

# Heterogeneous Data with Agreed Content Aggregation System Development

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**Abstract.** A web-based service for the automation of contextual advertising management in Google AdWords system are developed. An analysis of the Internet advertising market, the vector of its development and the latest user needs are solved. Literary sources for deepening the knowledge about contextual advertising is analyzed. A few competing systems are found and analyzed, their deficiencies and advantages are determined. Conceptual model of the providing recommendations informational system on advertising services through Advertising Services is constructed. The set of potential software solutions and methods for the implementation of this system are analyzed. Among the advantages and disadvantages of each one the optimal solutions for implementing the system are shown and their choice is grounded. A web-based service for automating contextual advertising is designed.

**Keywords:** content, Advertising Services, Internet advertising market, contextual advertising, contextual advertising, advertising campaign, computer science, information technology, Google AdWords, web service, information resource, statistical analysis, intelligent system, median filtration, international scientific, automation system, advertising service, web page, search engine, contextual advertising management, contextual advertising automation, advertising campaign creating, Google AdWords system, automated management information system, electronic content commerce system, search result, agreed content aggregation system, enterprise technology, online advertising.

## 1 Introduction

Due to the fact the number of Internet users is growing every year, one of the most effective forms of advertising at the present time is Internet advertising [1]. Internet in the eyes of users is a source of heterogeneous information and, therefore, advertising,

given in time and at the right place, is seen as an answer to the user's question [2]. Relevance of the work is that many organizations active enter in and out of the Internet, create their websites or use other means of online advertising, one type of which is contextual advertising [3]. Unlike conventional advertising online advertising has several advantages: the possibility of rapid analysis and correction of advertising campaign, interactivity (possibility to connect consumers with the advertiser for making an order directly through the Internet), the constant growth of the audience, relatively low cost, the possibility of targeting [4]. Contextual advertising – is a new, very efficient and promising form of online advertising, where messages are placed in a thematic context, thus ensuring precise hitting the target audience [5]. The effectiveness of contextual advertising has long been proven in practice [6]. The basis of efficiency is guaranteed when you buy targeted traffic contextual advertising [7]. That is, if the resource is not advertised and there are a few visitors of the site, contextual advertising, situated on search systems sites and on partner sites, will lead visitors [8]. The advertiser pays for this targeted traffic flow [9]. The advantages include a small budget for an advertising campaign and the opportunity to compose and edit your contextual ads [10]. Contextual advertising allows you to quickly and accurately determine the demand [11]. There are special services that are designed for this [12]. Determination of demand is very important at the campaign start [13]. Another positive point is the price immediate determining of every search query that allows you to calculate the advertising campaign cost and its validity period [14]. Over the time, advertiser improves conversion of the site and enters stable value of advertising costs and profit level, when he picks up more effective advertising texts [15].

The aim of this work is to develop an information system for advertising campaigns creating and for contextual advertising automation.

For the work execution the following tasks have been set:

- The contextual advertising basic concepts and principles analyzing;
- The need to create a web service for managing contextual advertising providing;
- The contextual advertising existing management systems review conducting;
- The software development and database management system identifying;
- Web service for managing contextual advertising system in Google AdWords system designing and developing.

The research object is the process of context advertising management in Google AdWords system. The research subject is automation of contextual advertising. Practical value is automation system of contextual advertising. There are many similar systems for conducting advertising campaigns, services. Many of those systems have an excess of functional elements that mostly aren't used by ordinary users. Exactly this system has comfortable and intuitive interface for both professionals and ordinary users.

## 2 Analytical review of literary and other sources

### 2.1 Basic Principles of the Study

Contextual advertising – is a type of Internet advertising in which an advertisement corresponds to the web page content, on which it is located and which it is visited by internet users [16]. At the same time, it can be placed as a banner or a text message [17]. Contextual advertising is divided into [18]:

- Thematic (contextual, context-dependent). Context-dependent ads appear on thematic sites in the context of the content page. This is possible through usage of the special software that analyzes the pages content and displays the promotional materials (banners, text ads, strictly in accordance with the information available on the thematic site) [19].
- Searching advertising. This is a special type of contextual advertising, which is used in search engines [20]. The difference between thematic and searching is in that the selection placed advertisements determined by the user's search [21]. Payment of the search advertising can be based on different principles: the impressions of advertising messages, the number of times users click the search engine, auction-based keywords [22].

The most optimal way to attract visitors to your site via contextual advertising is work with keywords. In Google there is a special service on the selection of keywords [23-26]. Then, based on selected keywords, advertising is created that will be displayed in the search [27]. Then, based on selected keywords and created ads a unique article on the site is written. Moreover, the article should match the text that will be in the ad. Thus, the algorithm is reduced to three steps: selection of keywords, compiling ads, unique content writing [28]. The user searches in the web product or service on certain search queries and key phrases [29]. Further search engine using these keywords gives the result of the request [30]. Contextual advertising is displayed between the search line and the issuance of search engine results and on the right side of the page [31]. Payment for contextual advertising is carried out when user cross on the website. Cost is determined by an auction principle. The higher costs are spent for advertising, the higher the advertisement will be. The cost of crossing depends on various factors, such as on the ads subject [32]. The main value is that these ads appear on the first page of search results and are visible to users who search on a particular request, and no one more. So it turns out that contextual advertising that is tied to an advertisement keyword phrases are determined by its author, and placed in an advantageous position, which ultimately gives positive results for the business.

