Research Institute of Geodesy, Topography and Cartography,
250 66 Zdiby 98, tel: +420 284 890 515, e-mail: Milan.Talich@vugtk.cz

Geometrical Analysis of Deformation Measurement using Continuum Mechanics by Web Application

Milan Talich

Milan.Talich@vugtk.cz

May 13 - 17, 2007 The XXX FIG General Assembly and Working Week

Paper contents:

- description of XML web application to geodynamic analysis of deformations
- short description of general principles and advantages of applied technologies of web services and XML applications
- this way the paper reflects a decline of understanding web as a medium offering information to be the tool rendering services and applications

Web application to geodynamic analysis of deformations:

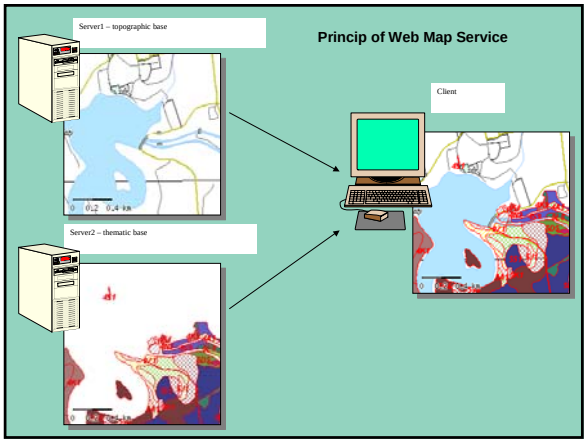
- Application to geodynamic analysis of deformations made on-line and utilizing simultaneously WMS web services (*www.vugtk.cz/~deformace*)
- Application goes from the desktop version which we used 20 years ago and is based on continuum mechanics
- As input to the application: coordinates of given points, their displacements and numbers stored at client and some other information as required
- As output:
  - Values of interpolated displacements in quadratic network
  - Deformation field values in the same quadratic network (strain tensors)
  - Graphic representation of displacement field and map deformation
  - Possible insertion of topographic base to map by WMS (SMO 5, UHUL, NASA Landsat and MODIS, DEMIS)
- Input and output values are in the XML format (GML, SVG, KML)

Why Continuum Mechanics:

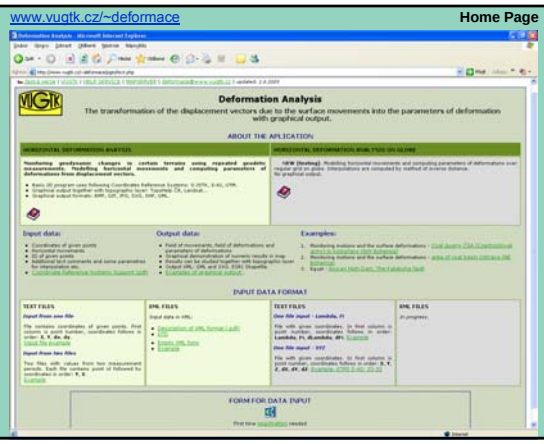
- All displacements depend on the selected coordinate frame
- Deformations parameters do not depend on the applied coordinate frame (translations and rotations)
- => It is not necessary to care of which way the conditions of coordinates (net adjustment) are set = which net points are to be considered as „stable“
- There is only one thing to comply – computing the net adjusting as free network
- => To the practical using this means elimination of the errors obtained due to false (erroneous) prepositions about stability of some chosen points that we consider as stable during repeated partial measurement
- fundamental prerequisite for using Continuum Mechanics is homogeneity of the researched territory

Applied technologies – XML, web services and applications:

- As basis is the XML (eXtensible Markup Language) interface to services and applications
- Web application enables interaction between man and machine, web service enables interaction machine - machine
- Web services represent basic building blocks to web applications and distributed data and information processing
- Using of standardized interface (XML) to services and applications allows creation of new platform independent applications, which utilizes such services
- Such services and applications may be multiplied => a development towards using distributed services and data from more servers simultaneously
- In GIS area WMS (Web Map Service) is used as Open Geospatial Consortium (OGC - http://www.opengeospatial.org/)
- => GIS data must not be on own PC



www.vugtk.cz/~deformace **Home Page**



Characteristics of Deformation application:

User interface

www
- Application properties
- Detailed description of inputs and outputs
- Examples of using

