Web Application for Topographic Maps Changes Acquisition

Dušan Petrovič[1], Blaž Kovačič[2]
[1]University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia
[2]Geodetic Institute of Slovenia, Ljubljana, Slovenia

Abstract

Paper presents a server-client based web application that allows map users to collect changes in maps by themselves and deliver them to data provider. The application was initially prepared to help update the content of the 1: 25,000 National topographic map of Republic of Slovenia, which became quite out of date due to lack of founds and other priorities at the National map agency in last years. The noticeable advantage of the application over similar ones is that client, not only can mark the area of the change, but also select the type of object that he would like to add, change, or remove from the map. The selection is available through an entire catalogue of objects and phenomena, presented on a map.

1. Introduction

Regular updating of topographic maps and topographic databases, especially in the mountain areas, has become a great problem in many countries, including Slovenia. At least in the Alps and other parts of central and southern Europe, the Switzerland is probably the only state, where the terrain acquisition for updating national topographic maps and databases is still being done (Gurtner, 2006). In spite of different new technologies and possibilities (LIDAR, etc.), the terrain capturing and interpretation remain the most reliable methods. They are not very distinctive for orientation and navigation purposes, but for capturing of landmarks and other important objects, like single tracks in forests, passages in steep and rocky slopes, springs, small graveyards, memorial signs etc.

The decisions of many National mapping agencies are quite understandable. Since the establishment and updating of topographic data is mostly financed from the budget, they try to reduce production costs. Terrain capturing method is long lasting compared to all the others and therefore very expensive. On the other side these objects (tracks, etc.) have lost the relevance for most of official use, including the military one and their capturing can no longer justify high costs. But there are still a lot of individual users, using paper maps as a guide in different outdoor activities. There are also more and more “modern” users, using raster map images as backgrounds on their GPS based devices (Fig. 1). They all are looking forward to have high-quality and regularly updated topographic maps.

The problem of updating large scale topographic data in Slovenia has started soon after 1991, when Slovenia became an independent country (Petrovic, 2006). The Slovenian State Topographic Map at the scale of 1: 25, 000 (DTK 25) is the largest scale map of Slovenia, presenting the entire territory on map sheets at the unique scale. The 198 map sheets were published from 1994 to 1998, as a remake of former Yugoslav’s military topographic map, last updated in 1985 and 1986. Unfortunately the design modifications had the priority over the updating of content. Only the highways and major roads, water accumulations, large buildings or larger new build-up areas were added to the source map sheets.

Later on, the National Mapping Authority, due to lack of funds, decided not to update DTK 25 any more and moved to 1:50,000 as the largest official topographic map scale of Slovenia. Even though the rest of the content of that map is regularly updated, the tracks have not been updated since 1980's. There is also a large scale topographic database which covers about 60% of the Slovenian territory at the moment, but these are mostly populated flat or hilly areas and it could be happened that mountain regions will not be captured at all. However, there is still the DTK 25. Although it has not been updated since mid 90's and the majority of content is even older. It is still the only available topographic data source for outdoor users.

2. Updating the official topographic data by users

The individual users show the most interest in getting detailed and high-quality topographic data of mountain regions and since using the available data, they are also representing the best data usability and quality control. The users are often skilled enough that they can provide reliable information about the real situation on the terrain and they are even prepared and willing to share their corrections with other users. There are quite a lot of different web services and pages, where different mountaineers, bicycle riders or mountain skiers share their tracks (usually GPS

