A Multitask PostGIS Based Vet GIS Framework

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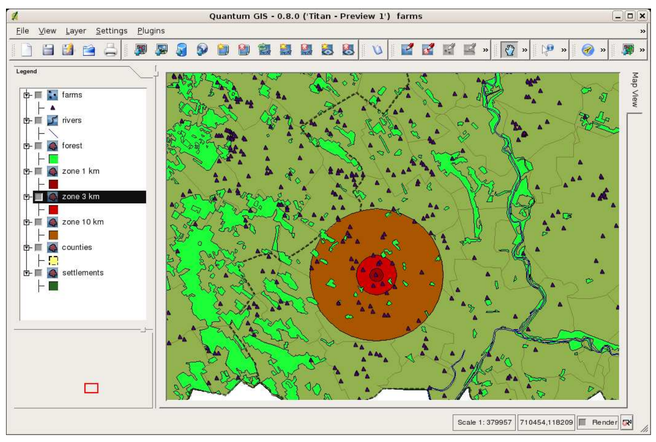
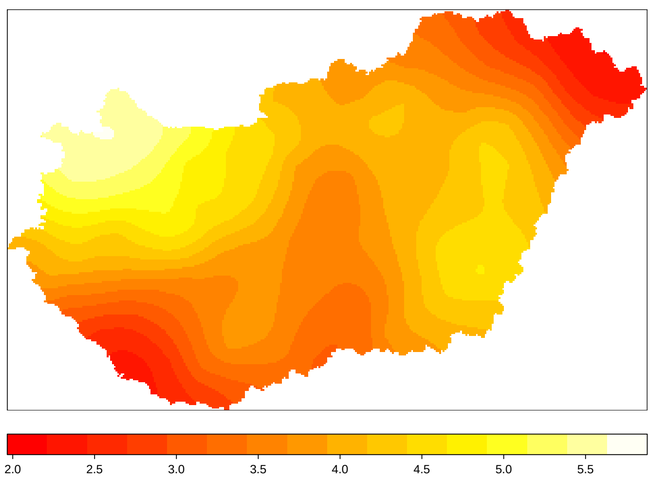
Introduction

Our goal was to have a freely scalable environment with GIS facilities for spatial visualisation and analysis in vet studies. In the environment integration the main spects were that we wanted to use free, opencource and cross-platform tools. The framework below shows the present status of our system.
Recently, it is more and more widespread in geographical information systems to store the vector graphical maps in databases instead of the former file based solution. This makes it possible to relate the map tables without any interface to the descriptive tables and to access the maps by a large number of users, and even the security of access is getting better.
For the PostgreSQL database server [1] the PostGIS [2] extension based on the OpenGIS "Simple Features Specification for SQL" [3] has the above capabilities. Besides of storing the spatial structures, the PostGIS has several functions for handling spatial objects.



