

Technical University of Sofia
Faculty of Computer Systems and Technologies

Eastern Macedonia and Thrace Institute of Technology

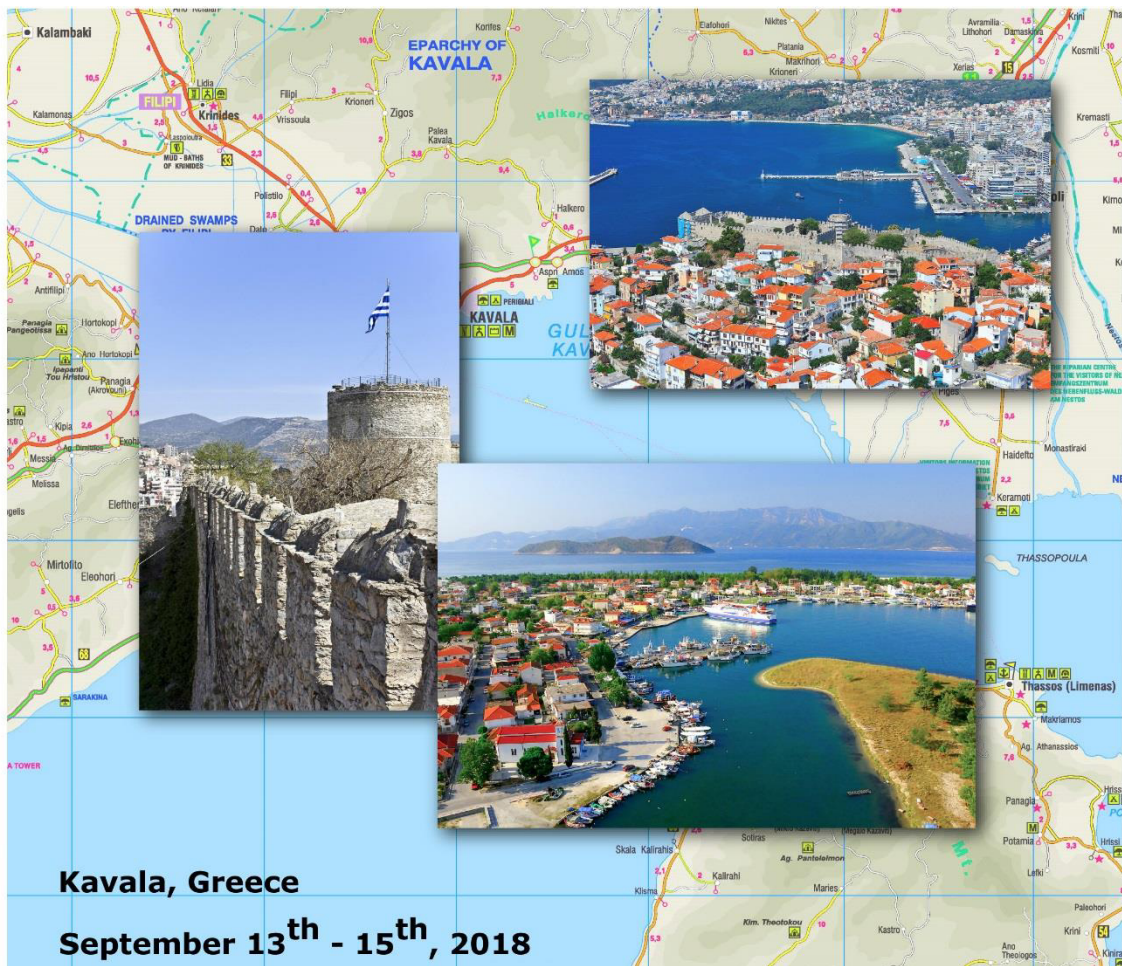
PROCEEDINGS

EIGHTH INTERNATIONAL SCIENTIFIC CONFERENCE

COMPUTER SCIENCE' 2018

UNITE 2018 WORKSHOP

Big Data and Smart Industry



Kavala, Greece

September 13th - 15th, 2018

CONFERENCE CHAIRS

Prof. Milena Lazarova,

Technical University of Sofia, Bulgaria

Prof. Dimitrios V. Bandekas,

Eastern Macedonia and Thrace Institute of Technology, Greece

HONORARY CO-CHAIR:

Ognyan Nakov,

Technical University of Sofia, Bulgaria

ISBN: 978-619-167-177-9

INTERNATIONAL ORGANIZING COMMITTEE	INTERNATIONAL PROGRAM COMMITTEE
<p>Adelina Aleksieva-Petrova, Technical University of Sofia, Bulgaria</p> <p>Antoniya Tasheva, Technical University of Sofia, Bulgaria</p> <p>Daniela Minkovska, Technical University of Sofia, Bulgaria</p> <p>Georgy Zapryanov, Technical University of Sofia, Bulgaria</p> <p>Iva Nikolova, Technical University of Sofia, Bulgaria</p> <p>Lyudmila Stoyanova, Technical University of Sofia, Bulgaria</p> <p>Ralitsa Peycheva, Technical University of Sofia, Bulgaria</p> <p>Roumen Trifonov, Technical University of Sofia, Bulgaria</p> <p>Sofoklis Christoforidis, Eastern Macedonia and Thrace Institute of Technology, Greece</p> <p>Virginia Dimitrova, Technical University of Sofia, Bulgaria</p>	<p>Betim Cico, "EPOKA" University, Albania</p> <p>Boyan Bontchev, Sofia University "St. Kl. Ohridski", Bulgaria</p> <p>Boyanka Zhelyazova, University of Forestry of Sofia, Bulgaria</p> <p>Chatzis Vasileios, Eastern Macedonia and Thrace Institute of Technology, Greece</p> <p>Daniela Gotseva, Technical University of Sofia, Bulgaria</p> <p>Elior Vila, University "Aleksandër Xhuvani", Albania</p> <p>Genti Daci, Polytechnic University of Tirana</p> <p>Goumas Stefanos, Eastern Macedonia and Thrace Institute of Technology, Greece</p> <p>Hristo Nenov, Technical University of Varna, Bulgaria</p> <p>Ivan Zelinka, Technical University of Ostrava, Czech Republic</p> <p>John Galletly, American University in Bulgaria</p> <p>Kamen Filyov, Technical University of Sofia, Bulgaria</p> <p>Lacezar Licev, Technical University of Ostrava, Czech Republic</p> <p>Mardiris Vasileios, Eastern Macedonia and Thrace Institute of Technology, Greece</p> <p>Milen Petrov, Sofia University "St. Kl. Ohridski", Bulgaria</p> <p>Mirjana Ivanovic, University of Novi Sad, Serbia</p> <p>Muzafer Shala, University of Mitrovica "Isa Boletini", Republic of Kosovo</p> <p>Stoyan Bonev, American University in Bulgaria, Bulgaria</p> <p>Tarxanidis Konstantinos, Eastern Macedonia and Thrace Institute of Technology, Greece</p> <p>Zoran Zdravev, University "Goce Delcev", Republic of Macedonia</p>