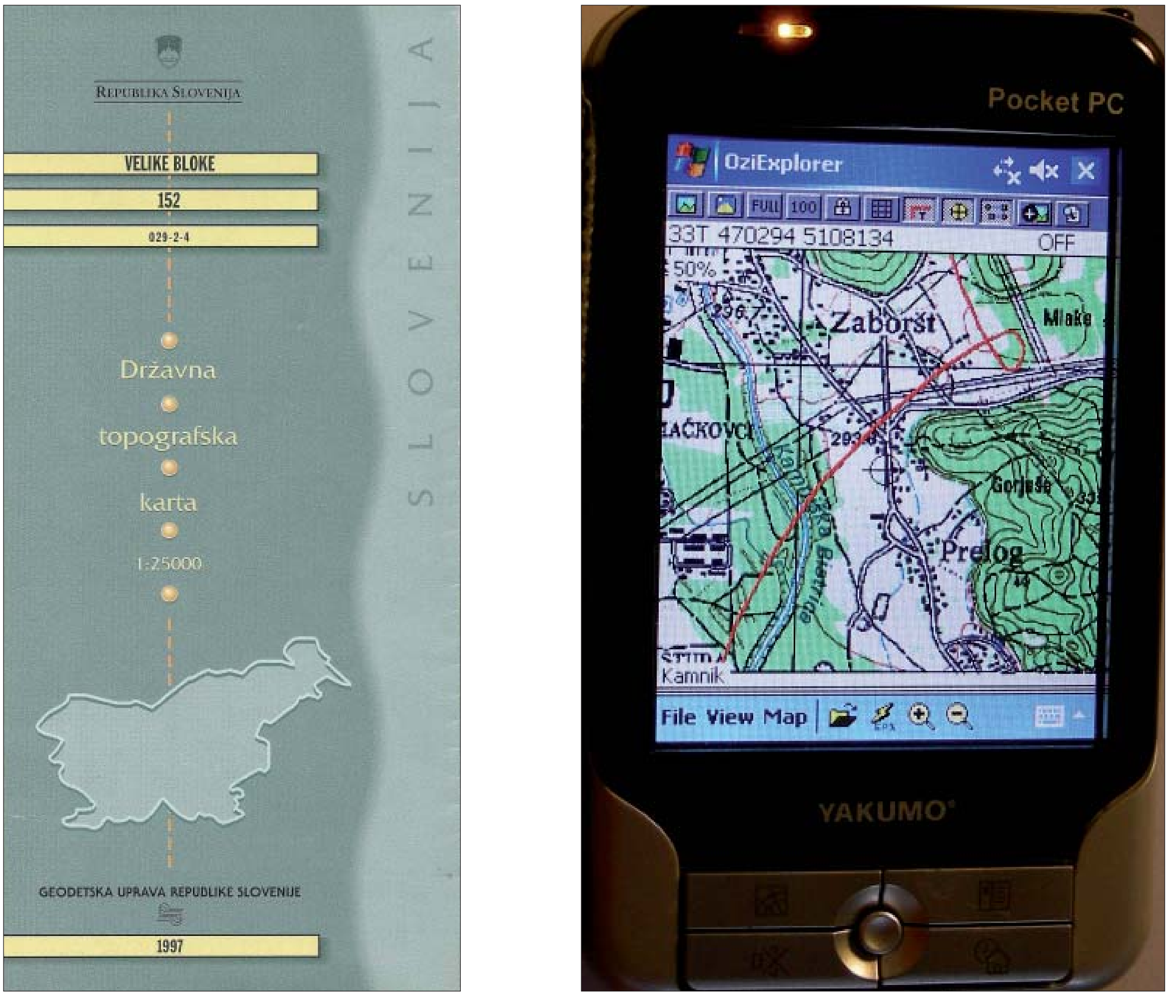

Fig. 1: Large scale topographic map (DTK 25) in paper form (left) and in raster digital form as a background on GPS included PDA device (right).

recorded) or even build different databases, freely available to all the costumer.

A step forward was made by some commercial data providers and also some national mapping agencies, who asked their users to help them find mistakes in their databases. In many cases (like Teleatlas Map Insight™ (Teleatlas 2008) or Navteq Map Reporter™ (Navteq 2008) users can only mark the point and argue the type of mistake, while the exact position of the changed object has to be captured by the data provider itself. We personally assume that the providers can evaluate only the minor part of all corrections reported by users, since every report causes quite a lot of further activities.

Therefore, we tried to find a better solution which would enable a non-expensive but still efficient method for updating DTK 25, keeping it in a condition which enables different users to use it in future. After analysing some Slovenian web forums and other personal web sites, we realised that

