

Creating an Interactive Network for Wine-cultivation

Jens Ingensand, Régis Caloz, Karine Pythoud

Laboratory of Geographical Information Systems,
Swiss Federal Institute of Technology (EPFL)
Institute of Urban and Regional Planning & Design - Geomatics
CH-1015 Lausanne, Switzerland
{jens.ingensand},
{regis.caloz},
{karine.pythoud}
@epfl.ch

Abstract. This paper presents an ongoing project in the Swiss Canton of Vaud - the development of an interactive network for wine-cultivation. The goal of the project is to develop an interactive application where winegrowers and other actors involved in wine-cultivation can input and share data (both spatial and non-spatial) and information related to wine-cultivation. For wine-cultivation it is essential to have knowledge about the soils and the microclimate, but also about growing-techniques and other factors. A first step was therefore to collect the information of all wine-growing regions of the canton in a spatial database. A second step was to develop a prototype of an interactive system, accessible through the internet in order to evaluate manners to present the collected information and to enable winegrowers to share and administrate their own data. The third and ongoing step is the development of the final application where all groups, involved in wine-cultivation will have access to the system. This paper focuses on the development of the prototype and gives an outlook of how the future system will work. It also deals with the question on how data (both spatial and non-spatial) from different actors can be collected and validated in one collaborative system.

Keywords: Wine-cultivation, GIS, Web-mapping, Collaborative Systems

1 Introduction

In Switzerland wine-production and the sales-framework have undergone deep changes during the last years. The new national and European agricultural policies, the changes of consumer practices and foreign competition generate a significant pressure on the field of wine-cultivation.

The wine-growers in the Swiss Canton of Vaud have already played a pioneer role through the launch of the project “terroirs viticoles” [1] (Wine Soils) which made it possible to characterize the wine soils and the microclimate of the canton, and on the other hand to work out a methodology transposable on other Swiss wine cantons. The syntheses of this project were at that time distributed using reports and a CD-ROM to the main actors of the branch.

However the hard pressure in this field makes it necessary to be competitive and to improve both the products and the production methods. European standards in terms of traceability (the possibility to trace the way of the wine – from the plantation - to the cave - to the bottle) impose an optimized management in wine-cultivation. As a consequence, computer technology plays a major role in this process and the development of collaborative systems in the field of agriculture is in full rise.

At that time the project “RIV - Réseau interactif en viticulture” (Interactive network for wine-cultivation) saw the day. The first project “terroirs viticoles” had shown that the wine-cultivation data in the canton of Vaud is not structured. The cadastre is today limited to the knowledge of the existence of wine-cultivation on one specific parcel – but a map of the geographical distribution of each sort of grape doesn’t exist. Further only few winegrowers use computer programs for the management of their data.

This paper’s goal is therefore to describe the creation of this interactive network for wine-cultivation. In chapter two the concept of this network are outlined. The third chapter shows the development and evaluation of a first prototype in order to validate the concept. In chapter four current operations and future steps are illustrated.

2 Concepts

One primary goal of this project was to make the data from the project “terroirs viticoles” available for all winegrowers in the region, in order to adapt their wine-production to local geographical conditions. The idea was to use a web-mapping-system that is able to visualize this data directly on an interactive internet-page to allow the winegrowers to access the data at home.

In recent years web-mapping systems have been created for different purposes. Way-finding systems such as MapQuest [2] or Map24 [3] are good examples for web-mapping systems. Another reason for the choice of using the internet was the fact that certain stand-alone applications for wine-cultivation already exist on the market. The disadvantages of these existing systems are that they are mostly expensive and not adapted to the needs of a certain group of user’s; further many of these systems are reduced to the input of non-spatial data. Another aspect is that they are often used by medium and large-scale companies – in the context of the small-scale structures in the region, such systems wouldn’t be useful.

The next goal of the project was the elaboration of a wine-cadastre. The wine-cadastre is of a great interest for research-purposes, but also for wine-companies and the government. A surface of one specific sort of grape was defined as the smallest entity for the wine-cadastre. Such a wine-parcel is however not necessary the same as a legal parcel, as one winegrower can use two or more legal parcels for one sort of grape, but also plant different sorts of grape on one legal parcel. As winegrowers know best where their parcel can be found and what sort of grape is planted on the parcel, it was planned to let the winegrowers specify this information using the same

web-mapping system that is used to visualize the data from the project “terroirs viticoles”.

With the new data that has been input it becomes possible to create maps of the geographical distribution of certain sorts of grape among other things (e.g. traceability). Further statistical information can be gathered through the combination of the data from the project “terroirs viticoles” and the data that has been input by the winegrowers. At that point the RIV-application also becomes interesting for the government, as winegrowers can declare their data online and but also research institutes that are interested in calculating statistical information and helping the branch through research-results. The application can furthermore also serve as a communication-platform for all partners involved. (see fig. 1)

However the involvement of different partners makes it necessary to develop different interfaces in order to permit the access to the system, as each partner has specific needs.