Contents

Framework for Big Data Analytics of Moodle Data Using Hadoop in the Cloud <i>Aleksandra Nikolovska, Aleksandar Velinov, Stojance Spasov, Zoran Zdravev</i>	3
The Estimation of Power Transmission Line Losses Using Big Data and Linear Regression <i>Arbër Perçuku, Daniela Minkovska and Lyudmila Stoyanova</i>	9
"Smart" Ring, "Smart" Bracelet and Derivatives as a Tool for Managing "Smart" Systems <i>Krassimir Stoyanov and Varbinka Stefanova-Stoyanova</i>	16
Affective Computing and Emotion Detection through Image Analyses <i>Ralitza Raynova, Milena Lazarova and Adelina Aleksieva-Petrova</i>	19
Counting Meteors Using Computer Vision and Neuron Network <i>Kamen Stoykov</i>	26
Comparison Between Routing Algorithms Applied in NoC Architectures for Smart Ethernet Switches Routing Schemes <i>Ile Dimitrievski and Valentin Mollov</i>	34
Accuracy and Limitations of Timer Software Generated Squared-Shaped Pulses <i>Valentin Mollov</i>	43
Prototype of Intrusion Detection System Using Fuzzy Logic <i>Roumen Trifonov, Georgi Tsochev, Georgi Popov and Ognian Nakov</i>	47
Innovative Technologies and Materials in Robotics <i>Ivan Chavdarov, Roumen Trifonov and Galya Pavlova</i>	54
Method for the Analysis of the Thermal Field in the Integrated Scheme <i>Marin Hristov and Jordan Milev</i>	61
Distributed Lock Management in Cloud Computing: Performance and Challenges. <i>Artur Koçi and Betim Çiço</i>	67
Survey on Hypervisor Security: Challenges and Solutions <i>Ibrahim Mesecan, Zhang Wensheng and Betim Cico</i>	75
From Big Data to Big Decisions via the Bridge of Learning Analytics Visualization <i>Dafinka Miteva and Eliza Stefanova</i>	85
Investigation of Threats and Attacks of Data Link Layer Case Study: ARP Poisoning and VLAN Hopping <i>Elior Vila and Loreta Kroj</i>	92
Decentralized Networks – Unveil the Technology Behind Blockchain <i>Ivaylo Chenchev and Adelina Aleksieva</i>	99
HDD Performance Research <i>Sergey Nedev and Vladimir Kamenov</i>	106
Multimedia and Cloud Computing – Recent Advances <i>Daniela Minkovska</i>	112

International Scientific Conference *Computer Science'2018*

Overview of the Concept of Language-Oriented Programming <i>Daniela Gotseva, Yavor Tomov and Petko Danov</i>	118
Query by Example – Retrieval in a Multimodal Context Applications <i>Petar Marinov and Nadejda Angelova</i>	123
Technologies for Confidentiality and Security of Individual Learner Profile <i>Svetlana Toncheva-Pencheva and Yordanka Anastasova</i>	131
Responsive Design of the Website of the University of Mining and Geology "St. Ivan Rilski" <i>Nikolay Yanev and Dimitrina Deliyaska</i>	137
Text Preprocessing For Documents Classification <i>Vasil Angelov, Roumen Trifonov and Daniela Gotseva</i>	144
An approach to Mid-level Representation in Object Recognition <i>Petar Marinov and Nadejda Angelova</i>	149
Dynamic Data Assigning Clustering for Schools' Group Separation <i>Olga Georgieva</i>	157
Analytics and Report Plugins in Moodle <i>Zoran Zdravev, Aleksandar Velinov, Stojance Spasov and Aleksandar Krstev</i>	163
Methodology for the Application of the Five Component Conceptual Model of Adaptive e-Learning Systems <i>Adelina Aleksieva and Varbinka Stoyanova</i>	169
Web Application for Document Classification with Naïve Bayes Algorithm <i>Adelina Aleksieva-Petrova, Milen Petrov and Petros Georganikos</i>	175
Parallelization of Algorithm for Primitive Polynomials Generation in Extended Galois Field (p^m) <i>Antoniya Tasheva, Boyan Petrov and Kamen Stoykov</i>	180
An Approach for Generation of Interactive Images Using G-Buffers <i>Virginiya Dimitrova</i>	187
Using Web Calculator of Genetic Algorithms for Modeling and Optimization of Packet Forwarding in Software-Defined Wide Area Networks <i>Boris Tudjarov and Valentin Hristov</i>	194
Compression Effects on JPEG Image Quality for Different YCC Formats <i>Georgy Zapryanov and Iva Nikolova</i>	200
Software System for Aggregating Social Statistics Between Different Social Networks <i>Plamen Tenev</i>	208
Impact of ICT Implementation in the Learning Process at the High Polytechnical School of Uige in Angola <i>Amoussou Dorothee</i>	214

Analytics and Report Plugins in Moodle

Zoran Zdravev, Aleksandar Velinov, Stojance Spasov, Aleksandar Krstev

*Goce Delcev University, Stip, Republic of Macedonia, zoran.zdravev@ugd.edu.mk,
aleksandar.velinov@ugd.edu.mk, stojance.spasov@ugd.edu.mk,
aleksandar.krstev@ugd.edu.mk*

Abstract: Moodle is one of the most famous e-learning platforms. It is often necessary to get knowledge about the use of a Moodle site by users. For this purpose, Moodle uses analytics tools. Sometimes these tools do not come standard with the platform and must be installed as plugins. The goal of our research is to explore the benefits of analytics and report plugins in Moodle. Here we present an overview of the plugins Forumgraph, Overviewstats and Piwik. We can conclude that they differ in relation to the information they present. The most comprehensive analysis is displayed with the Piwik plugin. For a more detailed analysis of big data from Moodle platform, can be used tools such as Hadoop, Hive and so on.

