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Interactive Hiking Map - Example of the National Park Paklenica

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Abstract. Interactive maps have found their application in hiking as well. More and more hikers use smart devices for orientation that contain topographic and/or other cartographic products adapted to moving around certain terrain. This trend has not been fully developed in Croatia, but the increased number of users of smart devices and applications adapted to them shall certainly lead to a larger number of interactive hiking maps.

The paper presents the Interactive Map of the National Park Paklenica that was produced within the frame of the diploma thesis at the Chair for Cartography of the Faculty of Geodesy, University in Zagreb.

Keywords: interactive maps, hiking maps

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1 Introduction

Maps are the best way to present the space, and Internet is exactly the best possibility to provide the accessibility to maps that printed maps has never had [1]. Interactive maps present to users even more lucidly and in a more interesting way the contents that they are interested in, and since they are available on Internet, they are easy to browse and use.

Interactive maps have found their application in a large number of activities. These are most often the maps that provide various information for users about certain locations, towns, traffic, economic facilities and similar. Their application is unlimited and it depends on the needs of users and those who order maps.

Due to their beauty, richness and diversity, the protected areas present a fundamental value and one of the most important natural resources being of special interest to tourist, mountaineers and all nature lovers. The presentation of such areas has always been a special challenge for cartographers.

There are 420 areas in Croatia protected by the Law on Nature Protection [2] in 9 categories of nature protection. These are: strict reserve, national park, special reserve, nature park, regional park, natural monument, significant landscape, park-forest, and park architecture monument. The total area of all protected areas is 717.921 ha. The most beautiful and valuable areas are protected in 8 national parks (95.472 ha) (Figure 1) and 11 nature parks (419.621 ha) [3].

2 Interactive maps

The interactivity (*lat: inter Agere = alternately or „in relation so some other“*) refers in social psychology to succession behaviour of two or more persons in order to communicate. Analogously, the interactivity in cartography provides for users the map choice, making decisions, but also the feedback effect on map presentation in real time. In creating multimedia *interactive* properties of the map, the interactivity refers to various possibilities of users to make individual choice, as well as visualisation and presentation of information adjusted to the interests and needs of users.

Some of the basic advantages of interactive maps are: the possibility of changing the scale, the possibility of changing the view, the possibility of selecting symbols or colours on a map, moving on a map, switching on/off the layers on a map, links to other maps or pages, etc.

In a very short time, Internet has proven as its basic advantage to have the possibility of searching and publishing extremely large number of data available to a large number of users. Among many other data available on Internet, there are also a large number of various maps.

The availability of Internet maps is one of the basic advantages as related to traditional maps, and the other important characteristic is *interactivity*. Interactive maps make it possible for users to have the contents they are interested in presented in better laid out and more interesting way.

2.1 Interactive hiking maps

Hiking maps are a special type of thematic maps where the hiking infrastructure and connected contents are specially emphasized. It relates first of all to the relief, mountain peaks, hiking routes, control points of hiking trails, mountain accommodation, traffic and other facilities intended for hikers. In order to increase the accuracy of the presentation and to provide higher reliability of maps, the data related to hiking infrastructure are collected by means of GNSS devices that survey the details that are not or only rarely delineated in topographic maps.

The experienced hikers always have a map of the selected area with them, when they go to the mountains. They first study such map in order to get better prepared for challenges they might come across. Present hiking maps very often have well described hiking trails, their length and the time needed to cross them, which makes the orientation in space much easier, and more and more hikers use GPS

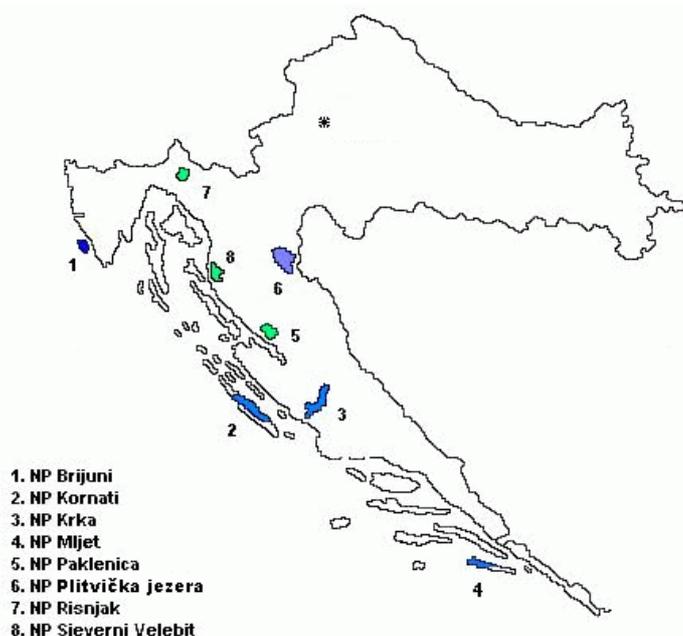


Figure 1. National parks in the Republic of Croatia [3]