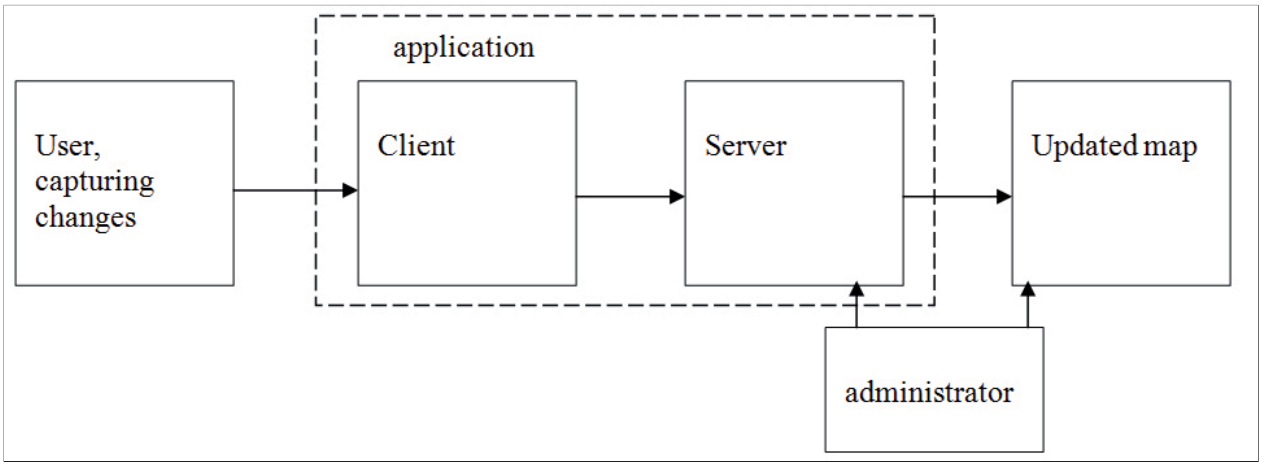

Fig. 2: Idea of updating DTK 25 by users.