The value of contextual advertising is that it is trading, that is, advertising of limited and specific trade proposals. It is so efficient compared to other means of advertising – it just “catch” those who already had come to the store. This is a huge advantage of contextual advertising. Contextual advertising services [33-37]:

- Yandex. Direct – contextual service, most popular Russian-language search engine. It is considered as a leader in the performance of other contextual advertis-

ing systems due to the fact because Yandex has the largest audience among all other search tools in Runet. For this reason, search, contextual advertising in Yandex – is currently a tool that enables the fastest return. At the same time moderating Yandex site-partners advertising network is quite tough. Requirements for attendance, unique content, and so on. e., made by Yandex, on the one hand, guarantee the quality of the sites from which the crossing will take place, and on the other hand, close the road for the partners of sites, whose attendance does not reach the necessary level.

- AdWords | AdSense from Google – the system of contextual advertising with the largest worldwide audience girth. It is first in the world by popularity. For the Ukrainian advertising it is often used as an aid directed primarily to display contextual ads on Google search results. However, AdSense advertising network in Ukraine is quite wide spread and liberal to the participating sites.

## **2.2 Advantages and disadvantages of contextual advertising**

The main advantage of contextual advertising from other advertising is that it doesn't distract the user from his main interest, but accompany him and gives, what interested him now, this is so-called rule of relevance [1-9].

Advantages of contextual advertising [30-33]:

- Payment only for clicks– the advertiser pays only for clicks on its website, for impressions payment is not taken;
- Flexibility option – for the campaign by more than 20 different parameters that can be adjusted for specific tasks advertiser;
- Minimum budget – for starting using Google AdWords budget required minimum of 0.01 cents;
- Rapid effect – the first website, that you click get a few hours after the launch of the campaign;
- Detailed analytics – AdWords has great analytical system that allows you to make smarter contextual advertising.

Along with the benefits of contextual advertising there are drawbacks, main includes:

- Inefficiency in some areas – advertising will useless if the product or service is not looking on the Internet, such as a grocery store or output to market a new product that is not yet known, for example, the new “gadget”;
- High cost of clicks – is the competitive business areas where the cost of clicks by keyword reaches the maximum possible value;
- Constant adjustment – using the Google AdWords auction system shows the situation of change ads display in real time, so you need to constantly monitor the rates and parameters of the campaign.

### 2.3 Analysis of the known means of solving the problem

In the course of this thesis the modern information automation of content is analyzed, defined by their functionality, advantages and disadvantages. Among the most common automation systems of contextual advertising include the following: Marin Software, HTraffic, Origami, Alytics, Begun.

**1. Marin Software - management service of contextual advertising.** The international system of automatic control of advertising campaigns. It is the leading system services of which the world's largest agencies and advertisers use. The main advantage of the system is the model predictive control rates. This tool allows you to start working with a small amount of conversion data. Flexible settings of Marin Software help to quickly work rates and optimize ad campaigns at any time intervals. In addition, the platform is integrated with social networks and connects to any channels and data sources, including offline and conversion metrics. Advantages:

- Predictive control rates model. It is based on the general laws of contextual advertising. It works directly with the entire pool of requests, including low frequency. The result allows reducing financial and time costs;
- Working with low-frequency queries. The ability to use a summary statistic requests for certain groups of low-frequency queries. Most conversion requests that are relatively inexpensive and will be displayed and profitable;
- Counter and statistics. Own counter is capable to receive all the information about the goods sold: name, SKU, number of units, total cost, and more. It is possible to connect any external statistics. Built-in integration with Google Analytics, Omniture and Yandex;
- Starting and stopping of the campaigns on schedule. Instead of changing rates in the current campaign to launch a new, raising or lowering rates. Seasonal campaigns can be planned and put them on the time frame for several years to come;
- Flexible system configuration. Setting to limit the maximum and minimum positions, restricting step for raising and lowering the rate, etc;
- Recording of offline conversions. Integrated Call Tracking tracks data on phone calls for Yandex and Google AdWords.

Disadvantages are no free fare.

**2. Management contextual advertising HTraffic service.** Free service for contextual advertising managing in Yandex and Google AdWords. Service allows you to bypass the "pitfalls" of these systems, so users can save time and money. According creators service words, HTraffic allows 5-7 times to expedite campaign management and clicks by 45% without increasing costs. Unique algorithm to search via keywords is 10-20 times faster than similar tools. The service also provides summary statistics for both systems. Advantages:

- Automatic generator of advertising campaigns with enhanced management and control;
- Automated conversion optimizer, which uses complex algorithms to maximize the efficiency of key parameters – LTV, ROI, revenues, profits and others.

Disadvantages is complex functional for the average user.

**3. Automation system of Origami contextual advertising.** The system is designed to improve contextual advertising optimizers and reduce labor costs. Origami allows to manage centrally by accounts Yandex, Google AdWords and Yandex Market from one interface. The system is equipped with many useful tools for organization and analysis of advertising campaigns:

- Automated Conversion Optimizer, which uses complex algorithms to maximize the efficiency of key parameters – LTV, ROI, revenues, profits and others;
- Comfortable interface for analyzing the effectiveness of advertising campaigns by data from Google Analytics, a telephone conversion data with their CRM advertiser;
- Automatic generator of advertising campaigns with enhanced management and control;
- Management system in Yandex Market rates;
- Alert system “Intelligent Assistant”, which reports on broken links, errors UTM-tags and more.