devices for orientation that already contain topographic or other cartographic material intended to help in moving around the terrain.

The interactive maps find their application in all areas of human activity, and thus also in hiking. The example of such a map is the map of the National Park Mount Rainier in the United States of America (Figure 2).



Figure 2. The example of interactive hiking map – Mt. Rainier [4]

3 Hiking portals in Croatia

The beginnings of organised hiking in Croatia date back as far as the year 1874 when the Croatian Climbing Society (HPD) was founded. Today, after 140 years of its existence, there are about 27000 hikers active in Croatia who are organised in more

than 250 climbing societies and clubs, and their activities are coordinated by the Croatian Mountaineering Federation (HPS) [5]. Apart from „central“ hiking Internet portal, the portal of the Croatian Mountaineering Federation: www.hps.hr, there are also more portals active with a wide spectrum of information related to hiking and spending time in nature. They also present a valuable resource for hikers and hiking. One of such Internet pages is also <http://planinarenje.hr> that has been refreshed with the interactive map of Croatian mountain peaks, but also of the mountain peaks in the neighbouring countries that the hikers are interested in [6].

The Mountaineering Section of the Faculty of Geodesy initiated in 2014 the Mountaineering Portal (www.planinarski-portal.org) where web GIS application with dynamic overview of maps is available, as well as the possibility to ask about various spatial matters. The application is conceived as a complete web GIS portal that includes all essential information related to mountaineering facilities in Croatia, the control points of the Croatian mountaineering bypasses and access roads. In this way, all registered users could participate in updating the contents of GIS application by collecting various data, which would contribute to its accuracy and quality [7] (Figure 3).

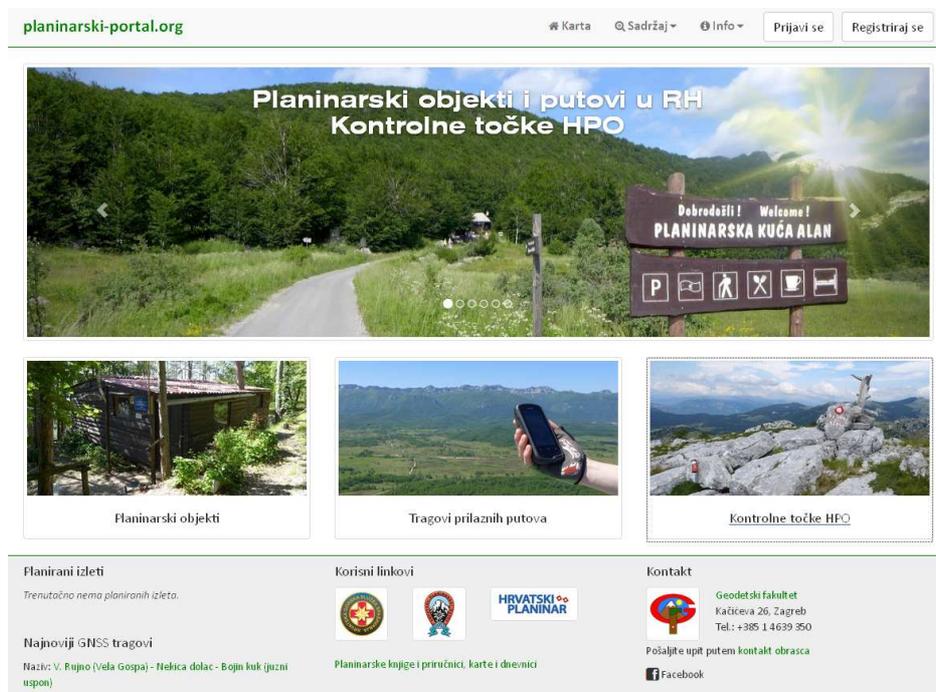


Figure 3. Home page of the mountaineering portal of the Mountaineering Section at the Faculty of Geodesy [7]