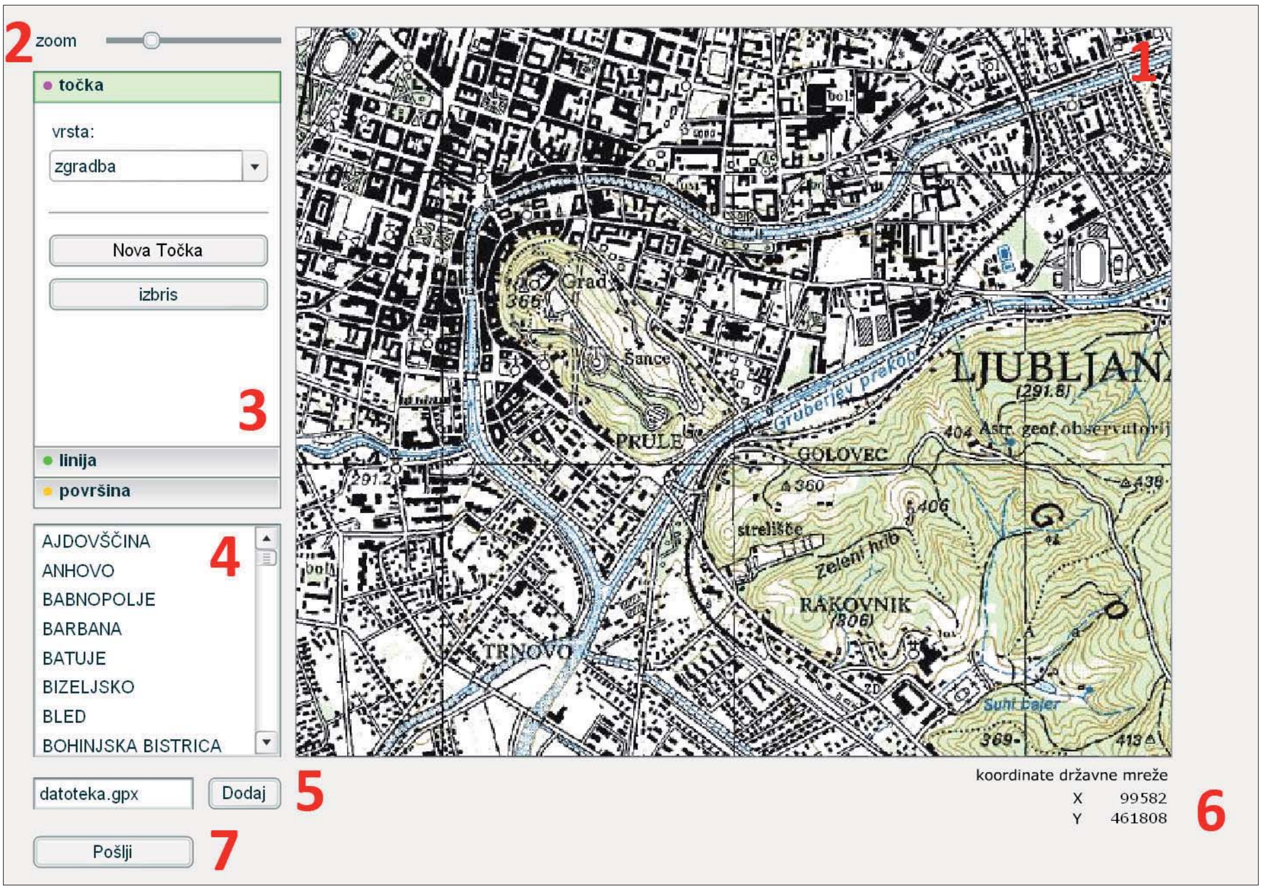

Fig. 3: User interface of client application
1 – Main window with zoomable and panable map
2 – Scroll bar for zoom ratio
3 – Field for selecting type of object
4 – Selection of map sheet
5 – GPX files import
6 – Pointer coordinates (in national coordinate system)
7 – Command button to send all the data to the server

the users of DTK 25 should be interested enough in keeping the map up-to-date. We decided to make a concept and establish a server-client based web application, where users can mark all the changes and corrections found on the terrain in such a way, that the changes can be almost directly involved into the map or database. To detail the notification of the object changes at the approximate place, we would also allow users to determine the exact position and the type of the new or changed object, as it was captured on the terrain.

Some doubts about such deep involvement of users into the official topographic map content are justified, of course. The main problem is the quality. How to assure that the position accuracy of user corrections would not be worse than the map's current accuracy? We tried to enable one procedure with direct insertion of captured GPS tracks into the application. Accuracy of selected records would be later analysed. The other problem is how to motivate users to cooperate. It is indeed not possible to give a new version of map for free to every contributor, so this remains as a challenge for us.

3. A server-client based web application

An application named Reambulator v1.0 was developed in ActionScript 3.0, which is a part of Adobe Flash CS3™ enviroment, initially designed for composition of web pages. Enviroment has a lot of pre-prepared graphical solutions which makes programmer's work easier. Server part of applicaton, the database was made using PostGreSQL™ with PostGIS module, while PHP code supports the comunication between user interface and server. Figure 3 shows the user interface of client application.

The application enables users to add any point, linear, or area features that exist on the displayed map. They can add new items, replace the attributes (type of object), or mark non-existent objects (Fig. 4). The position of new objects can be inserted manually on the map background, while GPS captured data in GPX format can be also uploaded into the application. When the user confirms the record, the data is sent to the server, where all users' records are stored. The administrator evaluates all the acquired records and decides, which data can be inserted onto the map directly,