Keywords: Moodle, Plugins, Learning Analytics, Reports.

1. INTRODUCTION

In contrast to the traditional way of learning, e-learning offers a number of opportunities. Using the Internet, we can share and learn, in a much easier way. Internet has helped education system a lot by introducing concept called e-learning based Learning Management System (LMS) [1]. Today, a number of institutions from primary schools to universities use this way of learning. With the e-learning advance, educational institutions managers started to deal with different activities, requiring the development of new procedures and finding alternatives to address emerging challenges that go beyond educational issues [2]. The learning process is facilitated, by creating new procedures. New activities enhance the way of learning. This makes the learning process more interesting than the traditional way of learning. E-learning is a planned learning process [2]. This means that there are individuals who create learning resources and plan the process of acquiring knowledge of students. These individuals are teachers who place their lessons in digital format on an e-learning platform. Teachers create courses in which they can attach the resources. Students join the courses and have access to all resources. They can access them from anywhere and at any time. This requires only an access device (computer, mobile phone, tablet) and the Internet. This facilitate the learning process in terms of the availability of learning materials. The number of books in libraries is limited. If a large number of students take books, one student may not be able to take a book. In this case, the concept of access to learning materials has been violated. This is not the case with the e-learning. Unlimited number of students may have access to learning resources. With this new way of learning, we can not have a case in which one of the students will be left without a book. This is major advantage of e-learning. Availability can be broken only by interruption of the Internet and the inaccessibility of e-learning platform. These resources are available to students at school, at home, at work and everywhere. The importance of e-learning for education is enormous.

There are more e-learning platforms. One of the most famous e-learning platforms is Moodle [3]. It is open source, and everyone can use it, to change its code and to adjust it for its own educational purposes. It is available in more than 100 languages [4]. According to a survey done in 2015 [4], there are more than 54,000

active Moodle sites that are registered from 225 countries, with millions of users. Today, there are 103843 active Moodle sites that have registered from 233 countries and more than 124 million users [3] [5]. Accordingly, the number of sites has increased by the half (around 50000) for a period of three years. The number of countries from which the Moodle sites have been registered has increased by only 8 for a period of 3 years. It is often necessary to get knowledge about the use of a Moodle site by users. For this purpose, Moodle uses analytics tools. Sometimes these tools do not come standard with the platform and must be installed as plugins.

The goal of our research is to explore the benefits of analytics and report plugins in Moodle. We do this to get information about using the platform, user behavior, visitors, courses and so on.

This paper is organized as follows. Section 2 represents a general overview of Moodle plugins. In Section 3, we give an overview of some of the most famous plugins for analysis in Moodle. In subsections 3.1, 3.2 and 3.3 each of the plugins for analysis is presented in the order as follows: Forumgraph, Overviewstats and Piwik. Section 4 provides a discussion about the plugins. The conclusions are presented in Section 5.

2. PLUGINS IN MOODLE

Plugins in Moodle are add-ons that increase its functionality [6]. Moodle plugin is just a folder of PHP scripts, CSS, JavaScript and images [7]. We can also create our own plugin. We have to create a folder with specific files and put it into mod directory [7]. There are plenty of plugins for different purposes like: Administration, Assessments, Collaboration, Communication, Content, Interface. There are also a lot of types of plugins such as: Activity module, Admin tool, Block, Editor, Local Plugin, Course format, Quiz/Access role, Search engine and so on. Often some plugins depend on the version of Moodle. There are plugins that are not adapted for newer versions of Moodle. Therefore, it is necessary to keep an eye on installing the plugins. There are currently 1477 plugins that have been developed by 834 developers. The number recent plugins download is around 400000 [6]. On the Figure 1 we can see the top Moodle plugins downloads in the last three months. As we can see from the figure, the most attractive is the plugin "Adaptable" with more than 70000 downloads.