Disadvantages is lack of intelligence transitions on advertising banner. According to words of the platform creators, a large element of flexibility and adaptability to specific tasks is laid in it. The system will be useful at all levels of conducting an advertising campaign to the level of operational planning and reporting.

**4. Automation system of Analytics contextual advertising.** Tools for optimizing contextual advertising works in three directions: creation, management and analysis of advertising campaigns. The system consists of several modules, each of which automates specific process. Advantages:

- Continuous monitoring of sales for each key request, and the announcement by several statistic indicators;
- Monitoring of conversion and sales calls;
- Integration with CRM data analysis and its quality in terms of each key request ads;
- Customer value management optimizing through rates (CPA);
- Control rates for Yandex;
- Ads and Yandex Google AdWords generation in a special format that allows you to program shows.

Disadvantages is complex interface. The system is designed to help advertisers make the most of investments into contextual advertising. Analytics not only optimizes traffic from contextual advertising but increases sales by constant budget.

**5. Begun - automation system of contextual advertising.** Contextual advertising auction payment system. One of the market leaders in online contextual advertising in the UKRNET. Since 2010, the service is an authorized reseller of Google AdWords in Ukraine, and in 2011 it became possible to place ads on “the Rambler” and through Yandex. The basis of service laid down three basic principles: contextual, payment by results and auction. Contextual is to show ads only to those Internet users who are

interested in the advertiser's goods and services. This principle allows to attract those potential buyers who are very likely to become real customers. The following principle is pay for results. Customer service can choose the most suitable option for themselves, pay per click to a site by calling the office or for a certain number of users informed to help accurately determine the results of the campaign. The principle of auction is to give the advertiser to choose the price independently. This advantage allows you to run advertising services regardless of budget campaign. In addition, Runner offers advertisers a wide range of products to promote on the Internet: text or text-image ads on search and content sites, graphic banners, advertising on mobile and in videos, geocontextual advertising. Advantages is contextual, comfortable interface and geocontextual advertising. Disadvantages is a small functional.

### 3 Systems analysis of the research object

The main aim that is shown in Fig. 1 is the creation and implementation of automated management information system of contextual advertising. From the main aim three subsidiary branches are separated with the following sub-aims.

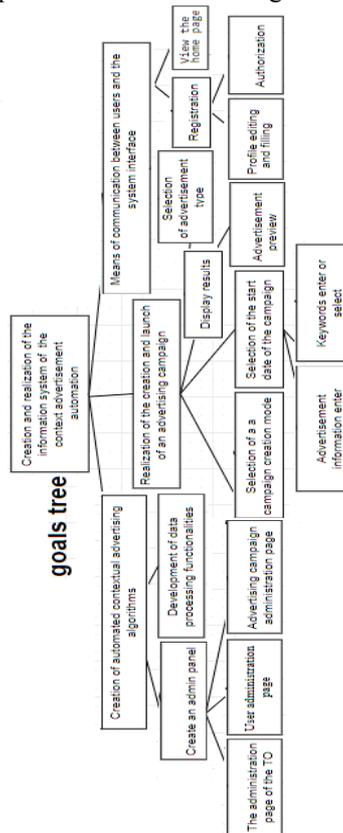


Fig. 1. Goals tree

The first aim is for the development of algorithms responsible for the automation of contextual advertising. In its turn, it is divided into two subtasks to create a panel for system filling by the content, so-called “administration panel” and develop functionality to handle incoming data. Administration panel should contain three main parts, which are responsible for administering users, advertising campaigns and configuration analytics. The second aim is for the realization of creating and launching the campaign, which includes such tasks as an option under the company creating regime, choosing a site and campaign start date, and their display. To select a site and start dates includes sub-task inputting information announcement and entry or selection of keywords. Under the third aim for a full system realization is the possibility of communication between users, it will be ensured through discussions and leaving reviews about the effectiveness of advertising. For this user registration and the opportunity to fill in information should be realized. In this case, we have three external entity: a user who interacts with the system, database, analytics and driving campaign.

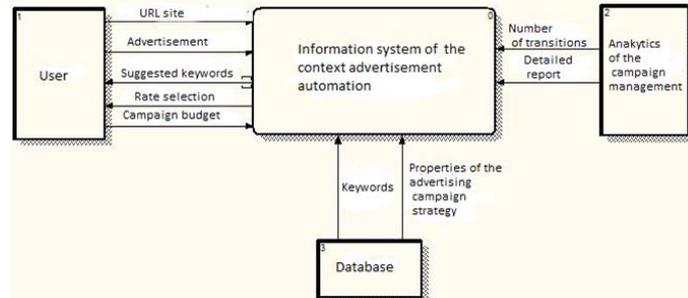


Fig. 2. Context Diagram

The user has the main role in the system, he is responsible of all system results, because he defines settings of contextual advertising and brings all data. For a more detailed description with the main process of context diagram its decomposition is realized (Fig. 3).