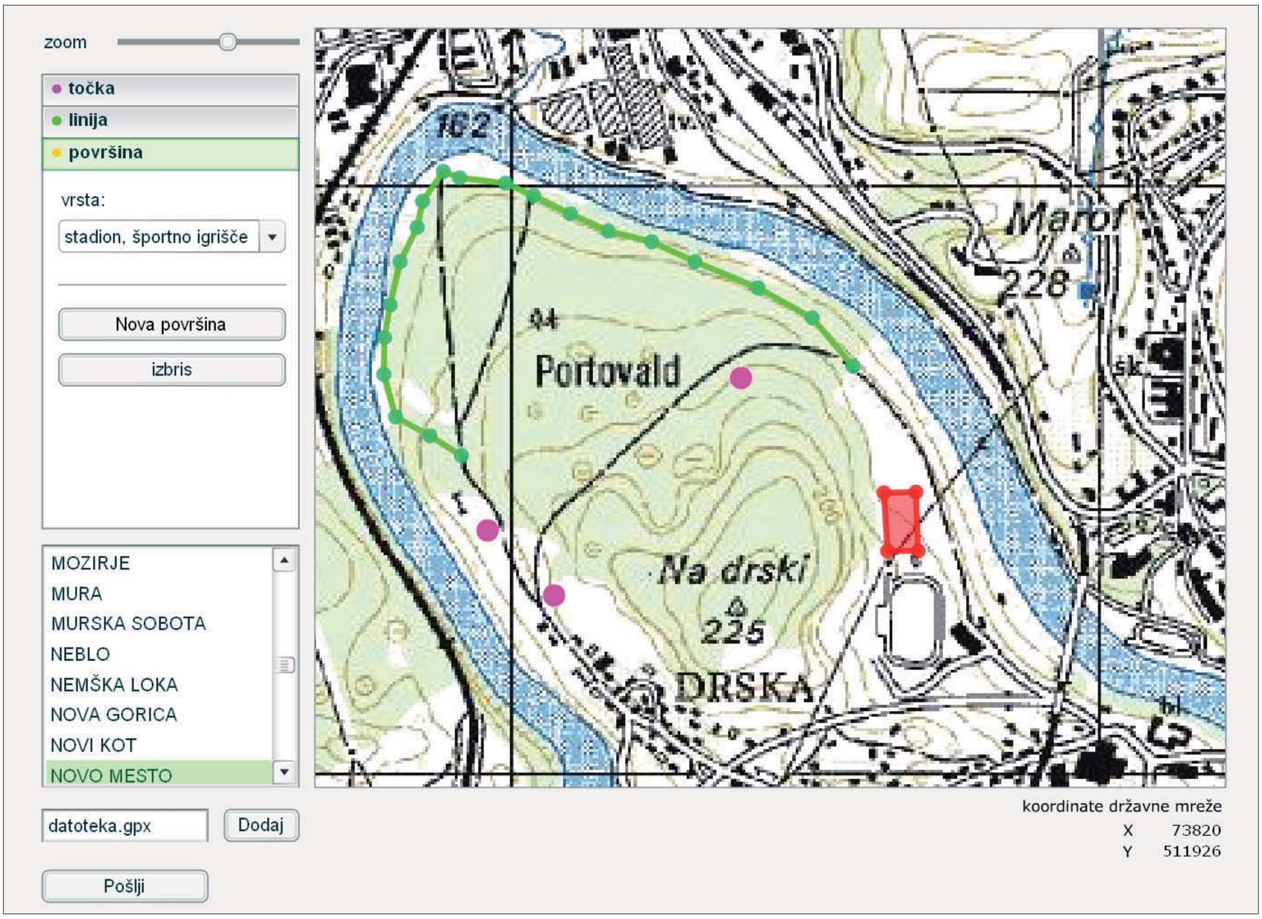

Fig. 4: Example of inserted point, linear and area features.