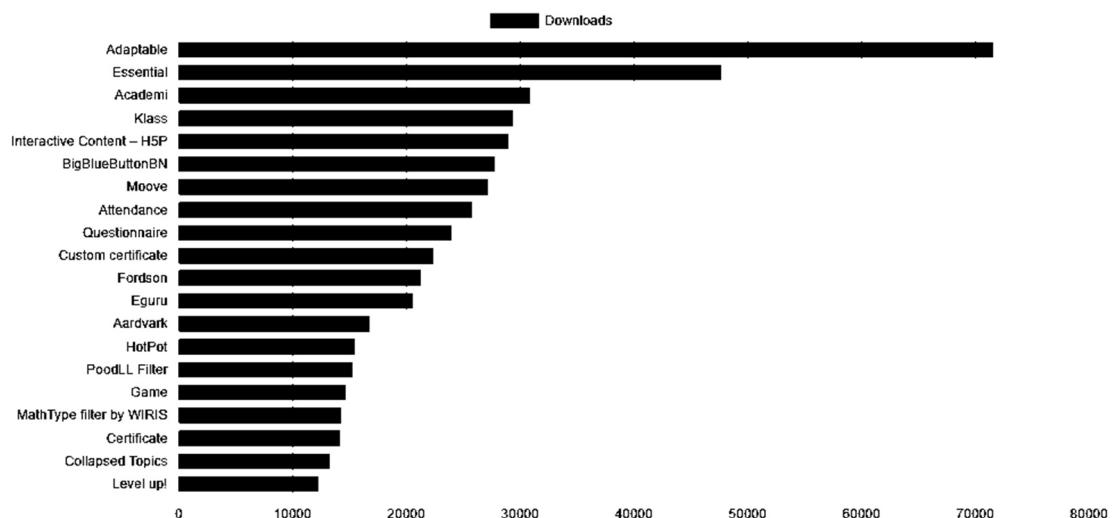


Fig. 1: Top Moodle plugin downloads in the last 3 months, June 2018

(Source: <https://moodle.org/plugins/stats.php>)

It is often necessary to get information about the number of users who have accessed the Moodle site, the countries where they are accessing, the number of downloaded resources, the most commonly used search engines, and so on. Special plugins for analyzing the Moodle sites have been developed. All of the statistical data we previously listed can be obtained automatically with these plugins. For some of the more important plugins for analysis we will talk in the next section.

3. OVERVIEW OF PLUGINS FOR ANALYSIS

Plugins for analysis are very useful for the administrators of Moodle sites. Plugins can get a lot of information that is not available with the basic version of the Moodle platform. It provides information for the behavior of users, the frequency of access, the countries from which it is accessed, the method of access (phone, computer), etc. In this section, we will look at the functionalities of some of the plugins for analysis, such as: Forumgraph, Overviewstats and Piwik.

3.1. Forumgraph

Using the Forumgraph plugin, we can analyze the interactions in a single Forum activity [8]. This plugin can also create a force-directed graph. The graph is created using the D3.js Javascript library. In order to make an analysis, you first need to choose the course and then the forum that is on it. Then we will be able to see forum information such as: discussions count, replies count, user with most posts that are ranked (Figure 2). Finally, the graph with the users follows. Each node in the graph is single user. The number of posts of the user determines the size of the node. The interaction between users is represented with the edge. The nodes of teachers and students are represented in different colors. The number of sites that use this plugin is 164 [8].

