12 MAPS FOR ORIENTEERING AND FOR FINDING THE CACHE

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What are maps good for? Why do we use maps? How do we use maps?

There are several answers to these questions as map users have different ideas and needs regarding map use. However, the most typical and the most classical map use is orientation: to use the maps on the terrain. Of course, not all maps are directly designed for field orientation; for example, thematic maps or small scale maps published in atlases are planned to represent data and give an overview of large (country- or continent-wide) areas.

ORIENTEERING MAPS

One of the most prominent map types used primarily for navigation is the orienteering map. Although orienteering is a special sport practiced in every continent, it is not a well-known activity in most countries. This sport started as a military navigation test in the second half of the 19th century. The first civil (non-military) event was organized at the very end of the 19th century in Scandinavia.

Scandinavia is still the most developed area of orienteering. The main reason is probably its very complicated terrain compared to continental or Mediterranean areas as well as the long tradition of using topographic maps. In every country where orienteering was practiced before the foundation of the International Orienteering Federation (IOF, 1961), local topographic maps were used for the events and training.

As large scale topographic maps were allowed to be used for civil purposes from the middle of the 19th century in Scandinavia, the map use there was a part of the education and culture, much more so than in other countries.

The legend of topographic maps was different from country to country. Orienteering was not a part of the Olympic Games (the situation has not changed since then), and international events were rare at that time (these events were organized only in the Nordic countries before the 1960s).

Orienteering in Central European countries takes its origins from Scandinavia before the Second World War. In these countries, the sport was based on normal tourist activities and events. Tourist events were widespread especially after 1950, but because of the secret military intention, it was mostly a fieldwork exercise with maps rather than a sport activity.

The early period of orienteering maps was the age of homemade maps. In most countries (excluding Scandinavia), there were no suitable maps available for public use. According to the running speed and the course distance, the scale of maps was 1:20,000 to 1:40,000 (or 1:50,000 to 1:100,000 in the early years). In some countries (Eastern Europe), the topographic maps were secret, while the largest available scale of topographic maps was only 1:50,000 in other areas (Germany, Spain). Using tourist maps was a logical alternative, but the accuracy of publicly available tourist maps was not suitable for these events in Eastern Europe. Therefore, these countries tried to find more accurate tourist maps published before the communist era.

There was also a problem of copying. The only simple method of making some dozens or hundreds of maps (this was the average number of participants in most events) was the black and white photo in those times.

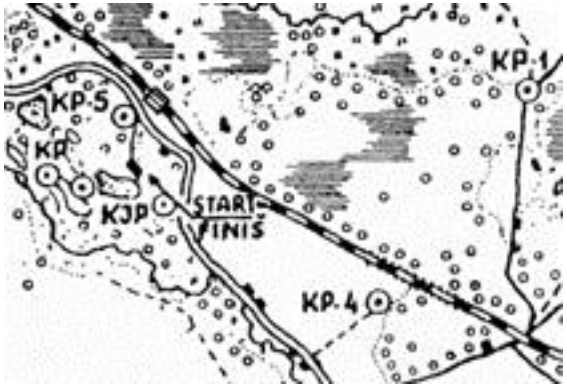

Figure 12.1. Map and course of the first Estonian championship 1959, 1:50,000, based on an agricultural map.

Offset printing (especially in colours) was the most common technique for producing books, journals and any kind of printed product, but it was expensive and technically difficult for the keen organizers of orienteering events. To move one step further, the sport had to reach a higher level: increase the number of participants in events, create international relations, and form regional, national and continental organizations.

In those times, there was little sense of speaking about legends, specifications or standardization; in most countries, it was a problem even for local participants to understand maps because the legend was changed from event to event.

After the number of users and competitors reached a certain level, orienteers tried to find solutions to make the orienteering maps appropriate, up-to-date, and later, more internationally acknowledged.