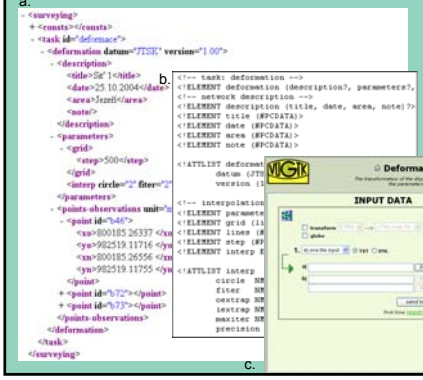
Help
- standard Windows Help format .HLP,
- Register
- Searching

Coordinate systems
- UTM
- WGS – fi, lambda, or X,Y,Z
- S-42 (Gauss)
- S-JTSK (Křovák)

XML format
- Corresponding to XML definition and other international recomendations of W3C consortium
- Modular system
- Input possible of one or two sets

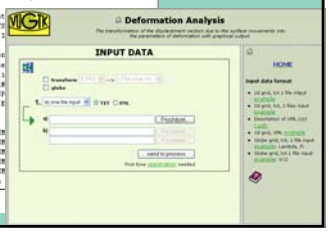
INPUT DATA - XML FORMAT

a.



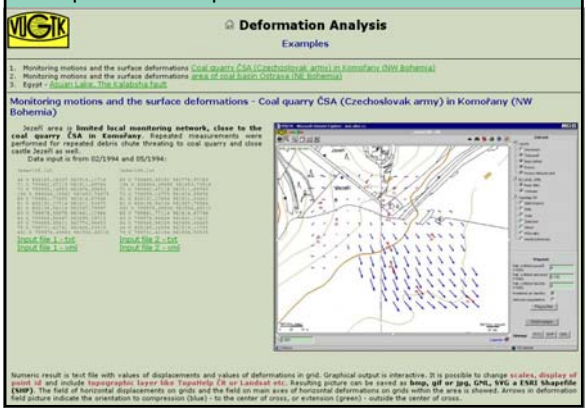
b.

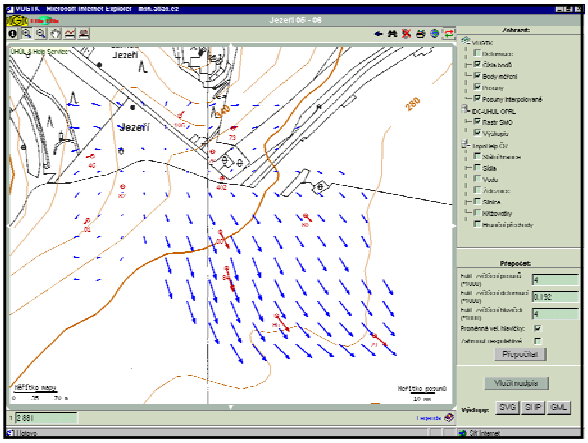
c.

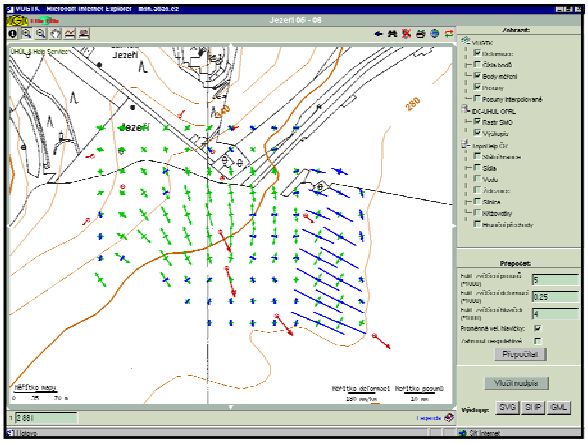


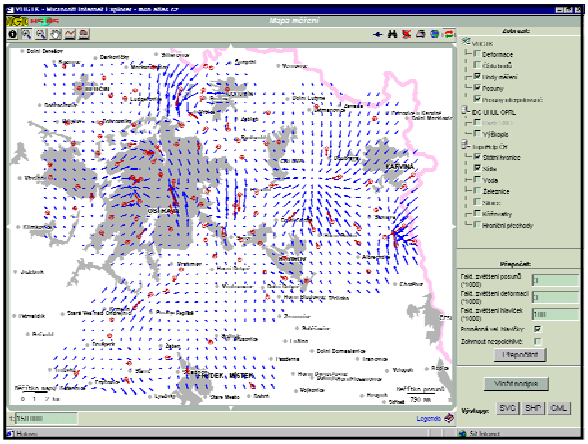
a. Data
b. Description
c. Input form

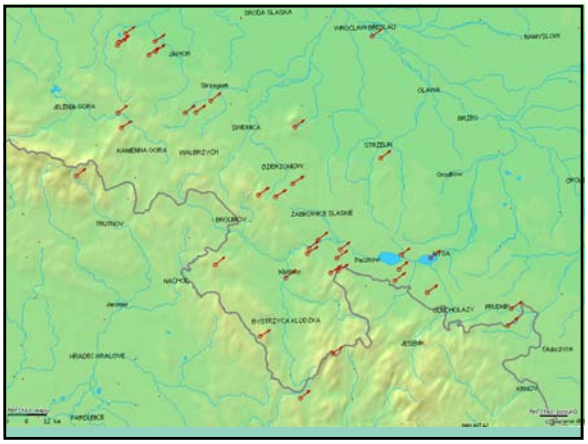
Exaples of use in practice:

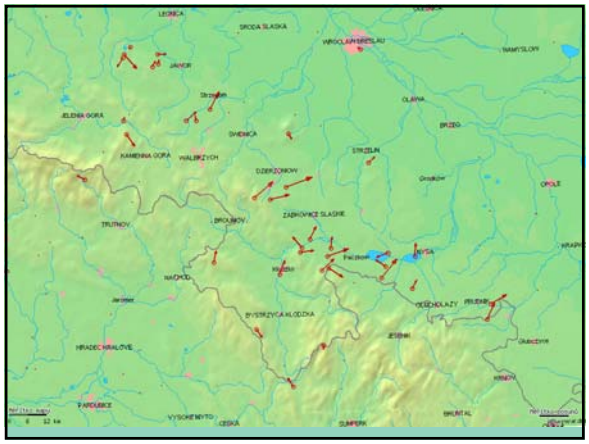


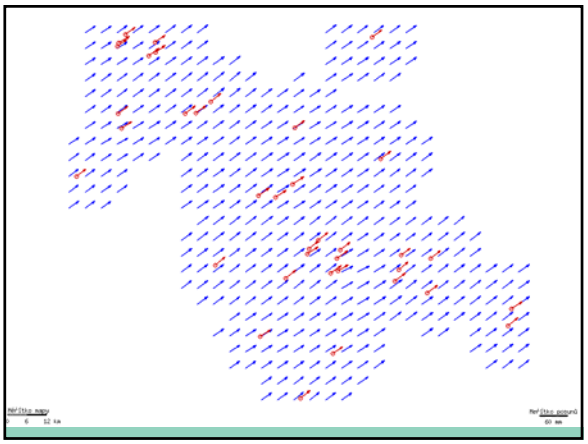


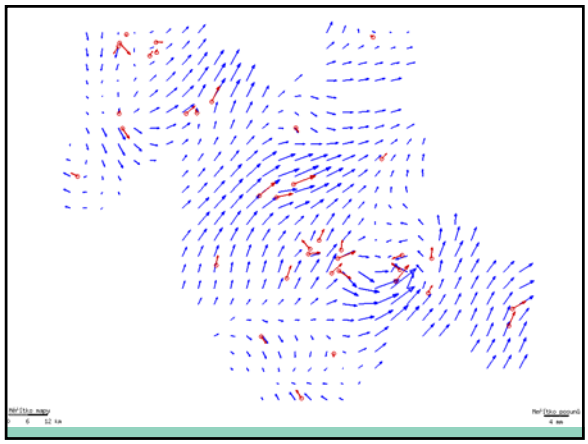


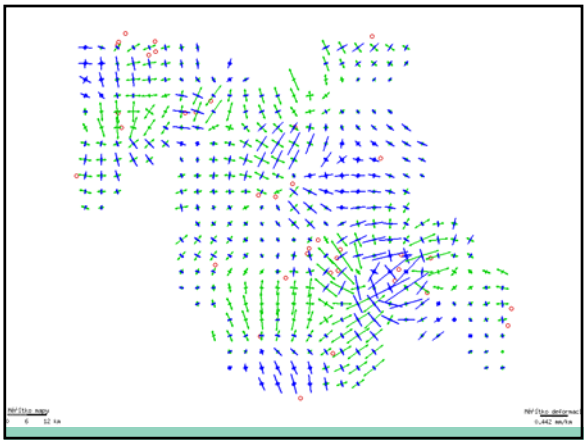


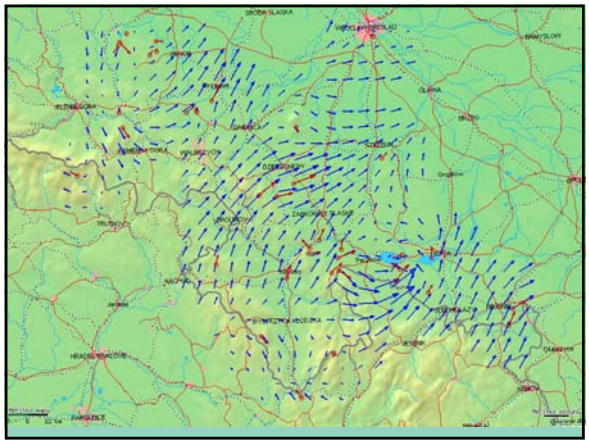


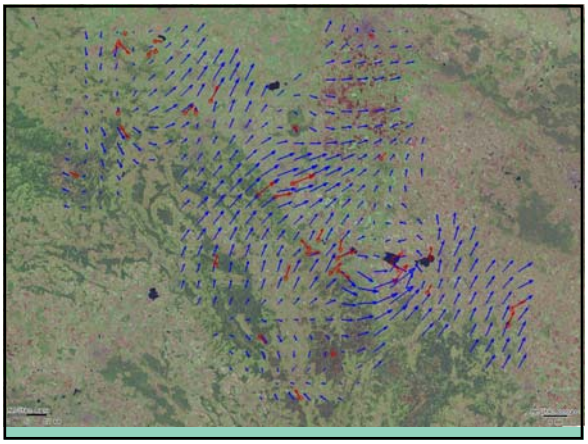


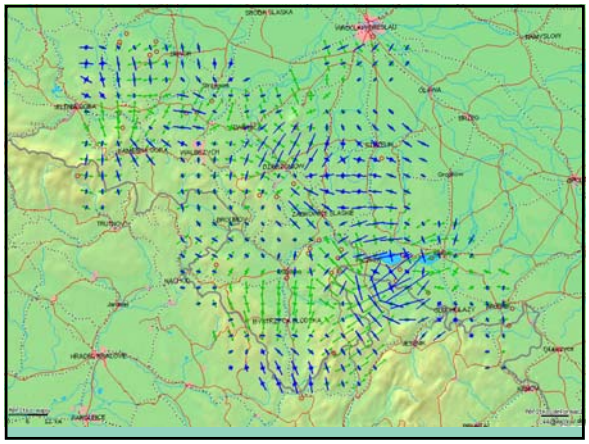


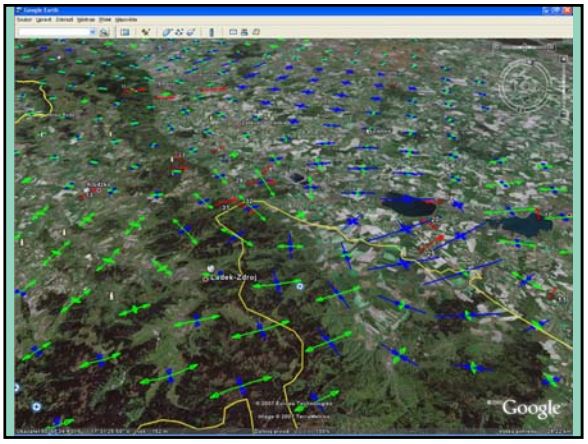


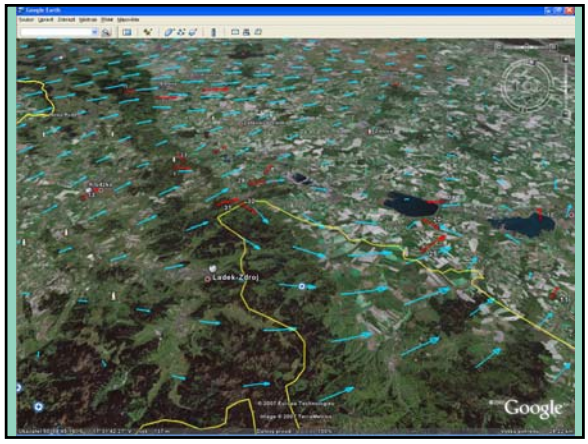









Google


Google

Conclusions:

- **the deformation analysis by application of theory of continuum mechanics (fundamental prerequisite is homogeneity of the researched territory) is more objective dynamic indicator in the researched area than the only calculus and representation of point displacement vectors.**

Conclusions:

- **presented application demonstrates XML technology and standards to form web computing applications with simultaneous use of XML web map services**
- **this concrete application enables that any surveyor may perform even more complicated work such as deformation analysis without own special software**

Research Institute of Geodesy, Topography and Cartography,
250 66 Zdiby 98, tel: +420 284 890 515, e-mail: Milan.Talich@vugtk.cz

Thank you for your attention

Milan Talich

Milan.Talich@vugtk.cz