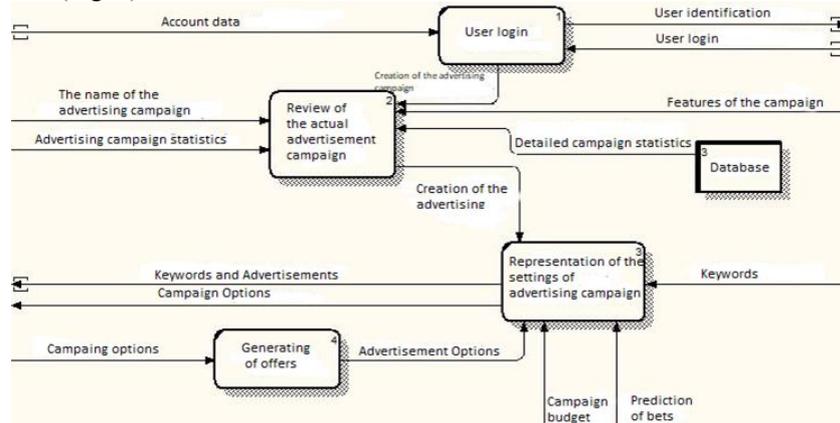


Fig. 3. Detailed context diagram of the first level

In this diagram system decomposition into subsystems such as search results, user authentication, display advertising campaigns, generate proposals are realized. Each of them receives distributed system data streams. Let's consider more about obtaining search results (Fig. 4). To create a campaign, the system aggregates the user's query and sends data to the next step to create the ad, which considers various kinds of corrections such as filters. The next step is to make a request to Google AdWords. Obviously, the hierarchy of management tasks leads to the need of creating a hierarchical control system. At each level should be ensured the maximum correspondence of hardware characteristics to a given class of tasks. An abstract logical structure of the task hierarchy (Fig. 5) allows you to see the dismemberment (decoding) for private tasks. Thus, there is a hierarchy of tasks, so to speak, in a large-scale cut.

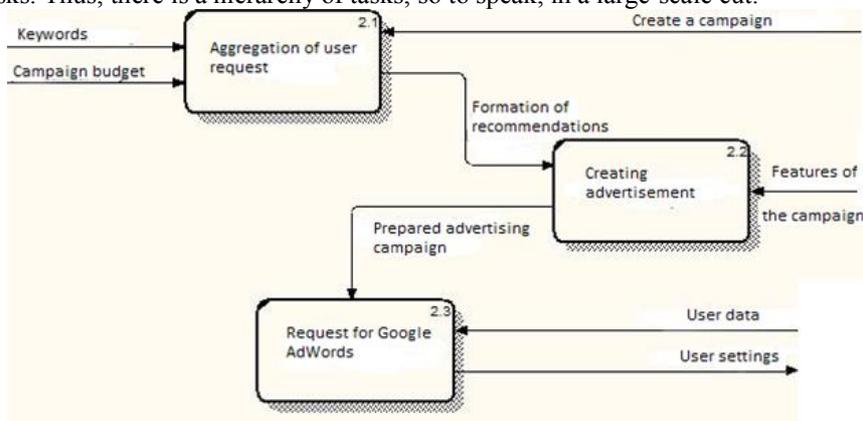


Fig. 4. Detailed diagram of gaining the results of the second level

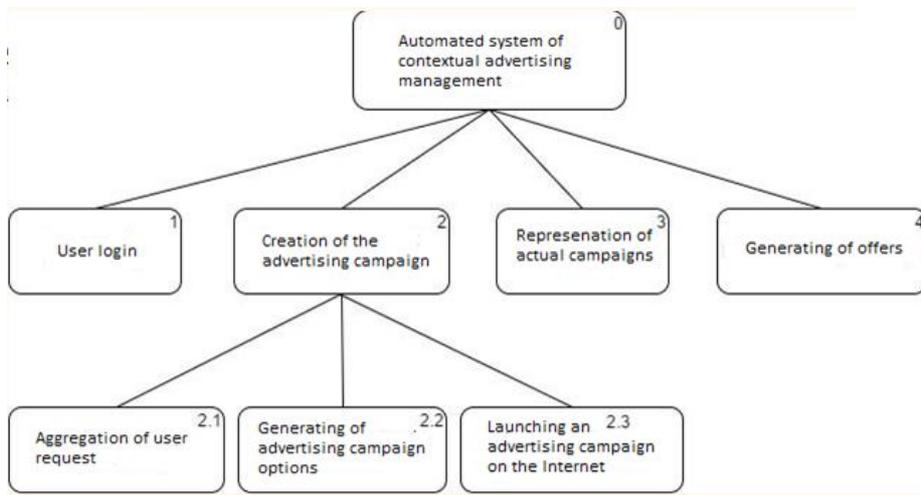


Fig. 5. Tree structure of tasks hierarchy

The main task is contextual advertising realization automated system. It includes a set of tasks shown on the second level of tasks tree hierarchy. As a result of main task decomposition is divided into a set of more detailed tasks, let's briefly describe them: *User authorization*: includes a task associated with the system of authorization and user authentication, further its aim is also new user registration.

*Creating a campaign*, one of the key parts of the system, it is responsible for creating the campaign, depending on the set of factors that affect on the output result. It has more difficulty understanding compared to other tasks on the same level, which is shown in the tree. It includes such sub-tasks:

- User request aggregating. It understands a collection of all the information, as for the campaign and create compositions from these data;
- Generation of advertising campaign parameters – keyword selection and choice of optimal rates;
- Launch an advertising campaign on the Internet – provides data processing and transfer them in Google AdWords.