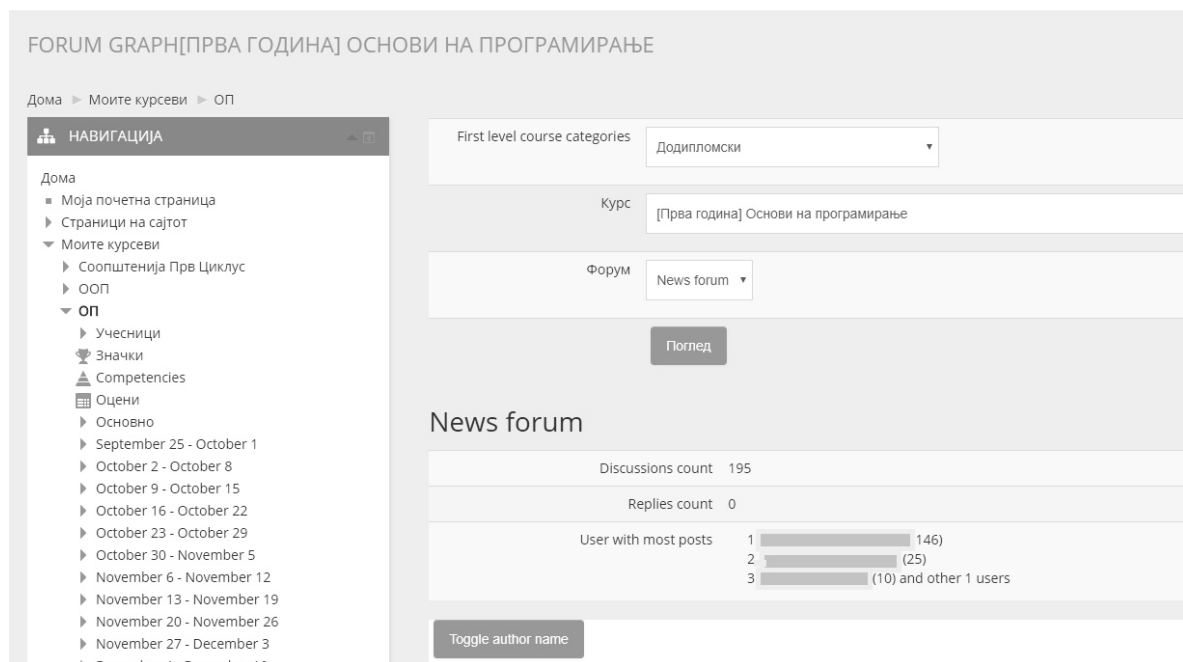


Fig. 2: Forumgraph plugin

3.2. Overviewstats

Overviewstats is another plugin for analysis and reports [9]. It displays various site and course report charts (Figure 3). It uses the YUI Charts module to produce the graphs. It provides an overview of several types of reports [10]:

- Users logging in – per day
- User countries
- User preferred languages
- Number of courses per category
- Number of courses per size

“Users logging in-per day” chart represents the number of logins per day for unique users. This report has been prepared for each day of the last month. “User countries” chart displays the countries where the users come from as well as the number of users. To make this report, the user profiles of Moodle are used. “User preferred languages” displays the languages of the graphical user interface that are most often selected by users. “Number of courses per category” displays the number of courses in each course category. Here are two ways of showing the number of courses: recursively (includes subcategories) and own courses only. “Number of courses per size” chart displays the number of courses in relation to the activities they have (0-4, 5-9, 10-14 activities etc.). The number of sites that use this plugin is 1632 [9].