The Map Committee of the IOF was formed in 1965. The most important and urgent work of the committee was

to work out the specifications of World Championship maps, which are as follows:

- The maps have to be new;
- The map has to show every detail of the terrain which can affect the route choice of the competitor;
- Small and unimportant details have to be omitted (this was most important for the sake of accuracy and legibility); and
- The maps of international events have to use the same specification.

The suggested scale was 1:25,000 or 1:20,000, and the distance between the contour lines was 5 m (10 m or 2.5 m was also allowed depending on the terrain). Later, the scale was increased to 1:15,000, which is now the suggested scale of orienteering maps (they can be magnified to 1:10,000).

The first orienteering map specification specified the colours of the orienteering maps:

- Black, brown and blue for topography;
- Yellow for open ground;
- Grey or green / black for restricted run ability (vegetation);
- Violet (magenta) for course overprint.

The major differences comparing orienteering maps to other types of maps are:

- There is practically no text on orienteering maps because text information is unnecessary for the competitors during the event, and it would not be fair to use language specific textual information in international events. (Nevertheless, there is certain textual information on orienteering maps, such as title, scale and distance of contour lines, but it does not affect the map use as this information is known in advance.) For the average map user it is quite unusual to prepare a map without text, but one of the most important aspects of orienteering maps is to leave out all unnecessary elements and features which do not help the navigation of competitors, and which are not easily identifiable at running speed;

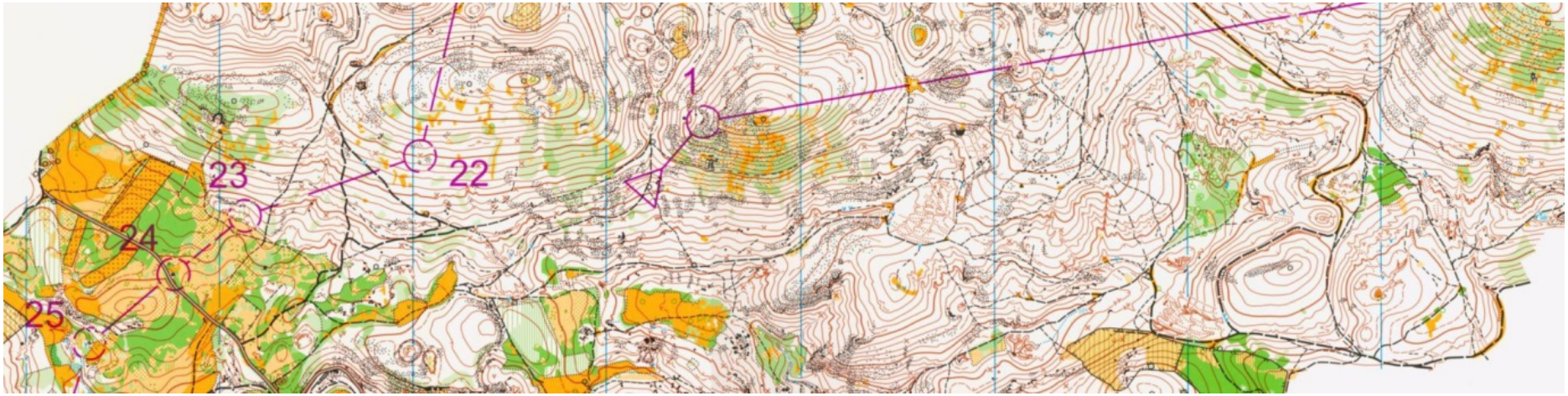

Figure 12.2. Map of the long distance event of the World Orienteering Championships, Hungary, 2009.