*Displaying of the current campaign* is this task involves a display of earlier created campaigns by users. *Proposals generating* is during campaign creation system gives recommendations for more effective and optimal settings. The module of functioning of automated management intelligent agent (IA) in information system of contextual advertising (ISCA) activity was developed [21]. Let the IA be in the state  $S(0)$ , there is some information resource  $G$ . Before the IA there is a task  $P$  is to go to some target state of *Goal*, using this resource and software knowledge stored in its ontology:

$P: S_0 \xrightarrow{G,O} Goal$ . The period of operation of the IA ( $r$ ) is used to assess the states, and for the actions, the cost of resources  $g$  for the transition from state to state.

Then the formula for choosing alternatives is presented as:

$$o(a_{ij}^k) = \frac{r_j^k}{g_{ij}^k}. \quad (1)$$

So for interaction of the ISCA with the consumer it is necessary to solve three sub-tasks (identification, processing of the order, implementation of payments), the second of which is divided into nine subtasks (the formation of a consumer basket, the formation of proposals for shares, receipt of confirmation of the order from the consumer, clarification of the methods payments, payment, clarification of delivery methods, registration of the order, formation of a notice to the consumer about the registration of the order). Alternative solutions are used to solve each subtask. For the subtask of specifying the delivery methods you can choose one of three alternatives: mail, courier, self delivery. Information is stored in the ontology of e-commerce [21].

The rationality of activity planning is formulated as follows: how to maximize the resulting ISCA effect with minimal cost, taking into account that:

- 1) The main restrictive resource factor is the level of demand for goods and services that a particular ISCA implements;
- 2) The target economy effect received by the user of the IA from the functioning of the ISCA and possible losses from its incorrect functioning;

3) The costs of promoting the information resources of the ISCA are known and determined by IT Internet marketing and SEO;

4) Indicative terms of profitable functioning of the SEC for a specific category of goods or services for known (specified) promotional and other measures by Internet marketing tools and SEO technologies are known from expert assessments, norms, forecasts, for example, based on Google Analytics and tools statistics Google AdSense and Google AdWords.

So for the subtype of the formation of sales for goods or the formation of shares for the service in accordance with the forecasts for the decline in demand for them, the following rule has been used: IF ((Ends the seasonal period) OR (The number of sales is equal to or less than the threshold minimum) OR (The number of negative comments is greater or equal or (The number of failures / returns is greater or equal to the threshold minimum)) AND (There are no alternative solutions, goods or services) TO (Block the sale of goods and formulate a request moderator on his replacement).

Knowledge base (KB) details this rule through the system of refinement product rules, constructed in accordance with the Rete algorithm. For IA, there is important information that allows you to succeed in solving this problem, i.e.: information on new types of alternative products or services that are more in demand among potential customers; information on pricing policies for such alternative products in accordance with the capabilities of regular consumers (target audiences) of this specific SEC; information on more effective marketing technologies for the promotion of goods and services through the information resource of the SEC. To search for this information, analyze the information resources of the relevant ISCA that have been in demand in recent years. The results are written in the developed ontology using the SWRL rules. In general, we get the following model of the problem:

$$\left[ \begin{array}{l} \Theta = \sum_{i=0}^{N-1} o_i(a_{ij}^k) \rightarrow \max, \\ r \geq r_e, \\ \sum_{i=0}^{N-1} g_{ij}^k \leq G, \end{array} \right. \quad (2)$$

where  $r = \min_j r_j$ . The problem (2) can be solved by the method of functional equations, which is suitable for solving dynamic programming tasks. The use of adaptive ontologies in IA KB allows reducing the task of planning activities to the task of dynamic programming [21].

#### 4 Technical characteristics of the selected software development

The operating system OS is a set of programs that provide a basic set of features to manage computer hardware. OS is a link between applications and computer hard-

ware. The basic requirements for the operating system intended for use in the server part of the program are:

- Full range of network technologies support (network equipment, protocols, access to remote resources and services, etc.);
- Multitasking;
- Multithreading;
- Multiplayer mode;
- Various hardware platforms support (64-bit processors, storage systems on hard disks, etc.);
- Extensibility;
- Security acceptable level (availability of identification, authentication, and audit mechanisms);
- License low cost.

The NetBeans IDE, a powerful PHP, HTML, CSS and JavaScript processing environment, was chosen to implement the Web service. To develop the web service server part, the programming language was selected - PHP5.3. To work with the database was selected MySQL5. The client part is implemented using Hyper Text Markup Language (HTML), JavaScript programming languages, jQuery libraries. To implement the function of the web service, the Google AdWords API is used.

## **5 Description of the created software**

Software called “contextual advertising management platform” have been developed. The purpose of this product is to help users create and run effective online advertising campaigns thus to save their time and money.

Functional restrictions are imposed on users with older versions of browsers, since they do not support the latest standards used to develop this product. The database of the web service consists of 8 tables. This system is developed as distributed, where one part is responsible for displaying the data, the other for its processing, where the existence of the first without the second does not make sense.

The system contains sub-modules for processing, forming, validating data, and logic of work with them. Due to well-chosen software implementations, software solutions have a high degree of declarative, which makes it easy to understand executable code and simplifies system development.

You must run an executable web server before running the program locally or deploy it on a dedicated server with a static IP address. If we launch the site locally, then we need to open local host with the browser specified in the parameters of the port. If the site is deployed on a dedicated server, we should open the server address or its domain name in the browser. The entry point in the program can be both the main page and the admin panel page. The “Contextual Advertising Automation” system functions as a web page, and in order to take advantage of its capabilities, the user must have a pre-installed browser, version of which is not younger than the version released in 2014, in order to speed up all the functionality. The web page requires

permission to execute JavaScript scripts, as it is completely built on them. One of the possible settings that a user must do is to allow his location to be used to allow the map service to display its approximate location. The service consists of two parts:

- The component responsible for displaying and working with users, that is, its system interface implemented under a web page;
- A component that acts as the heart of a system that implements the entire functionality and can connect to other interfaces such as mobile applications.

