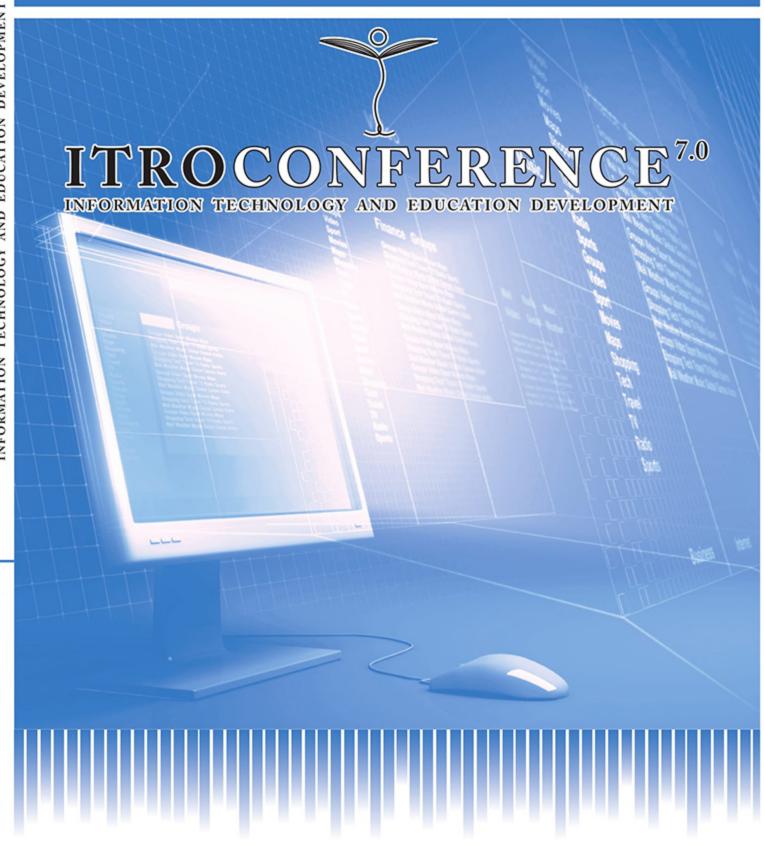


# UNIVERSITY OF NOVI SAD TECHNICAL FACULTY "MIHAJLO PUPIN" ZRENJANIN





**ZRENJANIN, June 2016** 



#### UNIVERSITY OF NOVI SAD TECHNICAL FACULTY "MIHAJLO PUPIN" ZRENJANIN REPUBLIC OF SERBIA



# VII INTERNATIONAL CONFERENCE ON INFORMATION TECHNOLOGY AND

# DEVELOPMENT OF EDUCATION ITRO 2016

PROCEEDINGS OF PAPERS



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With this publication, the CD with all papers from the International Conference on Information Technology and Development of Education, ITRO 2016 is also published.

#### INTRODUCTION

This Proceedings of papers consists from full papers from the International conference "Information technology and development of education" - ITRO 2016, that was held at the Technical Faculty "Mihajlo Pupin" in Zrenjanin on June 10<sup>th</sup> 2016.

The International conference on Information technology and development of education has had a goal to contribute to the development of education in Serbia and the Region, as well as, to gather experts from natural and technical sciences' teaching fields.

The expected scientific-skilled analysis of the accomplishment in the field of the contemporary information and communication technologies, as well as analysis of state, needs and tendencies in education all around the world and in our country has been realized.

The authors and the participants of the Conference have dealt with the following thematic areas:

- Theoretical and methodological questions of contemporary pedagogy
- Personalization and learning styles
- Social networks and their influence on education
- Children security and safety on the Internet
- Curriculum of contemporary teaching
- Methodical questions of natural and technical sciences subject teaching
- Lifelong learning and teachers' professional training
- E-learning
- Education management
- Development and influence of IT on teaching
- Information communication infrastructure in teaching process

All submitted papers have been reviewed by at least two independent members of the Science Committee.

There were total of 163 authors that took part at the Conference from 15 countries, 4 continents: 96 from the Republic of Serbia and 67 from foreign countries such as: Macedonia, Bulgaria, Slovakia, Russia, Montenegro, Albania, Hungary, Italy, India, Rumania, Bosnia and Herzegovina, USA, Egypt and Nigeria. They were presented 82 scientific papers; 42 from Serbia and 40 from the above mentioned countries.

The papers presented at the Conference and published in Proceedings can be useful for teachers while learning and teaching in the fields of informatics, technics and other teaching subjects and activities. Contribution to the science and teaching development in this Region and wider has been achieved in this way.

The Organizing Committee of the Conference

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## Creating Interactive Map with OpenLayers

#### E. Gjorgjieva, N. Koceska, S. Koceski

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Abstract – Maps are a powerful tool for geographic data presentation. Interactive maps a computer-based tool designed to collect, manipulate, analyze and visualize geographic data. They can be used also as a new teaching and learning tool for teachers, to conduct problem-solving active-ties in the classroom, and for students, to explore geographic issues. This paper describes the process of creating interactive map of Republic of Macedonia using OpenLayers. The application allows visual presentation of some geographic and statistical data for Republic of Macedonia, like: region-al borders, location of cities, presentation of some important information about selected city, population density for re-goons and cities, total number of men, women and children etc.