- Comparing to other similar scale maps (topographic maps), orienteering maps have many details, although the map specification contains only a limited number of map symbols (maybe more than 100). The representation of the relief with contour lines is probably the most specific comparing to other similar scale maps;

- On orienteering maps, the representation of areas is based on the run ability and cross ability. Competitors should be aware of the areas where the vegetation is difficult or impossible to cross or just reduces the running speed. There are some other features too (e.g., cliffs, fences) where it is important to represent the cross ability; and

- These maps are regularly made by amateur orienteers and not by professional mapmakers. Although the users of these maps, the orienteers, are aware of that, their expectations have been increasing as the sport has become more popular. As we have more and more data sources and technologies available (aerial photographs, GPS data, laser scanning), it looks easier to create orienteering maps. However, the excess of data has an unwanted consequence: there will be too much data on the maps, which will make the printed maps less legible.

THE USE OF ORIENTEERING MAPS

It is interesting to observe how orienteers use the orienteering maps. According to the competition rules, orienteers can use only the map and compass during the event. There is not too much sense in using any other tool, although a GPS device could be useful (but they are forbidden). Nevertheless, orienteering maps normally do not show any absolute geographic coordinates, which would be vital for GPS navigation. We will see another sport-like activity, geocaching, in the next subchapter, which is based on the use of GPS.

- Competitors have to *measure distances* and *directions* while they are running, as the essence of the orienteering events is that the fastest is the winner. Distances are simply measured, rather than estimated by pace counting. However, orienteers do use this technique only in certain situations during an event. Measuring direction means that orienteers are measuring the angle between the magnetic north (which is provided by their compass) and the direction they want to head. Even the accuracy of distance and direction measuring is not comparable to precise devices, but the method in which orienteers use these techniques is adequate to find the control points on the terrain;

- The general technique of navigation for orienteers is continuous map reading. It is essential that the competitor should be 100% sure of his/her actual position every second of the event. Due to a large amount of map details, the most difficult task for orienteers is to filter out the most relevant information, to identify the most prominent features in the map and on the terrain; and

- One of the most complex challenges of the orienteering map is the *relief representation*, namely, to interpret the *contour lines* and "translate" them into a real 3-dimensional form in the competitor's mind. It is vital because the relief is a continuous feature covering the whole terrain. The best competitors are very good at understanding and interpreting contour lines even at running speed.

Orienteering has various official disciplines (*foot orienteering* is the standard discipline; *mountain bike orienteering*, *ski orienteering* and *trail orienteering* are the newer forms, although ski orienteering was practiced in Nordic countries as early as the foot orienteering). Some other forms (like sprint orienteering) may require different maps. Although these maps are based on the usual orienteering maps, they are specialized:

- Mountain bike and ski orienteering maps are simplified compared to the foot orienteering maps: in both disciplines, the competitors are moving at a much higher speed, and the maps are in a special folder; these conditions do not favour map reading. Small features (knolls, pits) which can be covered by snow or which are not visible from the "bike able" paths and tracks, are not represented, while the road network used by skiers or bikers is exaggerated. The scale of these maps is also slightly smaller (1:20,000) than that of foot orienteering maps because the maps should fit in the map folders;

- Sprint orienteering is a relatively new form of the sport. The only difference compared to the normal foot orienteering is that the venue of the event is not a forest area but a park or an urban area or their combination. These areas have much more features and objects, so the map scales are much larger (1:4,000 or 1:5,000) in order to show all relevant details. The courses are generally much shorter (the winning time is about 12–15 minutes), which means that the competitors are running as fast as they can. In such a high speed small terrain details are not easily identifiable (or the

competitors should reduce their speed), so the mapmakers should represent only the most relevant features. It is easy to create sprint orienteering maps full of details because urban areas usually have very good base maps (e.g., cadastral maps), but it is difficult to create a good sprint orienteering map where only the relevant features are represented; and

- Trail orienteering (sometimes called precision orienteering) is a discipline of the orienteering sport designed so that people with disabilities could have meaningful orienteering competitions. It eliminates the element of speed over the ground but makes the map interpretation element much harder. Competitors travel along a track or marked route and study clusters of control markers placed on the terrain. They are issued with a very detailed map and control descriptions. With these aids they must decide which (if any) of the markers relate to the feature depicted by the centre of the circle. Movement up and down the track is permitted, but no one may approach the control markers on the terrain.