The service solves the problem of creating and maintaining advertising campaigns, selecting key words and providing guidance on how to conduct a campaign. The service functions correctly with browsers released in 2014 and later. Without permission to run JavaScript scripts, the service will not be able to function. Requirements for the technical characteristics of the device on which this service is used are the same as browser requirements in this device. Service consists of two parts:

- Component responsible for displaying and working with people (the system interface implemented by a web page);
- Component that realizes all functionality and can connect themselves to other interfaces such as mobile applications.

This is a platform for contextual advertising automation. Services allows you to automate all stages of working with contextual advertising: to create advertising campaigns, review analytics and management, increase the effectiveness of contextual advertising. Automated contextual advertising management system is designed to increase the efficiency of working with advertising campaigns in Yandex.Direct, Google.AdWords, VKontakte, and also with Yandex.Market stores.

- Bid management allows you to keep your desired ad positions in Yandex.Direct, Yandex.Market and VKontakte. Ad-hoc bid strategy at ad-level, keywords, merchandise and competitor price analysis;
- Manage the schedule of impressions. The system independently enables and disables customer advertising campaigns;
- Automatic generation and copying of advertising campaigns. Also, the system tracks the change of information on the client's site and makes the necessary adjustments in advertising campaigns;
- Monitor the progress of advertising campaigns. The system can track campaign performance metrics, inform about potential issues.

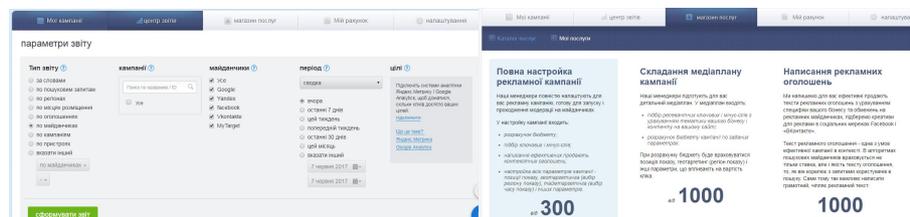


Fig. 6. Report center

Fig. 7. Service shop

The web service has two types of roles: administrator and user. Login to the web service is carried out by the login and password issued by the service administrator. Cabinet Administrator provides the following functions: view and edit existing users, add new accounts Google AdWords, viewing and editing strategies, creating advanced (for a custom) strategy deployment.

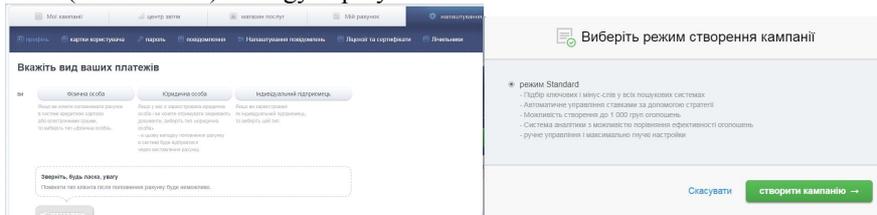


Fig. 8. Settings

Fig. 9. Advertising campaign creating

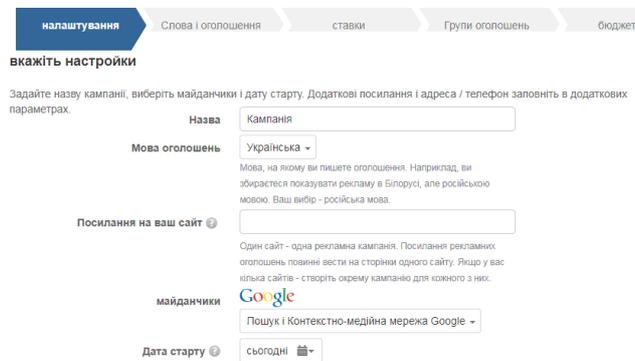


Fig. 10. Advertising campaign creating and setting

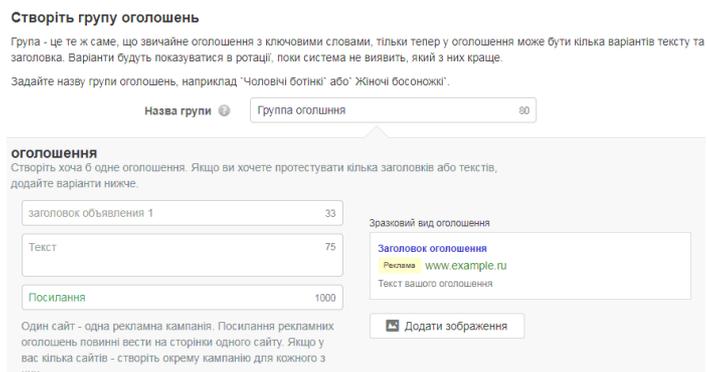


Fig. 11. Advertisement settings

**Ключові слова**  
 Додайте ключові слова, відповідні вашій групі оголошень. Ви зможете потім переприв'язати слова від однієї групи до іншої, якщо це буде потрібно.