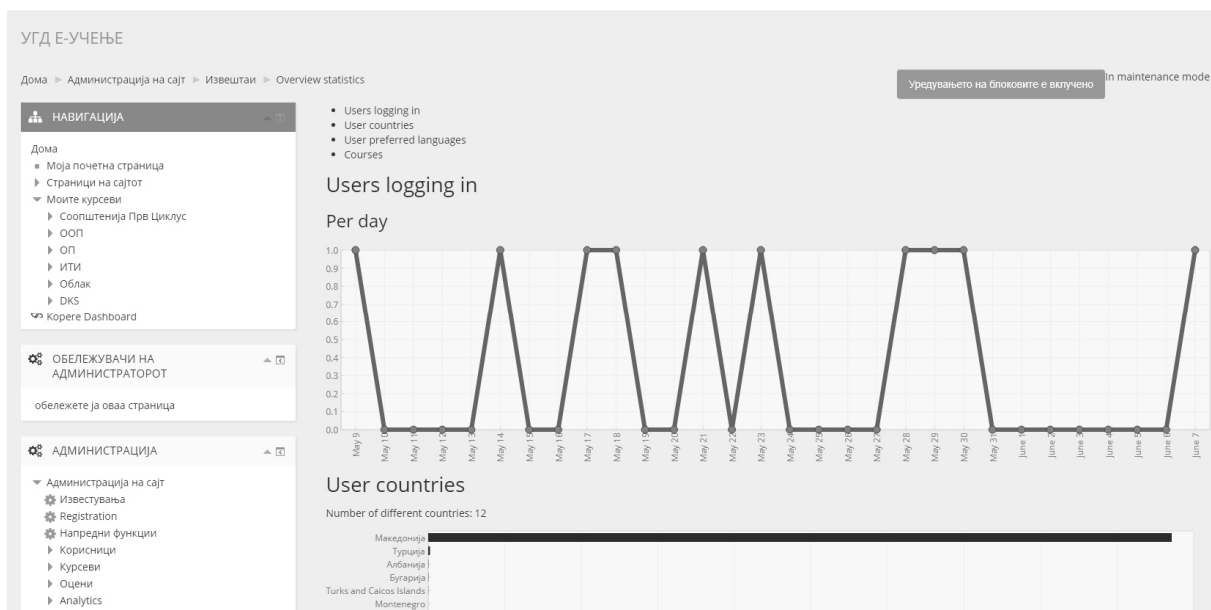


Fig. 3: Overviewstats plugin

3.3. Piwik

Piwik displays detailed analysis and usage reports on the Moodle site [11]. It provides analysis for visitors of the site such as Visitors in Real-time, Visits over Time, Visits overview, Visitor Map, Referred Types (Figure 4). “Visitors in Real-time” is very interesting feature of this plugin. It displays all the actions of the users, user country, ip, the type of browser and browser language, operating system, the type of device from which the user accesses the site (Desktop, Smartphone, Phablet, and Tablet), device brand and the resolution. A complete overview of the user profile can be viewed (total time spend on the website, first visit, last visit, type of devices,

location and total history of the visits with all the user actions on site). Piwik also displays information about the user behavior such as the visited pages, page titles, site search, outlinks, Downloads, events and contents. Evaluation over period is given on a weekly basis. The number of sites that use this plugin is 1290 [11].

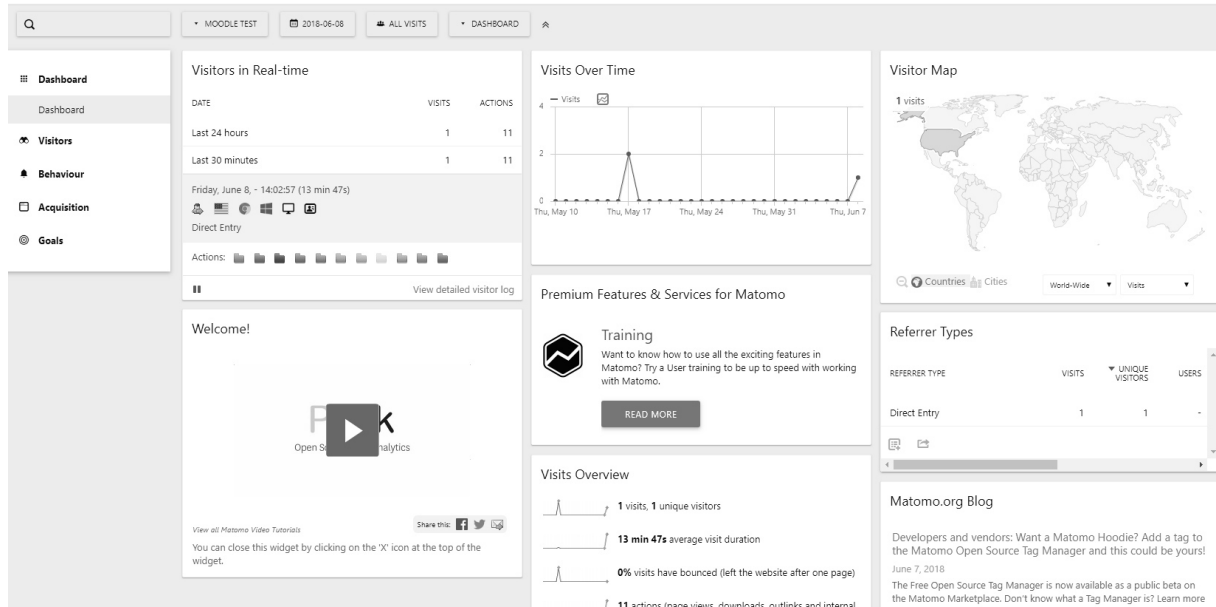


Fig. 4: Piwik plugin

4. DISCUSSION

Tab. 1: Differences between plugins

Plugin	Internal Statistics (courses, categories)	User statistics	Access information	Real-time information	Information about user behavior
Forumgraph	YES	YES	NO	NO	NO
Overviewstats	YES	YES	YES	NO	NO
Piwik	NO	YES	YES	YES	YES