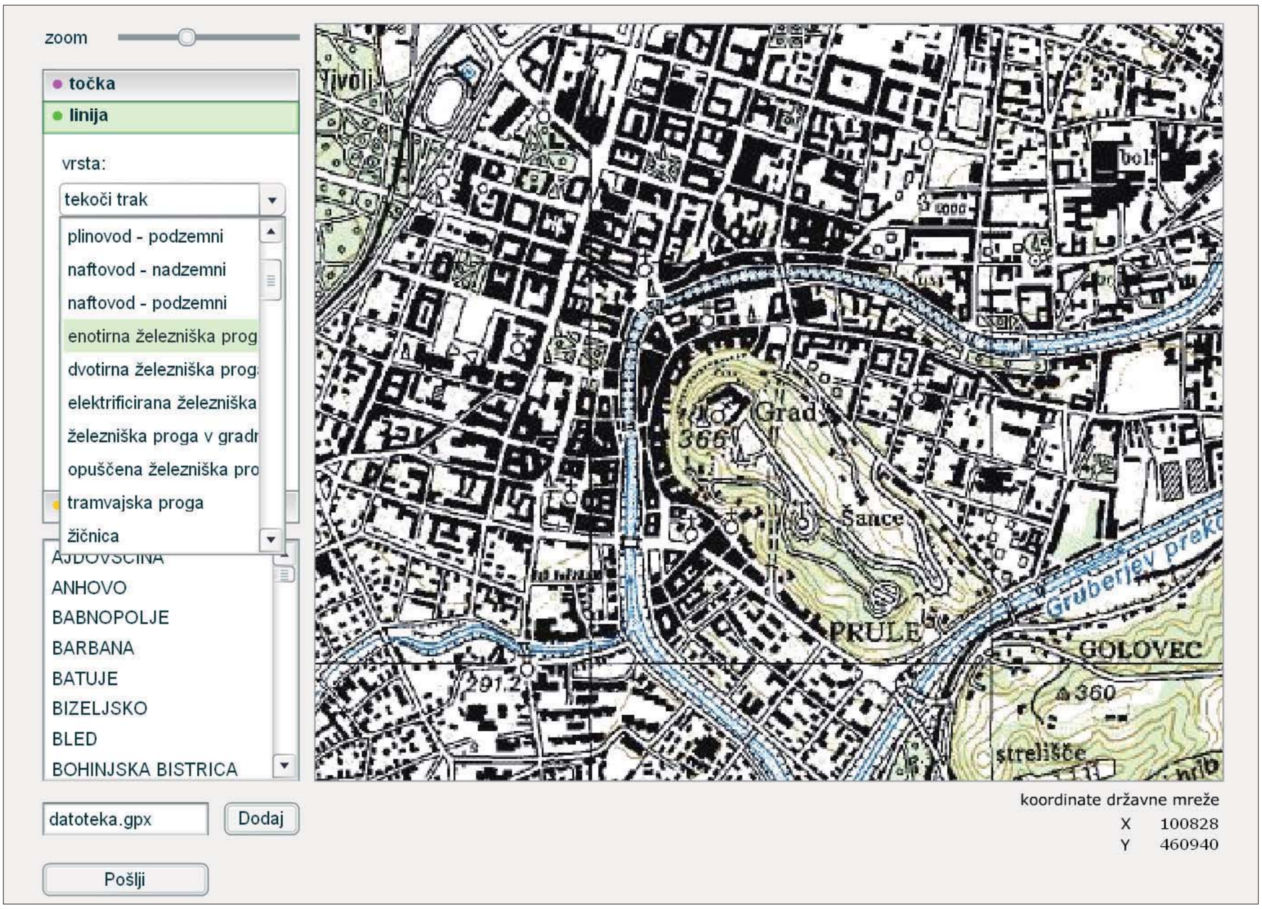

Fig. 5: Selection of object type.

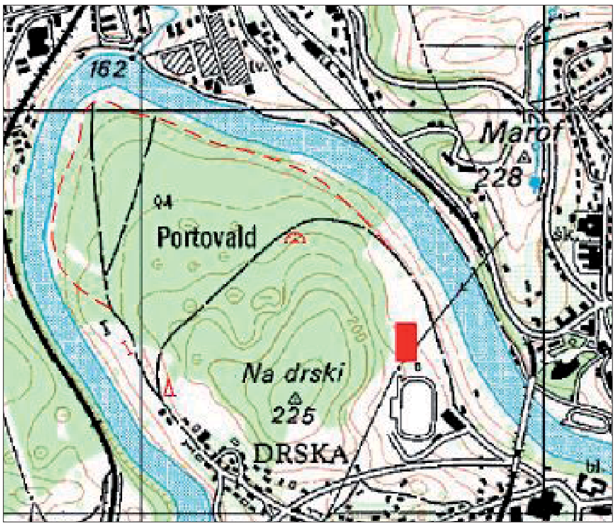

Fig. 6: Symbolised new objects in the original map content.

which data has to be checked with aerial or satellite images, and – in some cases – where terrain checking has to be performed.

The advantage over other similar applications is that – after importing GPS data or manual determination of object positions – the user selects the object type from the list of all available object types which are included in the map (Fig. 5).

The graphic data is linked to the attribute information by the object type. If we have a pre-prepared and server-side symbol table in the application, every inserted new record can be automatically presented on a map as a new object with correct symbolisation. In our case we used OCAD 9™ for symbolisation and the administrator can graphically check logical relations between the previous map content and the appropriate corrections (Fig. 6).

4. Conslusions

The presented application Reambulator v1.0 is only available in "lab" environment. We made some tests with the data that we captured ourselves, which of course is far from the later real-life use of the application. We are planning to put the application on the internet and submit it to real-life use in near future; however, there is still a lot to be done regarding the user interface. Furthermore, if experience would satisfy our expectations we are looking forward to launch the application in cooperation with the Slovenian Mapping Authorities.

References

Geopedia (2008): Geopedia.si – Map search application. http://www.geopedia.si/

Gurtner, M. (2006): From the field sheet to the complete digital workflow. Proceedings of 5th Mountain Cartography Workshop, Bohinj, Slovenia.

Lott, J., Reinhardt, R. (2006): Flash(r) 8 ActionScript Bible, Indianapolis, Indiana, USA.

Makar, J., Patterson, D. (2006): Macromedia® Flash® 8 ActionScript: Training from the Source, Barkeley, California, USA.

Navteq (2008): NAVTEQ Map Reporter™. Online application for submission of geo-object changes. http://mapreporter.navteq.com/dur-web-external/

Petrovic, D. (2006): Establishment of a Cartographical-Topographical System in Slovenia since 1990. Kartographie als Kommunikationsmedium, Wiener Schriften zur Geographie und Kartographie, Bd. 17, Institut für Geographie und Regionalforschung der Universität Wien, Wien.

Teleatlas (2008): Teleatlas Map Insight™. Online application for submission of geo-object changes. http://mapfeedback.teleatlas.com/index.htm

Vogeleer, D., Wilson, E., Barber, L. (2005): Macromedia(r) Flash(r) Professional 8 Unleashed, Indianapolis, Indiana, USA.