So far, we have not found any interactive hiking maps like the one on Figure 2, however, we have

made an interactive hiking map of the National Park Paklenica for the diploma thesis of the student Mirela

4 Interactive hiking map of the National Park Paklenica

4.1 Basic information about the National Park Paklenica

Due to its unique natural features, magnificent forests and extraordinary geomorphologic structures, the area of Velika and Mala Paklenica was proclaimed a national park in 1949. The main reason for proclaiming this area a national park was the protection of the largest and best preserved forest complex in the territory of Dalmatia, which was threatened by overexploitation. The Paklenica

National Park stretches on the area of 95 km², on the littoral slope of South Velebit under the zone of the highest mountain peaks Vaganski vrh (1752 m) and Sveto brdo (1753 m) [8].

It covers the area of torrent flows of Velika and Mala Paklenica, and their distinctive canyons carved vertically into the south slopes of Velebit and the broader surrounding area. The relatively small area has an abundance of geomorphological phenomena and forms, diverse flora and fauna, attractive landscapes and intact nature. Diverse habitats in the area of Paklenica, along with elevation stratification, provide a home for diverse fauna (figure 4).



Figure 4. The details of NP Paklenica

Distinctive features of Paklenica National Park are autochthonous forests of black pine, several types of beech forests and deep canyons with torrent flows

of Velika and Mala Paklenica. Wider area of Paklenica National Park prides itself with rich and diverse cultural heritage [8].

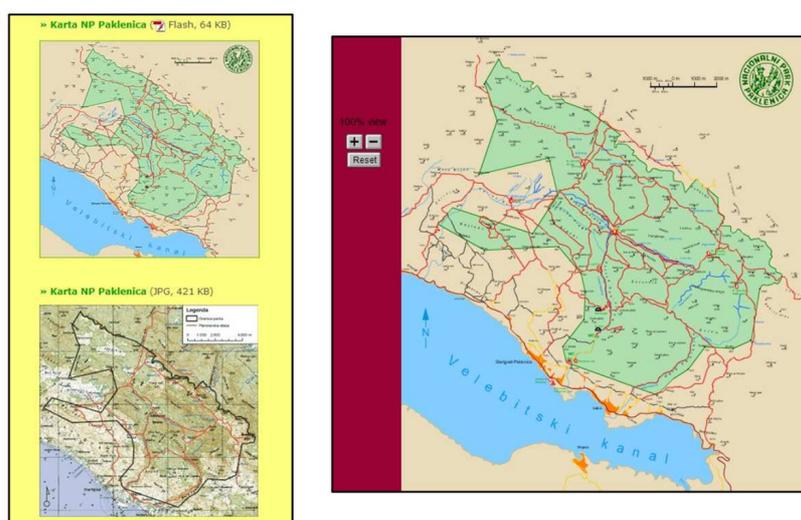


Figure 5. Existing interactive maps of the NP Paklenica

On Internet pages one can find various maps of the National Park Paklenica, however, these are

mostly analogous maps. There were only two digital maps (Figure 5) found, and they are both interactive only related to the possibility of moving around the map. The basic idea of the diploma thesis was to make an interactive map that will allow the searching with the objects of map presentation and homonyms, and adding new information about them.

4.2 Production of a cartographic project

Interactive hiking map of the National Park Paklenica was made within the frame of the diploma thesis prepared at the Chair of Cartography at the Faculty of Geodesy, University in Zagreb in 2013 [9]. Various programmes were used in individual phases of the work (OCAD 9.0.1; Quantum GIS 1.8.0, GRASS GIS 6.4.2., Dynamic HTML Editor 1.9, CoordTrans 2.3), and the database was created in OCAD. OCAD is a program for drawing maps of all

types (e.g. topographic maps, city maps, hiking and biking maps, Internet maps). OCAD provides you with a powerful software package for producing any kind of maps, by interchanging within the following fields: Geodata Capture (mobile application), Import and Export of Geodata, Desktop Publishing (DTP) and creating Internet Maps [10]. We have been using it in teaching activities at the Faculty of Geodesy for more than 10 years.

The data of the State Geodetic Administration (SGA) have been used as primary cartographic sources. The central access point for spatial data of SGA is Geoportal DGU (Figure 6), and the following data were used in the preparation of this work: Digital Orthophoto Map 1:5000, Croatian Base Map 1:5000 and Topographic Map 1:25 000.

