

SHORT REPORT

Cartography in Sports and Sports in Cartography

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Abstract

This paper presents the author's aspiration to determine a connection between cartography and sports. Cartography, created even before the advent of writing, allowed man to portray a part of the space in which he lived. This way of connecting cartography with other scientific disciplines has been done on several occasions. Its connection with, for example, ecology, climatology, hydrography has been explained, so this will be another in a series of works from a wide range of scientific fields with which a connection is made. The aim of this paper is to determine possible connections between cartography and sport in all its forms of appearance. Sports, once merely a set of physical activities and skills, is now a field in which science is making spectacular discoveries related to numerous human works. Interconnected in several ways, they complement each other and help each other in accomplishing certain tasks. Cartography seeks topics and ways of presenting interesting and diverse content related to sports sciences and sports activities, while sport in cartography finds help in communicating the results of scientific research, and also uses it as an aid and service in numerous sports events, thus facilitating work processes. The paper will also explain the use of the cartographic method, which is the basic method of work in cartography with implementation procedures, as well as the scientific meaning that is manifested through the definition of three categories: spatial, temporal and essential definition. By analyzing all of the above, it can be concluded that the connection between cartography and sports has been realized for mutual benefit. Cartography expands its possibilities of work and presentation on given topics, while sport in all its areas gets a chance to express everything that is important to it and to make it very clear and easy to understand.

Keywords: *cartography, sport map, cartographic method, cartographic sign*

Introduction

The universality of the cartographic display is reflected in its connection with many areas of work. The language of expression is universal and understandable, provided that the rules of the cartographic presentation have been followed. This universality is reflected in the possibility that, using the expressive means, the elements of an area can be shown in a manner that will be understood by the users, regardless of the degree of knowledge of the displayed space. One particular advantage is reflected in the ability of a map to eliminate the language barrier, which significantly increases the potential number of users. The use of cartographic displays that relate to activities in sports is very common. They

can be conditionally divided into two groups: the first is the use of maps for the communication and presentation of scientific research related to sports science and the second is the mapping of space in terms of displaying infrastructure and events of a sporting character. (e.g., Olympic Games, World Championships, regional competitions, map of the Olympic Village, the layout of facilities where competitions at the World Championships are held, etc.). In both cases, the connection between cartography and sport comes to a clear expression, because cartography in the presentation of scientific or event content has the opportunity to be shown through numerous possibilities from a wide range of methods and expressive means, while in contrast sports science



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and events receive an excellent way of communicating scientific results and providing information to participants of events and users of sports infrastructure that were mapped (Burić & Barović, 2005).

The aim of this paper is to determine possible connections between cartography and sport in all its forms of appearance.

Methods

Which of the cartographic mapping methods we can use depends on several factors that determine their use. Mapping methods can be seen through two levels of analysis. One is the use of a cartographic method as a basic scientific method through which we map out the analysed themes; another is the choice of an appropriate mapping method in relation to the task set, which, in relation to the essence of the appearance of the phenomenon, should be chosen by the appropriate method by which its qualitative, quantitative, or universal characteristics should be shown (Lješević, 1981).

When it comes to the use of cartographic methods, as a basic scientific method, cartography takes place through two procedures that need to be carried out in order to fulfil the task set. The first is mapping, which represents the separation of the necessary elements from the space that reflect the character of the phenomenon that is being mapped. In this process, it is necessary to collect as much data as possible on the mapping object in order to form a database that should be as large as possible. The following procedure is the process of obtaining mapped space data, which is realized by looking at the mapped content, which enables obtaining a larger amount of information than that which is entered by primary mapping. By using this method, it is possible to define the following scientific categories. Spatial relationships can be defined by positioning the results of the survey in relation to the accepted spatial system. This can be done in two ways in mapping sports-related topics. One is the input of the survey results into the territory where it was done, and the other is the positioning of objects in the space, for example, the display of the sports complexes, the Olympic villages, and similar.

Time defining can also be done in many ways, such as when communicating scientific research through the presentation of the movement of the investigated results during the defined period and presentation of the results at the moment of the research. When displaying the schedule of infrastructure related to sports events, this can be done, for example, with the development of sports complexes in a defined time interval or positioning at the moment of observation. The essential definition is the presentation of qualitative and quantitative characteristics of the mapped space. This way of defining enables determining cause-effect connections, analysis, synthesis, conclusions, as well as many other ways of looking at the mapped space.