Ключові слова: підібрати

Мінус-слова для групи: 0/2000

Повернутися на попередній крок

**Зберегти та продовжити**

**Fig. 12.** Keywords selection

налаштування

Слова і оголошення

**ставки**

**Задайте ставки для ключових слів**

Пошук  Правило  Сдина ставка

Вгорі сторінки + 0% - Але не більше 30

Автоматично оновлювати ставки

**застосувати ставки**

**Fig.13.** Keyword bids setting

Слова і оголошення

ставки

Групи оголошень

**бюджет**

**вквжіть настройки**

Задайте обмеження загального і денного бюджету

стартовий баланс: 100 грн

Рекомендована сума:  
 на тиждень: 10 000  
 два тижня: 15 000  
 місяць: 50 000

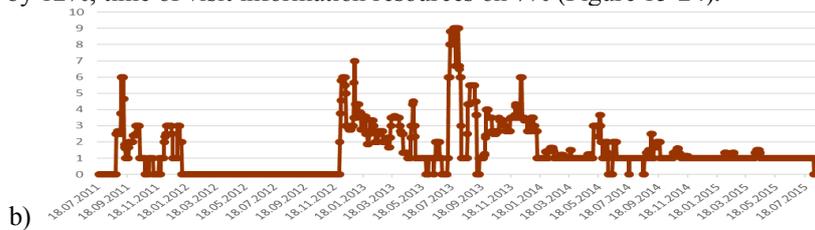
автопоповнення балансу:  Автоматично поповнювати баланс кампанії на 500 грн  
 коли її баланс буде менше 500 грн

розподіл коштів: між майданчиками:  
 автоматично  
 вручну: Google 50% Яндекc 50%

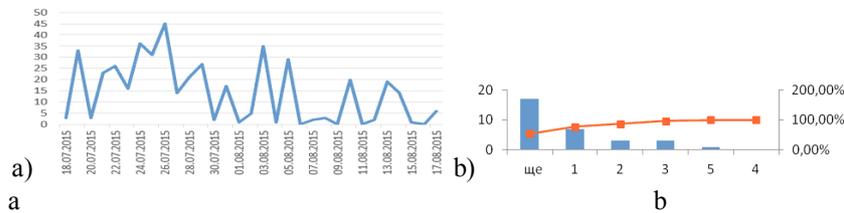
На протязі дня:  
 Прискорений режим показів  
 Рівномірний режим показів

**Fig. 14.** Advertising budget settings

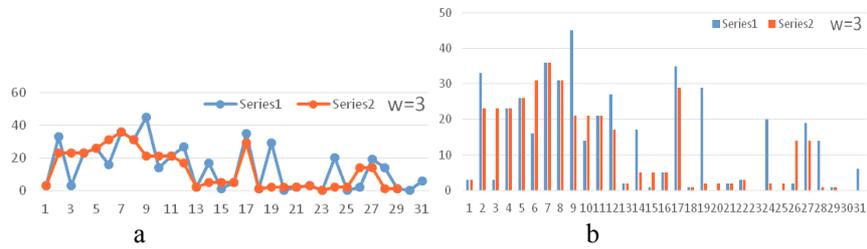
The presence of different types of IA in ISCA increases in sales of goods and / or services a regular user of 9%, the active involvement of unique visitors, potential users and expanding the boundaries of the target and regional audience by 11%, page views by 12%, time of visit information resources on 7% (Figure 15-24).



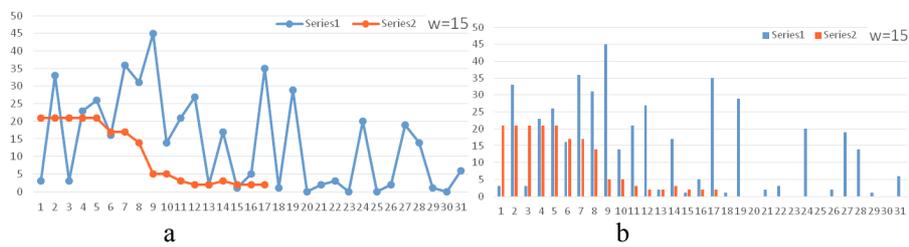
**Fig. 25.** Statistical analysis of the visiting information resource victana.lviv.ua



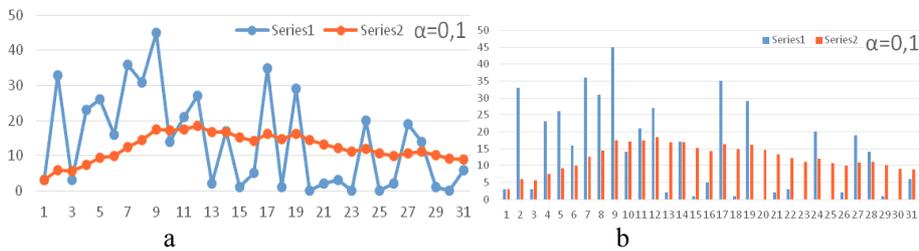
**Fig. 16.** Statistical analysis of the visits on the information resource tatjana.in.ua