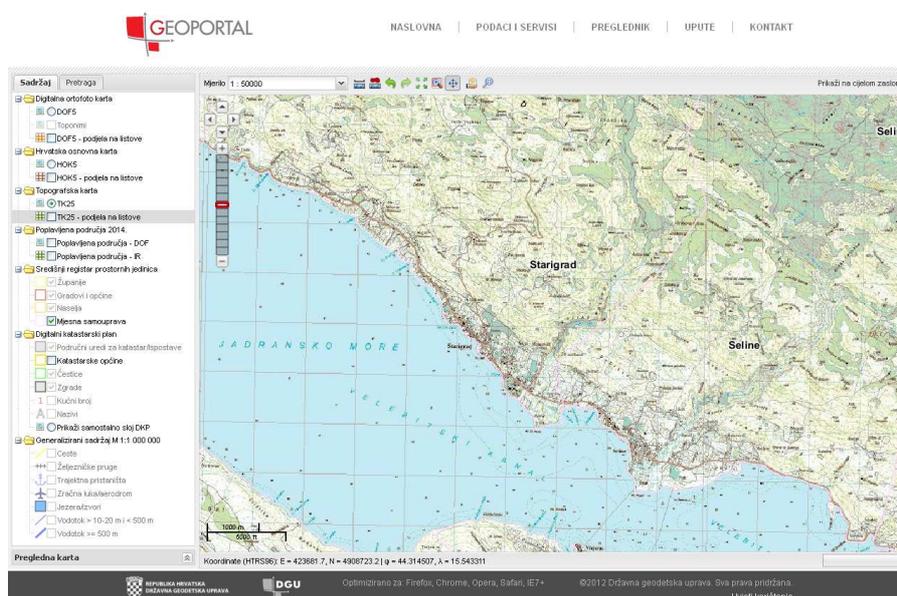


Figure 6. The location of the NP Paklenica on Geoportal DGU

In order to find cartographic documents (needed for the access to Geoportal and for the connection with the data from external sources), the free programme Quantum GIS 1.8.0 was used. The relief was presented with contour lines that were interpolated from ASTER digital terrain model, and the presentation of the relief was made in the free open source programme package GRASS GIS 6.4.2.

Hiking maps are a special type of thematic maps that require a special type of map graphics. Several types of cartographic symbols were used in the production of the map. One part of the used symbols is predefined symbols from OCAD, but there were also new, one's own symbols created. (Figure 7).



Figure 7. Cartographic symbols used in the production of the interactive hiking map of the National Park Paklenica

In the process of making a base map, OCAD creates simultaneously the database, arranges the objects into groups on the basis of which a unique

database is created (Figure 8).

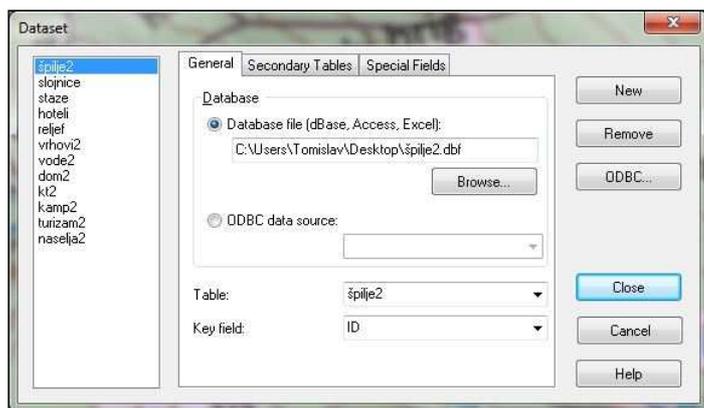


Figure 8. Creation of the database

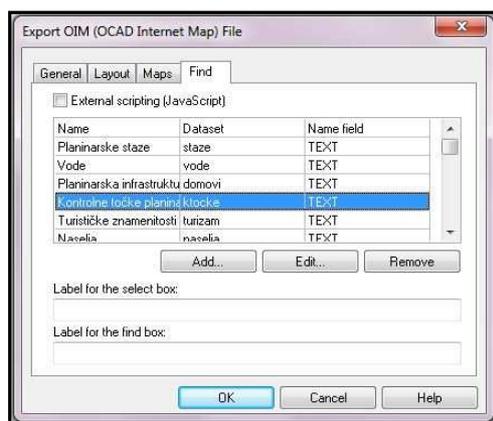


Figure 9. Dialog box for defining the search

After the database had been supplemented with data, the last step was the production of the interactive plan itself and its installation onto web. The map can be made in various formats, as.dxf, .jpeg, .tiff, .pdf, with OIM (*OCAD Internet Map*) being the most important among them. (Figure 8). After selecting the map resolution, the areas that we want to publish on web, and after selecting the objects according to which the search of the map will be allowed (Figure 9), an interactive plan can be made in 3 formats: *Java*, *Flash* and *SVG*. The basic difference can be seen in the format of raster files that the future plan will consist of. In this case, Java was chosen, and the plan consists of a large number of .gif files.