#### I. Introduction

The popularity of interactive maps within the past few years has been increased significantly. The ac-accessibility of free services such as Google and Bing Maps, allows online mapping to be used by every-one, and everywhere.

The opportunities that interactive maps provide can also be used in an educational process. Teachers can use it as a supportive tool to improve the teach ing process, to engage and to motivate the students.

Students can also take and advantage of using interactive maps, because the data are easier to visualize and understand, and the subject is easier to learn

Interactive maps can help the students to focus more deeply into the course material, and to learn more about the real world [1].

Interactive maps which are based on OpenStreetMap, Bing Maps, Google Earth or Google Maps, give very unique opportunity and viable option to add stimulation to students while learning by focusing on locations and places [2]. They can be improved in the classroom curriculum in many different subjects like geography.

However, the research of the impacts of interactive maps on education is still quite limited. One of the first publications of using digital maps in education is the article by Robert Tinker [3], who explored the possibilities of representing data with digital maps in many curricula. Koussoulakou

and Kraak's [4] have also experimented with animated maps. They have made a comparison of use of animated maps to static maps for analyzing patio-temporal data. MacEachren et al. [5] have tested controls for map animation and other interactive tools for map manipulation. More recently, several studies for using interactive maps in education process have been conducted. They have reported that students generally prefer using interactive, web-based maps over static, paper maps [6, 7, 8, 9].

In this paper we will present an interactive map of Republic of Macedonia, created with OpenLayers. OpenLayers is a free, open source, tool which allows creating interactive maps. It provides both novice developers and professionals with a robust library, for creating modern, fast, and interactive web-mapping applications for desktop and mobile devices. Created interactive map, can be used in geography classes.

#### II. OPENLAYERS

OpenLayers is an open source toll developed by Metacarta [10]. It is JavaScript library for making interactive web maps, which are viewable in almost all web browsers. OpenLayers is a client side library, therefore there is no need to download anything be cause it not requires any special settings or software. First version of OpenLayers was published in 2006, in part, to Google Maps.

With OpenLayers you can build entire mapping applications from the ground up and customize different things of your map such as: layers, events, controls, etc. Also, you can use more and different map server back-ends together, as well as vector layers. You can draw lines, polygons, circles, etc., with different styles.

Maps created with OpenLayers are interactive, so users can enable or disable the visibility of layers, they can zoom and drag the map, click on the markers to show some data about selected geography location etc. One of the advantages of OpenLayers is that you can customize your map with the design you prefer of a website.

With OpenLayers you don't need to be a programmer to create an interactive map because it is very simple to use.

## III. CREATING INTERACTIVE MAP WITH OPENLAYERS

Interactive maps are more interesting for the students than paper maps because they allow better visualization of data. Various software exists for cre-ating interactive maps. In our case we have used OpenLayers free, and open source solution that allows data visualization retrieved from different sources.

With the help of OpenLayer we have created an interactive map of Republic of Macedonia which allows visual representation of some geographic and statistical data for our country. This interactive map contains different layers which enable a rich presentation of the data.

The basic layer is the layer that shows the countries of the Europe continent, so the students can acquire some basic knowledge about every country, like: location, border states etc. (Fig.1).



Figure. 1. Map showing the location of Republic of Mace-donia

The second layer shows the basic map of Republic of Macedonia. By clicking on this map the next level, showing the regions in Republic of Macedonia, is presented (Fig. 2).



Figue. 2. The basic map showing the regions of Republic of Macedonia

The population density of the region is presented using different shades of red colors. The darker colors indicate regions with higher density, while the lighter colors indicate regions with lower density. This allows student to easily distinguish the regions, and to learn about population density.

This map also employs highlighting on mouseover to allow students to get into details easily and to support open-ended exploration. When students mouse-over a region, that zone is outlined in red and the fill color becomes more saturated. Double-click on selected region, will show that region enlarged with the towns located in that region.

Each town is presented with the name and picture, which is made clickable (Fig. 3).



Figure. 3. Presentation of the data about particular town

Clicking on the particular picture, a larger image appears that shows the selected city together with some important characteristics about it. The same information can be obtained using a dropdown box, which lists all the cities of a selected region. This allows student to choose the preferred way of interaction

On the right side of the map, various commands (dropdown boxes, checkboxes, and radio buttons) are available (Fig. 4). They allow various data to be presented on the map, like: population density (about region and towns), number of men, women and children, fertility rates, mortality rates etc.



Figure 4. Map with various commands used for data manipu-lation

Also various animation effects (pan, rotate, fly to etc.) are also implemented in this map.

#### IV. CONCLUSION

The rapid developments of information and communication technologies have changed the notation and the way of teaching and learning in the past decade. In this context interactive maps, could be seen as a useful and effective tool that provides inquiry-based learning experiences in the classroom. They support interactive learning, interdisciplinary learning, multiple representations, and multiple linkages of information. Because of this they are very popular with students, who prefer using interactive maps, over static, paper based maps.

In this paper we have presented an interactive map created with OpenLayer, which can be used in school geography education. This interactive map, which is web based, allows various ways of interaction forms for manipulating data representations. Geographic and statistical data of Republic of Mace-donia are presented with the help of this map, so the students can learn more about specific town and re-gion in Republic of Macedonia.

In near future we plan to conduct an experiment with end users, in order to get feedbacks which will help us in further application development.

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