Sprint maps are also used for trail orienteering events. The only specialty is that the trail orienteering competitors are not allowed to approach the control points, so they have to convert the side view of the terrain in their mind to the top view of the map.

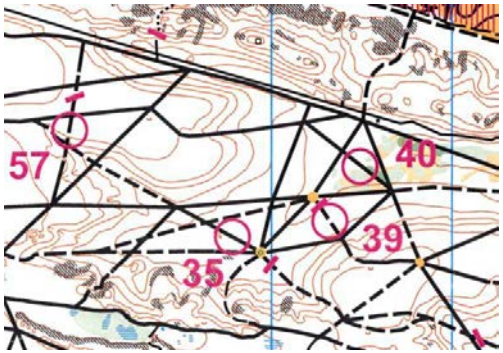

Figure 12.3. Map of the first World Mountain Bike Orienteering Championships, France, 2002.

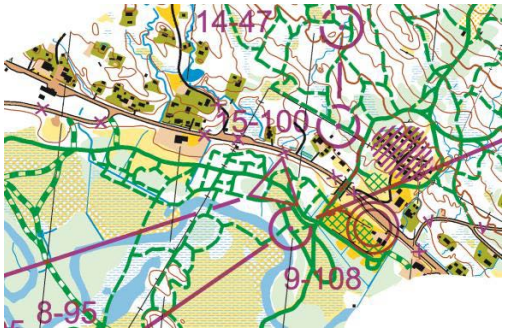

Figure 12.4. World Ski Orienteering Championships, Sweden, 2011.

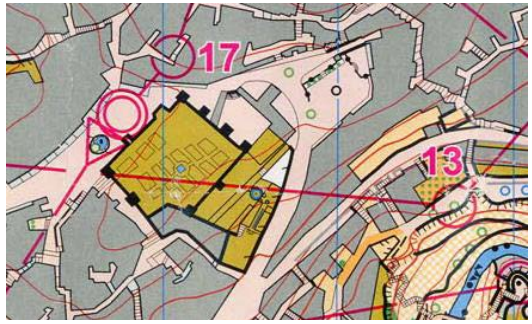

Figure 12.5. Sprint orienteering map, Morocco, 2013.

GEOCACHING

Geocaching is a free real-world outdoor activity, which is regularly called treasure hunt. Players try to locate hidden containers called geocaches (most often small plastic boxes) by using a GPS. GPS chips can be built in smartphones or cameras and users can document their treasure hunt experiences. It is more precise to use the general term, *Global Navigation Satellite System (GNSS),* which is much more neutral than the term GPS (Global Positioning System). The latter was the first available service, but nowadays Russia, China and the European Union are developing their own independent services. Geocaches are hidden outdoors and their location is defined by their geographic coordinates (latitude, longitude; height is also measured, but this is irrelevant in most cases). Theoretically, players do not need maps to find the geocache as its geographic coordinates unambiguously identify the location. Players use traditional paper maps or digital maps in their GPS device or smartphone to find their way to the location of the geocache. Let us imagine you know your actual position and the geocache location. Although this means that you can easily calculate (or rather, the GPS device calculates) the distance and the direction of the geocache, in most areas (especially in an urban environment) it is impossible to go straight.

Although clues are given on a geocache website, it is not easy to find the geocache in many cases because the precision of hobby GPS devices is only of the order of 10 meters and the geocache "owners" really hide their boxes on the terrain.

There is a global international website of geocache players (http://www.geocaching.com), and there are also independent local (national) community websites. New players can easily join the geocache hunting: they can download the geographic coordinates of selected geocaches to their device and after they have found them on the terrain, the players can also report the

successful hunting (password may be hidden in the geocache container), and they can collect scores in this way.

