>
      <ListItemAvatar>



 <Avatar alt="Remy Sharp"
src={data.profilePicUrl}/>
      </ListItemAvatar>
      <ListItemText
        primary={getPrimaryText(data)}
        secondary={
          <React.Fragment>
            {getSecondaryText(data)}
            {this.renderFollowingsInfo()}
          </React.Fragment>
        }
      />
      <ListItemSecondaryAction>
        <IconButton
onClick={this.onAccountInfoClick}>
          <ReportIcon/>
        </IconButton>
      </ListItemSecondaryAction>
```

```
        </ListItem>;
    }

}

export default FollowersListItem
```

Challenge.tsx

```
import * as React from "react";
import {ChangeEvent} from "react";
import {Dialog, DialogActions, DialogContent,
DialogContentText, DialogTitle, TextField} from "@material-
ui/core";
import Button from "./PendingableButton"

export type ChallengeProps = {
    error: string | null,
    submit: (code: string) => any,
    submitPending: boolean,
    show: boolean
}

export type ChallengeState = {
    code: string
}

export default class Challenge extends
React.Component<ChallengeProps, ChallengeState> {

    state = {
      code: ""
    };
```

```
  handleChangeCode = (event:
ChangeEvent<HTMLInputElement>) => {
    this.setState({


      code: event.target.value
    });
  };


  submit = () => {
    this.props.submit(this.state.code);
  };


  render() {
    return (
      <Dialog
        open={this.props.show}
      >
        <DialogTitle>Подтвердите
вход</DialogTitle>
        <DialogContent>
          <DialogContentText>
            Для подтверждения входа Instagram
отправил вам код в SMS или Email
          </DialogContentText>
 {this.props.error != null
&&<DialogContentText>
```

```
                {this.props.error}
              </DialogContentText>}
          <TextField
            label="Код безопасности"
            type="text"
            fullWidth
            value={this.state.code}
            onChange={this.handleChangeCode}


          />
        </DialogContent>
        <DialogActions>
 <Button onClick={this.submit}
color="primary" pending={this.props.submitPending}>
            Далее
          </Button>
        </DialogActions>
      </Dialog>
    );
  }
}
```