When choosing a mapping method, it is necessary to take into account the essence of the displayed phenomenon because, in relation to this feature, the methods are divided into qualitative ones, which include the method of qualitative targeting and areas, and the quantitative targeting, which include the methods of isolines, points, and cartograms and universal ones like the line of movement, characters, cardiograms, and vectors. Among the methods

listed, it is not possible to make a strict boundary because some methods, depending on the choice of the cartographic expression agent, can also have qualitative and quantitative properties.

Results

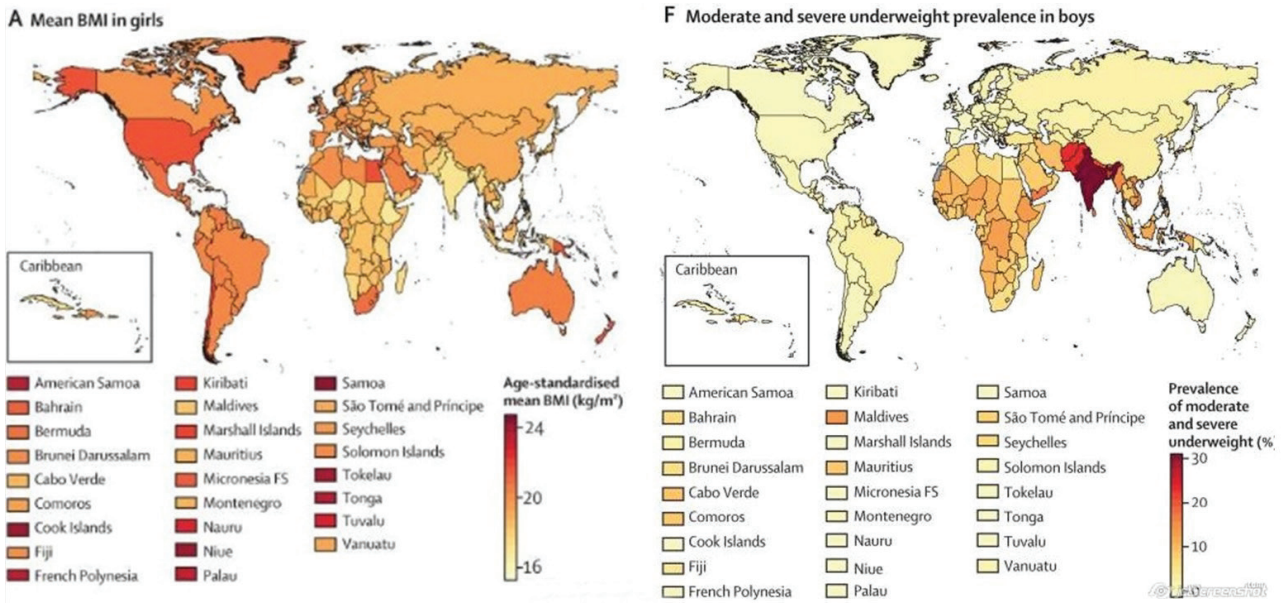
Establishing a closer link between cartography and sports science can contribute advancements for both scientific disciplines. Through the examination of the results of scientific research in sport, cartography will find new ways of displaying and perfecting its expressive means by enriching their number, but also their forms, in order to facilitate the use of the map to the potential user and the optimal understanding of the presented results. The greatly improved quality of new maps makes it possible to perceive more value and more information than in the data used for their creation. New maps can also be the subject of new research as well as determining the causal links between mapped content that again give new results. Sports science, through a cartographic presentation of its results, obtains a very clear, easily legible, and recognizable way of communicating its research results. As already mentioned, the language of cartography is universal, and there are none of the barriers that some other ways of presenting research procedures have.

There are more examples in which the connection between cartography and sports has been established, and in this review, we will show this through three examples: use of maps in preserving scientific-research works, maps showing a skiing complex, and a map used for the competition in orientation.

Numerous scientific papers testify about the connection between cartography and sports science. One of these studies treated body mass index (BMI), weight, overweight and obesity from 1975 to 2016 through a combined analysis of 2416 studies based on the population of 128.9 million samples (Figure 1). The paper cartographically presents BMI, the prevalence of obesity and weight loss for girls and boys through the presentation of a political map of the world in which the method of qualitative reorientation was used, and colour was used as the dominant cartographic expression.