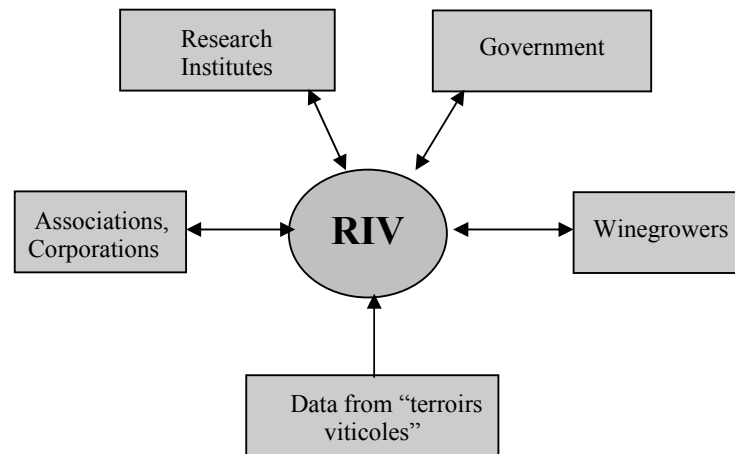


Fig. 1 Concept of the RIV-network

The following chapter illustrates the development of a prototype of the system in order to prove that the concept can become reality. The prototype has been developed at the GIS-Lab at the Swiss Federal Institute of Technology (EPFL) in collaboration with the Federal Institute of Agronomic Research (RAC Changins).

3 Development of the Prototype “Viti-Vaud”

The concept for this prototype was that it should be able to visualize the layers from the project “terroirs viticoles” and to enable the winegrowers to add the spatial extent and to specify the sort of grape among other things directly on the Internet.

The main functional requirements for the system were thus:

- The consultation of interactive maps, including the possibility to query objects in order to get information about the objects visible on the map;
- The input of spatial data and attributive data directly through the web-interface by the winegrower.

To find out about the winegrowers needs and their ability to use such a system, some initial questions were formulated:

- How familiar are the users with computers?
- Do they already use specific programs to register data about their wine-cultivation?
- Do the winegrowers have a connection to the Internet?
- Do the users have experience in searching spatial information on the Internet (e.g. through the use of existing web-mapping systems)?
- Which data are the users mostly interested in (data from the project “terroirs viticoles” and data from other winegrowers were given as alternatives).
- Which data would the users agree to share?

An inquiry allowed mediating those questions to the users and establishing requirements for the prototype. The most important requirements were thus:

- An optimization according to the most common systems. (e.g. almost all winegrowers were using Microsoft Windows [13] and Internet Explorer [13])
- Optimization of the spatial input function: The inquiry showed that only very few winegrowers had used their computers to draw or to paint, therefore it seemed necessary to optimize the part of the system where the winegrowers can input their parcel;

- Data-classification: The winegrowers were more interested in certain data than in other. Hence the available data should be classified taking in account this interest;
- Restricted usage: Some users didn't want to share all their data, thus the winegrowers should be enabled to choose whether or not other winegrowers could see his data.

The prototype of the system was thereafter implemented using CampToCamps Car-to-Web [4] solution, an open-source web-visualization system that is mainly based on MapServer [5], a map-engine that allows creating a dynamic map on a web-page. All data that is input by the users is stored in a PostgreSQL [6] /PostGIS [7] – database – a database-system that allows to store spatial objects as well as well as it has the capabilities to run spatial queries and spatial operations. Dynamic PhP [8] scripts and the protocol XMLRPC [9] connect the different parts of the system. Java [10] -applets are used to visualize the map and to permit the input of spatial data (see fig. 2)

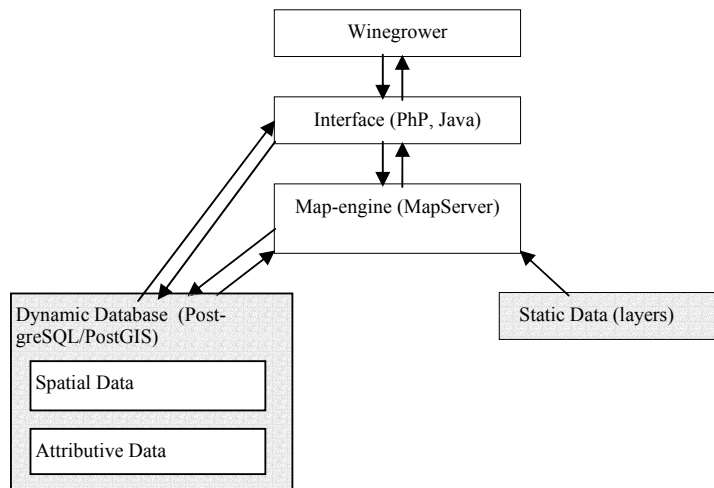


Fig. 2. Functional model of the Prototype

As a base for the spatial input, aerial images (orthophotos) and the legal cadastre were offered to the winegrowers. The resolution of these orthophotos was 1 pixel = 50 cm. On these orthophotos it is possible to see the spatial extent of a parcel. Based on these two layers the winegrowers could digitize their parcels.