Supposed outbreak with zones



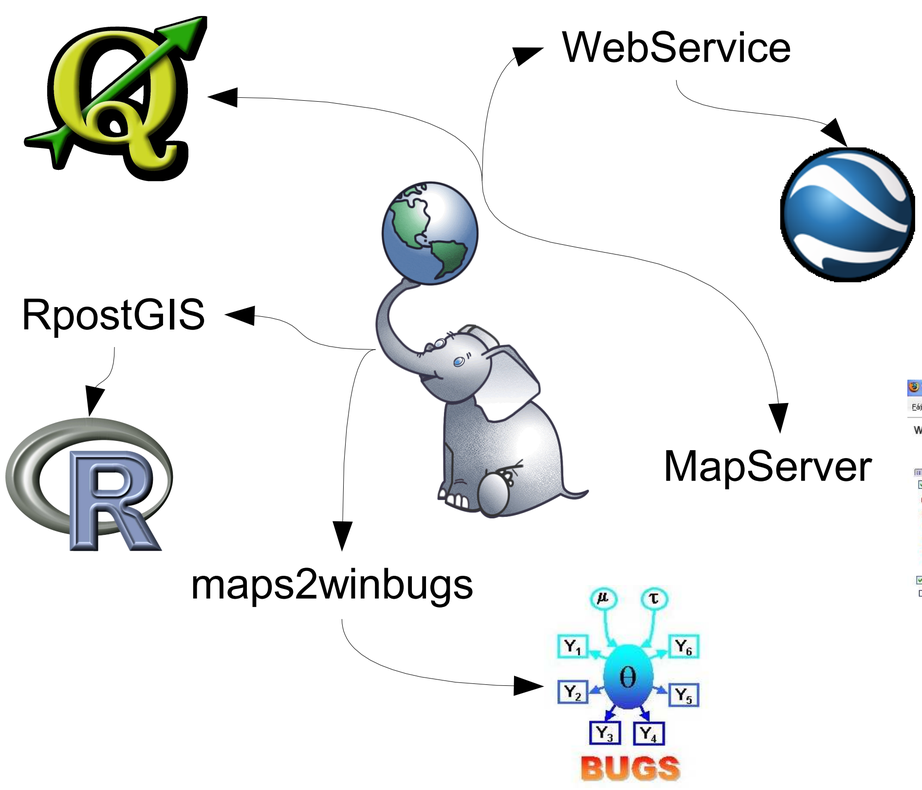
Isopleth map by R

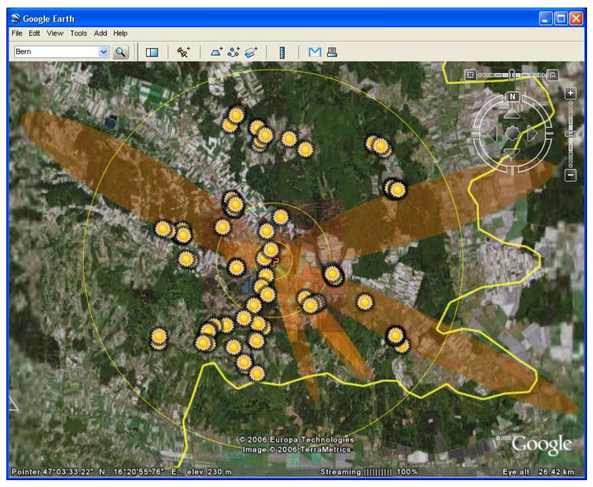
Statistics

For spatial analyses we use the R [11] environment and language. Beside this tool we started to use for Bayesian spatial analysis the WinBUGS [12] (and OpenBUGS). Unfortunatelly in these tools we are not able to use the PostGIS spatial tables directly.
This is why we developed a package for R, we call it RpostGIS [13], which provides a function (pg2map) to read spatial structures from a PostgreSQL-PostGIS database through a simples ODBC tunel.
We also developed a tool, the maps2winbugs [14] which helps to transform the spatial tables into that form in WinBUGS (GeoBUGS) can be used.

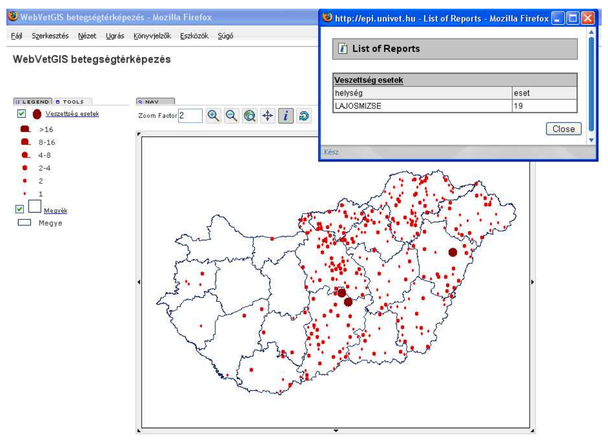
Visualization

For the spatial visualization of the data stored in PostgreSQL-PostGIS database we can use several tools. Some of them are WEB based and others desktop solutions.
We use the Chameleon [4] developing environment based on MapServer [5] for Web Mapping.
The desktop applications can use the data from the database by a direct connection or by indirectly. The soultions use direct database connection for example Quantum GIS (QGIS) [6], User-friendly Desktop Internet GIS (uDig) [7] or Thuban [8].
For those applications have no facilities to connect directly to PostGIS tables easy to develop data preparation tools. One possibility if we use WebService to produce input files for the desktop solutions, like Google Earth [9] NASA World Wind [10]. In our system for the Foot and Mouth Disease virus airborne spread modeling we use a WebService to generate input file for Google Earth.