In Table 1, we can see the differences between the plugins for analysis and reports. We can use Forumgraph and Overviewstats to get statistics about courses and categories. We cannot get this information with Piwik. We can get user statistics with all plugins. User access information is not available only on the Forumgraph plugin. The real-time information and information about user behavior are only available with the Piwik plugin.

From the research, we can see that each plugin has its own functionalities. Therefore, all plugins display a different output. This means that in order to get a complete analysis we must install all plugins. This greatly complicates the work of analysts. In the future, we need to think about the need to create a plugin for Moodle that provides a complete overview and full analysis.

Often the data itself offers a large number of hidden information and associations. For a more detailed analysis of big data from Moodle platform, can be used tools such as Hadoop, Hive and so on. We can use the tool Sqoop to import Moodle tables into Hadoop. We can later set up Hive queries and analyze data.

All these functionalities that plugins offer, in the future should help teachers in the process of improving learning. Teachers need to analyze the data obtained from the analysis. It is necessary to identify students with worse results and to direct them in order to improve their results. The future is in the teachers. Especially in the teachers who, besides the standard role, also have the roles analyst, instructor and facilitator. Students need to be taught. It is necessary to analyze their behavior in terms of learning and their results. The teacher should determine the methods he could use to improve learning. It is necessary to direct the students in order to improve their results and to facilitate their learning process.

5. CONCLUSION

Plugins for analysis and reporting are very useful for the administrators of Moodle sites. They can provide information about site visitors, user behavior, course information, access information and so on. From the considered plugins in this paper, we can conclude that they differ in relation to the information they present. The most comprehensive analysis is displayed with the Piwik plugin.

These plugins do not always satisfy the needs of the users. From this research, we can see that each of the plugins has its own functionalities. Often Moodle data provides hidden knowledge and relations. For this purpose, we need to use special tools for analysis and processing of big data such as Hadoop, Hive and other similar tools.

REFERENCES

- [1] Patel, C., Gadhavi, M., & Patel, A. (2013). A survey paper on e-learning based learning management Systems (LMS). Volume, 6, 171-176.
- [2] Oliveira, P. C. D., Cunha, C. J. C. D. A., & Nakayama, M. K. (2016). Learning Management Systems (LMS) and e-learning management: an integrative review and research agenda. *JISTEM-Journal of Information Systems and Technology Management*, 13(2), 157-180.
- [3] (2018) Moodle. [Online]. Available: <https://moodle.com/>
- [4] Umek, L., Keržic, D., Tomaževic, N., & Aristovnik, A. (2015). Moodle E-Learning System and Students' Performance in Higher Education: The Case of Public Administration Programmes. *International Association for Development of the In-formation Society*.
- [5] (2018) Registered Moodle sites. [Online]. Available: <https://moodle.net/sites/>
- [6] (2018) Moodle Plugins. [Online]. Available: <https://moodle.org/plugins/>
- [7] (2018) Moodle plugin for game based learning. [Online]. Available: <https://www.it.iitb.ac.in/~sri/students/pankaj-thesis.pdf>
- [8] (2018) Reports: Forum Graph. [Online]. Available: https://moodle.org/plugins/report_forumgraph
- [9] (2018) Reports: Overview statistics. [Online]. Available: https://moodle.org/plugins/report_overviewstats
- [10] (2018) Moodle: Overview statistics report. [Online]. Available: https://github.com/mudrd8mz/moodle-report_overviewstats/blob/master/README.md
- [11] (2018) General plugins (Local): Analytics. Piwik [Online]. Available: https://moodle.org/plugins/stats.php?plugin=local_analytics