By means of the described procedures, a database was created that makes it possible to search the map according to the given categories. Apart from the information about ID number that allows the connection with the base, and the number of signature, there is also the field in which the name of the object is entered that will be shown on the final map, and URL field where the link to another page is entered (Figure 10).

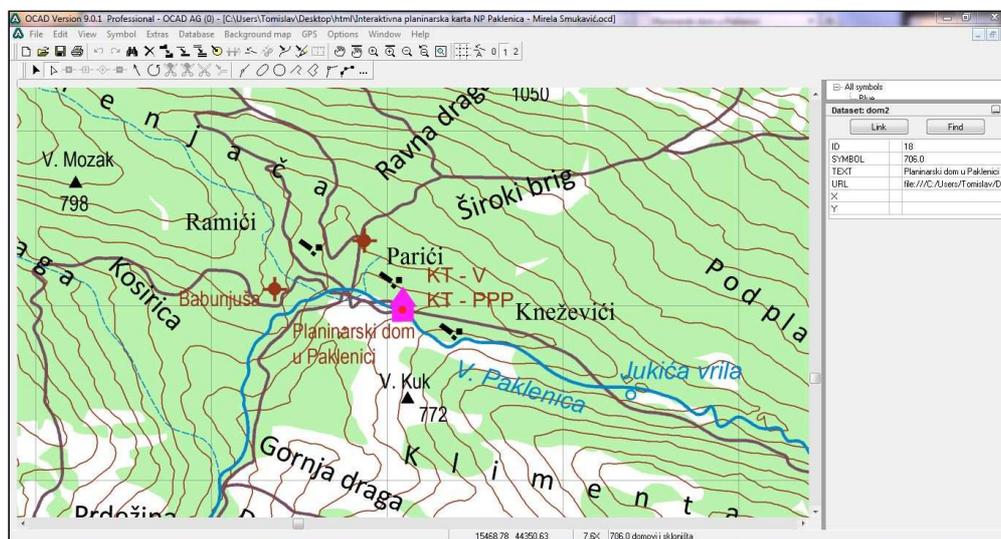


Figure 10. Presentation of the information from database after selecting an object

One of the characteristics of an interactive map is the presentation of additional information about the objects presented on the map. In order to meet this criterion, .htm files (pages) about single objects on the

map were made. For the purpose of creating *.htm file that provides additional information about the objects on the map, the free programme Dynamic HTML Editor 1.9.6 was used (Figure 11).