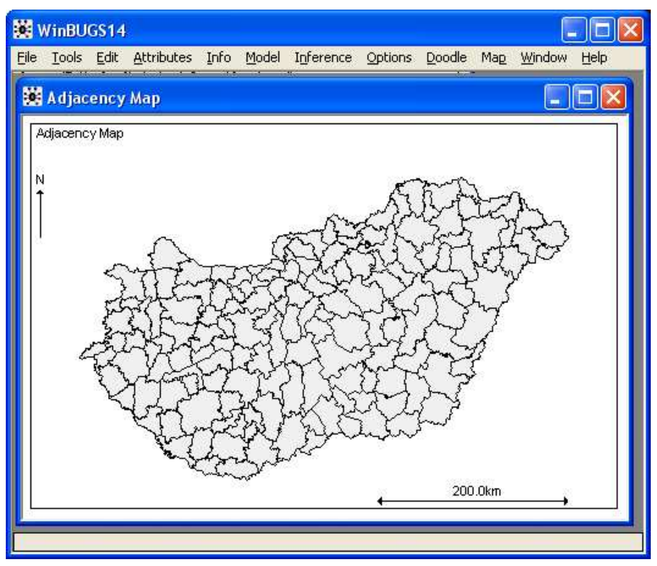




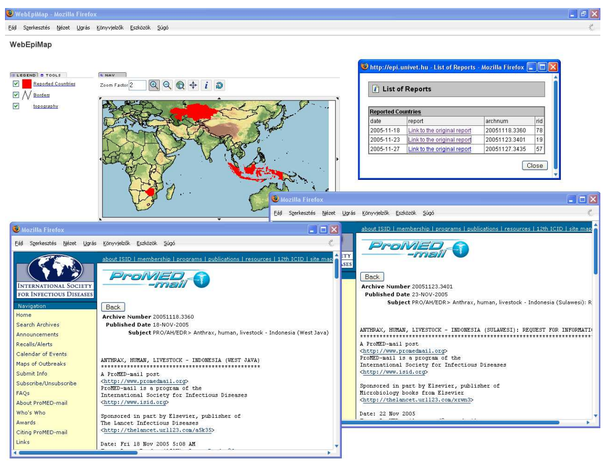
FMD Plums



Rabies cases



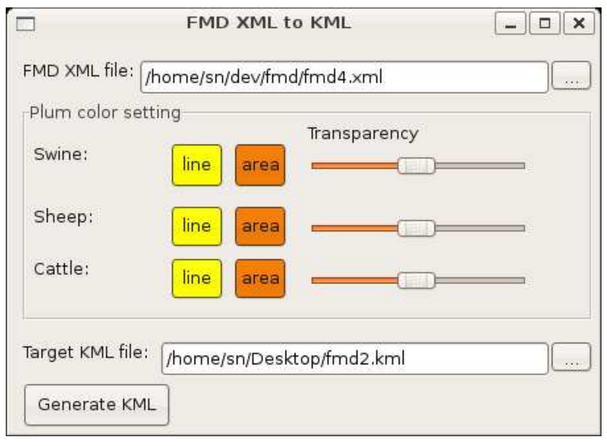
Transformed map in WinBUGS



ProMED report mapping

WebService

We model the long distance airborne spreading of the Foot and Mouth Disease virus by the Gaussian model. For this modeling we implemented a WebService, what generates virus plums from the input data. The source data of the model is stored in a XML structure, we call it FMD XML. The output of the WebService is a KML file, containing the calculated plums. The WebService is implemented in Python and for it we developed a GUI client, it uses WX widgets. By this GUI it is easy to generate the plums based on the input data.



Client for WebService

References

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[10] http://worldwind.arc.nasa.gov
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[12] http://www.mrc-bsu.cam.ac.uk/bugs
[13] http://epi.univet.hu/portal/sn/fejlesztes/letoeltheto-szoftverek/rpostgis/
[14] http://sourceforge.net/projects/maps2winbugs

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