There are different variations of geocaching (containers can be virtual, mobile or multi-cache, which can be a collection of several points around the cache). Although similar games were invented before the GPS era (where points had to be found by using written instructions), geocaching started in 2000, when the accuracy of GPS devices improved considerably due to the political decision of the USA. Along with the development of smartphones, the falling price of GPS chips increased the number of users considerably. GPS can identify the geographic location, which is practically useless for ordinary users, but the appearance of online map services (2005) like *Google Maps* or *Bing Maps* and the spread of mobile Internet access created a new era, that of the *location based services*. This service provides automatic information based on the actual location of the user (with the help of the GPS-enabled device). For example, a user can get automatic answers to questions like where it is an open post office nearby or what is this specific building. Young users are keen on using services where they can share their location information with their friends (like *Google Latitude* or *Apple's Find My Friends*). All GPS-based applications operate only outdoors, but companies are developing other technologies for a supplementary indoor navigation: users want to use such services without understanding or taking care of the technology. One of the main concerns with these services is similar to social networking concerns: users should be careful to share such information (not only their personal information but also their location) with anybody who they do not know at all.

Another similar game or passion of the simple, easily understandable, and a little bit artistic way of GPS usage is the *GPS drawing*. Tracks of a journey (walking, cycling) can automatically be recorded into the GPS receiver's memory and can be represented later on a website combined by maps, satellite images or only the track alone. This journey may be on the flat surface (e.g., walking, car driving) or taken in 3D (e.g., while flying or diving).

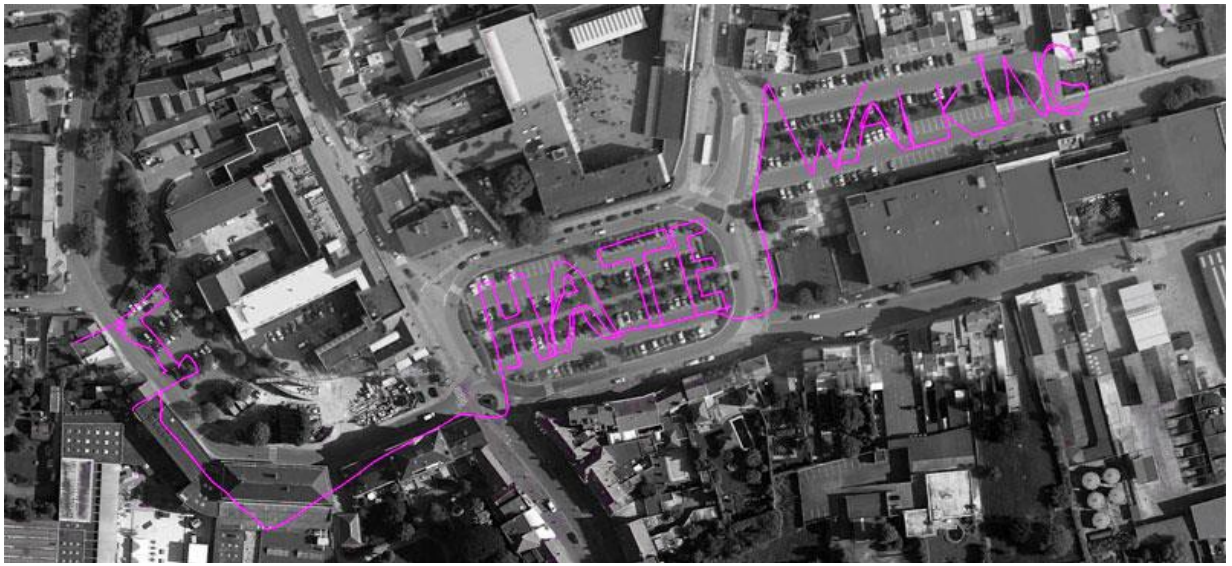

Figure 12.6. An example of GPS drawing.
Source: www.gpsdrawing.com.