Development of an information system for determining the opinion of citizens based on analysis of information on social networks and mass media

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Abstract. Currently, most of the modern society is concentrated in large and medium-sized cities. This gives residents more opportunities for self-realization, professional development, socialization, as well as a greater number of options for spending their personal time, which undoubtedly affects the satisfaction of a person living in an urban environment. To prevent a decline in the development of the city, constant monitoring of the state of the urban environment is necessary, since the population is constantly in direct contact with it. The number of the city's population and the satisfaction of living in it is one of the most important components of the indicator of the development of all sectors of the city. Assessment of the mood of the population is most often done through personal interviews with citizens. The purpose of the survey is to get an opinion about the general situation in the city or about certain areas, events, news. To automate this process, it was decided to create an information system for collecting citizens' opinions on certain events in social networks and mass media, which greatly simplifies the process of assessing the mood of citizens.

1 Introduction

Social networks are one of the most dynamic and fastest growing information systems in existence today. Social networks are an important part of "Web 2.0" and their further development greatly determines the prospects for the development of the Internet itself. The number of social media users in Europe and Russia has been growing for several years.

Based on research from CareerBuilder, a global leader in HR solutions, in 2019, about 45% of companies in the United States actively used information from social media when selecting future employees. According to the online survey of candidates, 29% use Instagram, 26% use Facebook and 21% use LinkedIn, 11% research blogs, while 7% meet individuals on Twitter. In the most developed and lucrative industries, employee insight is gained primarily through these social media and search engines.

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Social network analysis is a branch of modern computer sociology, which deals with the description and analysis of connections (networks) arising in the course of social interaction and communication. The use of this method is promising for the purposes of assessing the mood of citizens, because thanks to it we will be able to receive reliable information about the unrest among the citizens of our city, plan future events, and eliminate mistakes in their organization and conduct.

2 Material and methods

Social networks can differ both in subject matter and in a number of other features, however, among the common features inherent in all social networks, the following can be distinguished:
1) In the overwhelming majority of communities, there is user registration - that is, a separate account must be created for each participant. During the registration process, the user indicates some information about himself for identification (login, password, e-mail address). This approach guarantees to some extent the uniqueness of each participant.
2) Work in a network environment is carried out in sessions. Each session begins with the user specifying his login (name) and password to confirm his identity. For the convenience of the user, participation sessions are usually hidden by technical means, but, nevertheless, the user is identified constantly.
3) In addition to credentials, the user configures the appearance of the page, additional data about himself, indicates his interests, contacts.

3 Results and discussion

Currently, there are quite a lot of products on the Russian market that have the ability to analyze the sentiment of the text and collect people's opinions.

The most popular ones are: Brand Analytics, IQBuzz, MEDIALOGY, Babkee. All these services have one common feature - collection and analysis of user opinions. But their job is to search globally for brand mentions by keywords, tags, geolocation and other parameters. The application presented in this work has a different method of work from the applications listed above - not searching for mentions of any brand and its assessment, but collecting relevant news and the reaction of residents to these events.

Figure 1 shows the physical data model of the developed application.

**Fig. 1.** Physical model of IP data.

The most common web application development tools currently used are HTML, CSS, and JavaScript.
The application was developed using HTML5. To give the web application functionality, JavaScript was used - a high-level scripting language for writing interactive and "live" web applications.

When constructing charts in the application, the modern Chart.js library was used, which provides a wide range of chart types, flexible settings and modern design.

To simplify the writing of JavaScript code and the ability to easily extend the application by giving the code a certain structure, as well as the use of modern solutions in development, modern web frameworks were used. After analyzing the most common frameworks for creating user interfaces, we decided to use Vue.js. Vue.js is an open source progressive web framework for building user interfaces. It is not developed by a separate company, it is under the open license from MIT.

To display relationships between actors, i.e. objects interacting with the system, and use cases - functions provided by the system for the actors, a use case diagram was built, which represents the scenario of the system's behavior and is a conceptual representation of the system.

The use case diagram for the developed system is shown in Fig. 2.

![Diagram of use cases](image)

**Fig. 2.** Diagram of use cases.

To develop the application, we used Visual Studio Code, Google Chrome and an extension for Google Chrome - Vue.js devtools. We also used a tool for building front-end applications - Webpack and a library of CSS and HTML templates - Bootstrap.

After authorization in the system, the user will be redirected to the main page of the application, a screenshot of which is shown in Fig. 3.
Fig. 3. Application main page.
Fig. 3 clearly shows the division of the web application into separate blocks: filter, results, records, detailed statistics and a graph of changes.

The start of the application is the group ID input block. In the text field of this block, the identifier of the group of the social network VK is entered and after entering the identifier, you need to click the "Search group" button to obtain data from the database corresponding to this group.

Until no group is selected, the main interface of the application will not be available. The received data can be filtered in the filter block. After entering the necessary filters, you must click the "Filter" button to apply filters by the specified parameters.

Four blocks are responsible for displaying statistics at once: a filter statistics block, a record block, a detailed statistics block and a graph block.

Data counting is performed on the client side immediately after data filtering.

The rating of the sentiment of the record is carried out according to the formula (1) for finding the average value:

$$R_z = \frac{1}{n} \sum_{i=1}^{n} R_k,$$

where $R_z$ is the rating of the mood of the record, units;
$n$ - the number of comments to the post, units;
$R_k$ - rating of the mood of the comment, units;

The comment rating is determined by the coefficients, where:
coefficient 1 - negative;
coefficient 2 - neutral;
coefficient 3 is positive.

When calculating the mood of a recording, the result obtained may not be an integer, so the following system for assessing the average mood was distinguished:
— negative - when the average value falls within the range from 1 to 1.66;
— neutral - when the average value hits from 1.67 to 2.32;
— positive - when hitting the average value from 2.33 to 3.

The average value for all records is calculated in the same way. A line graph displays the change in mood over a specified time interval.

### 4 Conclusion

In the upper right corner there are two drop-down lists for changing the options for displaying statistics. The first allows you to select display for all records in the database, or for records that match the filter. The second drop-down list allows you to change the chart display interval. There is a choice of the following intervals:
— day - statistics for the last 7 days are displayed;
— week - statistics for the last 7 weeks are displayed;
— month - statistics for the last 7 months are displayed.

In each interval for displaying, the average value is calculated using the formula (1).

Thus, in the course of the work, a web application was developed, namely a frontend part in HTML, CSS, JavaScript and Vue.js framework using Vuex and Vue Router technologies.

The following tasks were also solved:
— the concept of a city and the directions that form it have been investigated;
— analogues were analyzed, system architecture was built;
— information and software support of the system was designed;
— the first prototype of the system was developed;
— the system was tested.
Upon completion of the work, a ready-made web application was received that successfully fulfills the tasks assigned to it.

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