With the precise legend, the values of the investigated indicators are defined through which the value of the indicators is indicated by the different colour intensities (the lighter tones are lower and darker tones are higher). Also, as a special addition, the results of the survey for the countries are shown, which are not visible on the map of the world because of its small scale, for the reason of not compromising the legibility threshold. Although this map has many shortcomings in the sense of omitting a number of mandatory elements, in this case, as a thematic map, it has fulfilled the function and provided the information presented by the work.

Frequently used maps that display sports complexes, and are operated according to the universal rules applicable to all centres of this type, represent ski resorts. The map that is being processed is a map showing the Livigno Ski Resort, at the border of Italy and Switzerland (Figure 2). To display the contents, methods of vector and signs were used, as well as expressive cartographic means: colour, simple geometric signs, symbolic signs, numerical scalars, and vectors. The lines show the ski runs by the difficulties (black, red and blue) with the symbolic signs of the cable car (gondolas, two-seaters, four-seater,



anchors), snowboarding and children’s parks, wi-fi locations, parking lots, information points, altitudes of characteristic points and site names. Relief shapes are displayed with the use of colour and dashes that symbolize the forest cover and shadows to highlight its plasticity. The accompanying legend con-

tains all the topographic characters used to display the content so that the user gets complete information about the content presented. This map also has a number of shortcomings from the group of map elements, but since it is a specialized thematic map, they can be ignored.



Maps used for orientation competitions also belong to the group of thematic maps. These are specialized maps that have the purpose of providing competitors with information that will help them master the set itinerary. Classical topographic maps can also be used for making maps used for orientation competitions, but specialized thematic maps are also available. Depending on the surface of the terrain where the competition is held, the proportions belong to the group of large scale maps. The map that was the subject of the analysis was made for the orientation competition that

was held within the 11th Cartography and Geoinformation Meeting in Buzet in 2015 (Figure 3). The method of qualitative targeting, vectors and points was used for the development of the map of the old town of Buzet. Colour, simple geometric signs and numerical signs were used as a medium of expression. As a special addition to the map, in addition to the legend, the image symbols of the characteristic objects are given, which are at the same time represented the control points that the competitors should visit in the order.

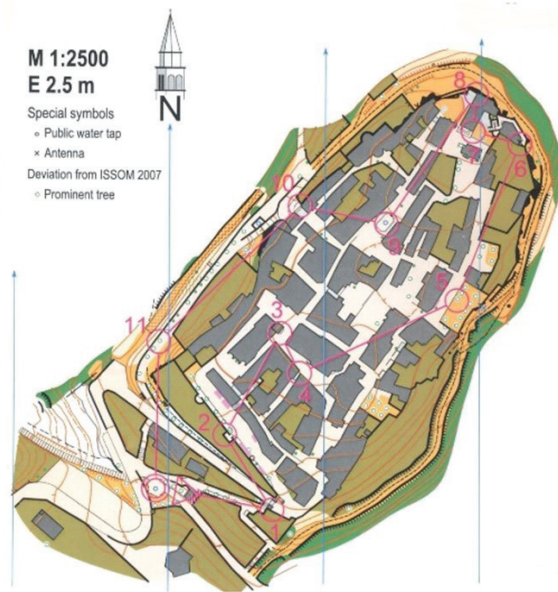


FIGURE 3. Sprint orienteering event

Discussion

The product of cartographic work is a map, as a presentation of the characteristics of a space that for some reason are separated from a particular unit or are presented as a separate thematic area to provide information about it. The language of the map is universal and has no boundaries. The means of expression used are defined by international rules that allow the map user to navigate by reading the presented content, regardless of possible language barriers that may arise if the map issuer is from a country whose language we do not know. There is practically no scientific area in which content cannot

Acknowledgements

There are no acknowledgements.

Conflict of Interest

The authors declare the absence of conflict of interest.

Received: 20 August 2020 | **Accepted:** 07 October 2020 | **Published:** 01 February 2021

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be expressed by cartographic presentation.

In conclusion, there is a strong connection between cartography and sports on several levels. Both need to cooperate and explore numerous opportunities. It is practically inconceivable to hold a number of sports events without a cartographic presentation of the facilities, but also the space in which they are held. Certainly, such displays facilitate the movement of the participants of the events, give guidelines for easier orientation of the contestants, and similar. A special connection is made when communicating the scientific results that have been achieved during the research procedures of numerous areas of sports sciences.

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