The development of this web-mapping system was however different to the development of a standard-GIS, such as ArcView [11]. The use of standard-GIS involves expert-knowledge [12] and the inquiry showed that not all winegrowers were used to

computers and computer programs. Therefore it was important to design the system according to Human-Computer-Interaction (HCI) theories and methods.

After the prototype had been developed it was evaluated by four winegrowers and one researcher from the Federal Institute of Agronomic Research. The results of this evaluation were that:

- All winegrowers were able to draw their parcels directly on the internet and to add meta-data related to these parcels.
- All winegrowers were able to navigate the map and to consult different layers showing e.g. the microclimate or soil-information.
- Some winegrowers had difficulties in finding their parcel on the map after it had been created, thus one idea for further developments was to create a function that enables the winegrowers to directly navigate to their own parcels.
- Another issue that had been discovered was that there was no restriction of where a winegrower could draw his parcel – in the prototype it was possible to draw a new parcel on top of one existing parcel or on the water.
- One technical problem of the prototype was that it was using Java-applets. These applets have two disadvantages: the user must install the Java-plugin in order to use the applet and further, it can take a long time to load an applet (especially the applet that is used to input spatial data). This can be a problem if the user is connected through a modem.

4 Current Developments and Outlook

At present the project has come to the next level – the development and implementation of the whole system. A committee was created, consisting of representatives of all actors involved in wine-cultivation in the canton, such as Federal Research Institutes (the Federal Institute of Agronomic Research (RAC Changins) and the Swiss Federal Institute of Technology (EPFL)), the Swiss-French Service of Agricultural Advisory (SRVA), the Association of Agricultural Promotion in the Canton of Vaud (Prométerre) and CampToCamp. The goal of this committee is to develop the interactive network for wine-cultivation.

The implementation and the evaluation of the prototype have shown that it is possible to create such a system. These results are now used in order to improve the system and to eliminate the problems uncovered.

The most important issues are now:

- Control issues: How is it possible to implement control-mechanisms that ensure the correctness of the data that has been input by the winegrowers? Possible solutions are to implement a forum-structure where moderators control the data. Another possibility is that winegrowers can notify a moderator if they discover incorrect data.
- Technical issues: How can the spatial-input function be improved? Here are basically two possible solutions: An improvement of the Java-applet in order to make it smaller and faster to load. The advantage of the Java-technology is that it is easier to create advanced functions such as snapping-functions. The other possible solution is the development of DHTML-pages that are using Javascript. This technology doesn't need any plugins that have to be installed by the user, but on the other hand it is more difficult to implement advanced functions.
- The conception of the database – which structure is the most accurate for the project – which partners need which tables and information? Which information shall be stored in which location? Who administrates which parts of the system? How can a history of the input data be maintained?
- The conception of different interfaces for all partners – Here a user-analysis for each partner has to be done in order to determine each user's needs. For this part of the project use-cases will be used and other prototypes will be created.
- The rights to digitize on aerial images (orthophotos). At present the owner of the orthophotos doesn't have the right to digitize information based on these orthophotos. These rights have to be acquired in order to facilitate the digitizing-process.

5 Conclusions

The development of an interactive network for wine-cultivation is up to now a unique project. On the market there are discrete systems available that permit to register wine-cultivation-data, but no distributed systems that can be used through the internet. The advantages of the development of this specific system are that users don't need to buy expensive, proprietary software, as the whole system is based on open-source software. Further there is no need to install software on each computer as it is using the internet. The development of this system also has the advantage that it is completely adapted to the all partners needs.

In a wider perspective this project can also be considered as prove that geographical information systems not necessarily are restricted to expert users such as common systems on the market. The interaction with spatial information becomes available for

everybody through the internet, but here it is very important to design the systems in a way that everybody can use them, which stresses the use of HCI-theories and methods.

It is conceivable to design such systems for other groups of users and other fields as well. What changes, is mainly the design of the interface, but not the concept and the idea of the system itself. The methodology opens the doors to spatial data input and analysis by users that are not experts in GIS.

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