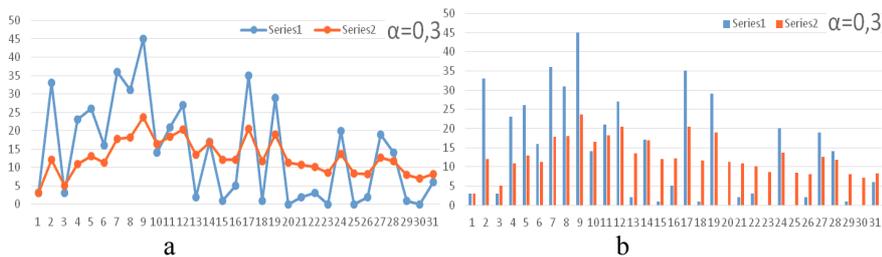
**Fig. 17.** Statistical analysis of the median filtration at interval 3: a – diagram of relations; b – graph of dependency



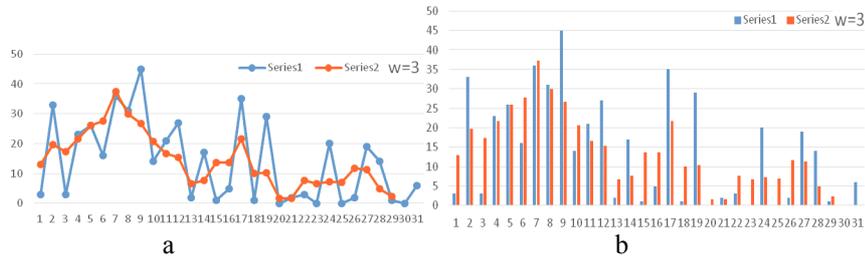
**Fig. 18.** Statistical analysis of the median filtration at interval 15: a – diagram of relations; b – graph of dependency



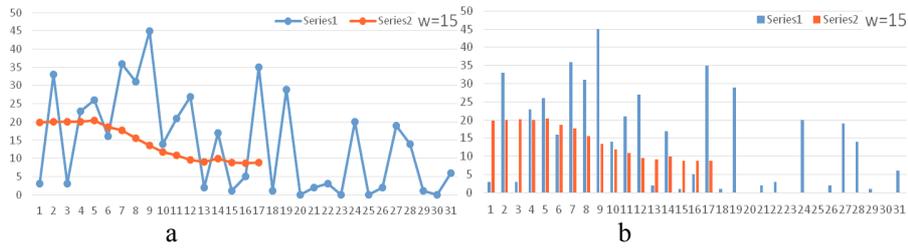
**Fig. 19.** Statistical analysis of the median filtration for  $\alpha = 0,1$ : a – diagram of relations; b – graph of dependency



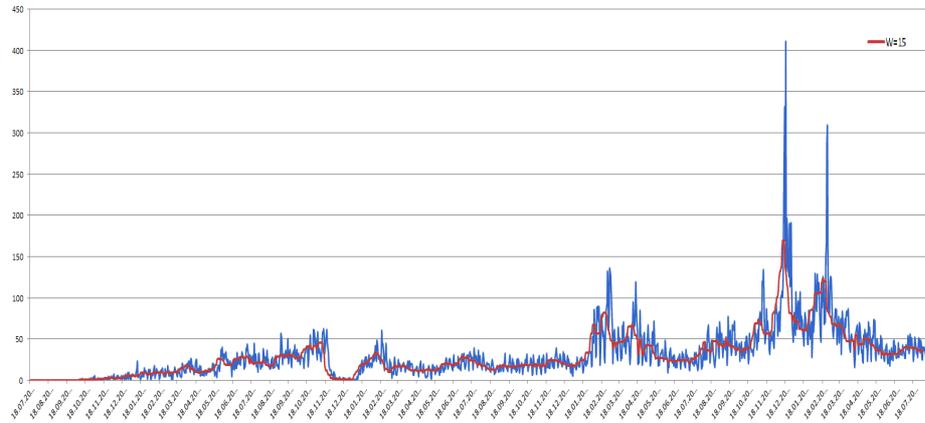
**Fig. 20.** Statistical analysis of the median filtration for  $\alpha = 0,3$ : a – diagram of relations; b – graph of dependency



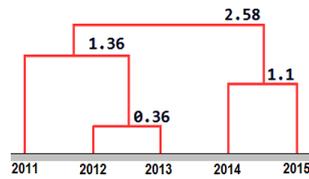
**Fig. 21.** Statistical analysis of the median filtration at  $w = 3$ : a – diagram of relations; b – graph of dependency



**Fig. 22.** Statistical analysis of the median filtration at  $w = 15$ : a – diagram of relations; b – graph of dependency



**Fig. 23.** Median smoothing at  $w = 15$  for vgosol.com.ua



**Fig. 24.** Dendrogram for vgosol.com.ua

## 6 Conclusions

In this paper heterogeneous data with agreed content aggregation system has been developed. Disadvantages and advantages of similar systems have been analyzed. The basic concepts and principles of contextual advertising work have been studied. The need to create a web service for managing contextual advertising has been justified. The research object system analysis has been conducted. A goal tree for implementation of automated management information system of contextual advertising has been conducted. The interaction of the system with the external environment within the DFD notation has been reflected. Software development tools and selected database management system has been defined.

Web services for managing contextual advertising in Google AdWords has been designed and developed. Developed system is designed to maintain and automate advertising campaigns, as well as advise on advertising services, which provides such basic functions: admin panel for managing advertising campaigns; advertising campaigns creation; campaign statistics grouping; groups of acquisitions creation; keyword setting; keyword bidding; flexible budget management of the advertising campaign. The ability to search for the necessary information, analyze and identify the key features that are needed to develop the system has been improved.

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