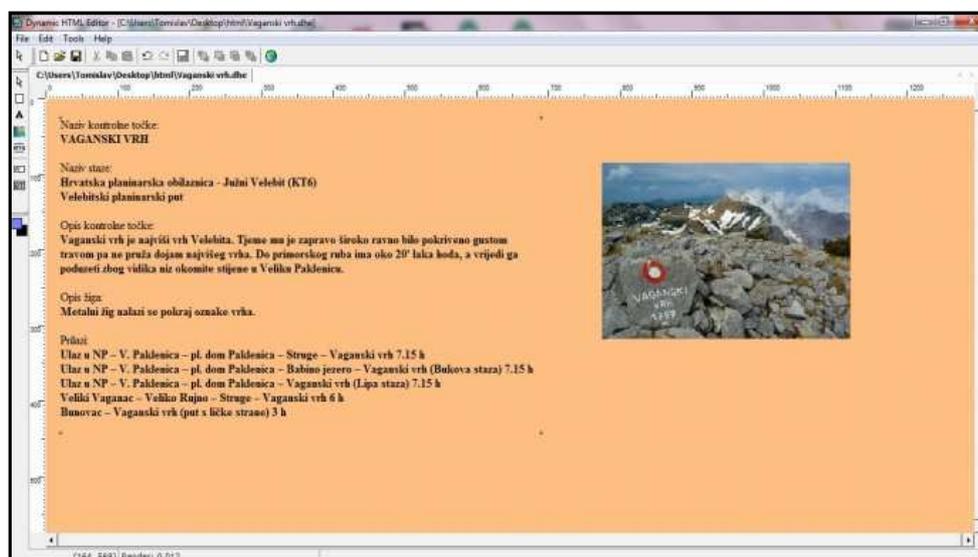


Figure 11. Presentation of additional information about hiking trails

Although it was planned to make .htm files for the most of the objects on the map, it was not completely possible due to the lack of available data, thus, .htm pages were made only for 60 objects. In the process of making .htm pages, we tried to achieve the compliance of the data within object units, except in the cases when there were no data available and the priority was given to providing the best possible information for end users.

4.3 Possibilities of the produced map

The produced *Interactive Hiking Map of the National Park Paklenica*, is run by means of the programme Java and the Internet browser Mozilla Firefox, it has got five levels of scale change. After running (Figure 12), the overview map is shown in the right upper corner, as well as the object units providing the browsing of the map.

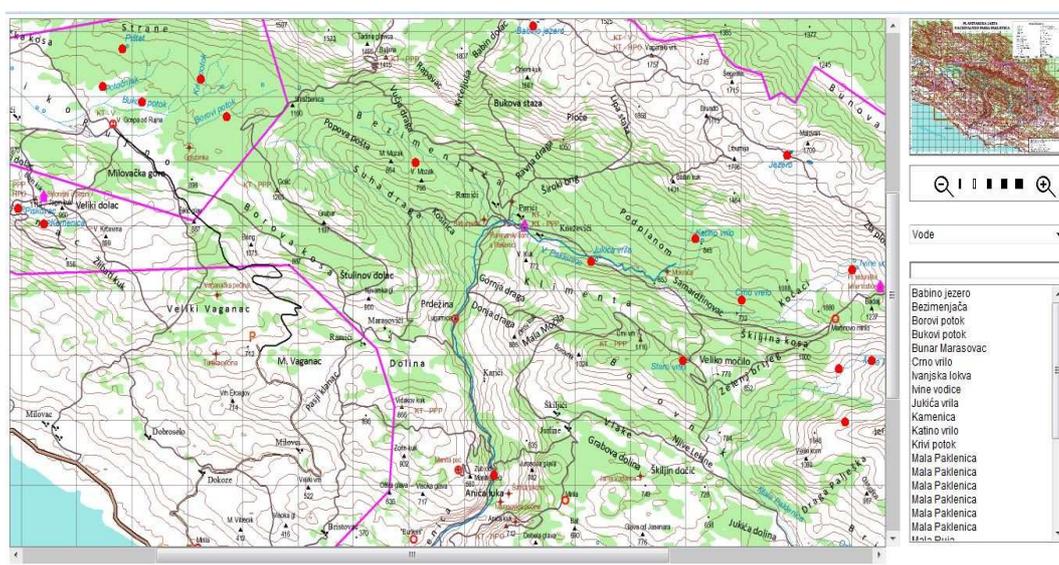


Figure 12. Interactive Hiking Map of the National Park Paklenica

The maps make it possible to browse by selecting a desired object unit or by entering a desired term in the browsing field. After selecting the object unit, all objects in it are marked in red colour (so called *hotspot*), and the later selection opens the web page with additional information about the desired object (see Figure 11), i.e. with the information that is considered to be useful for hikers.

5 Conclusion

The production of interactive maps has made the orientation in the field easier, especially because such maps can be adapted in smart mobile phones in distant and sheltered areas that are usually very attractive to hikers.

Interactive maps have found their application in

hiking as well. More and more hikers use *smart devices* for orientation that contain topographic and/or other cartographic products adapted to moving around certain terrain. This trend has not been fully developed in Croatia, but the increased number of users of *smart devices* and applications adapted to them shall certainly lead to a larger number of interactive hiking maps.

Although interactive maps and *smart-devices* make the orientation in the field much easier, one should consider possible problems with signals in remote and sheltered areas. Still, if the map should make the work possible without Internet connection, it could be a far more practical way orientation in the nature, because it is smaller, easier to search and simpler to handle.

The map was made within the frame of the diploma thesis and it is not prepared for commercial use. Demo version of them can be found on <http://www2.geof.unizg.hr/~vposlonc/paklenica/karta.htm>.

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