WPS applied to geostatistics and spatial interpolation

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Question: What is the value of point (x,y) ?!??!?!?

Geostatistics is an umbrella term for a group of methods and procedure whose final object is to answer the above question.
Geostatistics during the 70's was called “Voodoo Statistics” by the general statistics community.

Never the less Geostatistics works, and some method are highly advance (mathematical).

Geostatistics requires “stationarity”, meaning all samples group should have the same numerical average.
Isolated points with extreme values, will be a problem

Isotropy of data can be a challenge. Gas plume, pollution etc

Data with drift for example precipitation and temperature

Geostatistics requires expertise, and strong computers
“...real-time mapping of critical environmental variables using advanced geostatistics...based on interoperable web services...”

New Geostatistical methods

Automation of all processes

Web Processing Service as major web service

WPS as client of another WPS
http://www.intamap.org

**INTAMAP Home**

The INTAMAP project is a project for development of an interoperable framework for real time automatic mapping of critical environmental variables by extending spatial statistical methods and employing open, web-based, data exchange and visualisation tools. All the methods and implementations of methods are open source and downloadable from these pages. Additionally the UncertML candidate standard for communicating uncertainty was developed. The project can be seen to consist of four parts:

- **Statistical back-end**, implemented in R which contains implementations of traditional geostatistical interpolation methods, new methods (Spatial copulas and Projected Spatial Gaussian Process) and support tools. These can also be used as a standalone interpolation package under R.
- **Web processing service** to allow interoperability with OGC based web services.
- **Web and standalone clients** that permit easy access to the system, including a Java API that permits integration with other software systems.

If you want to test the system, a simple web page has been developed to allow users to try INTAMAP without installing anything on their computer.

As a test application, the full system has been implemented at **BFS** (Bundesamt für Strahlenschutz), where observations of gamma dose rates from across Europe are mapped in near real-time using the INTAMAP system. The data comes from the European radiological data exchange platform ([EUREDAP](#)).
http://gis-obama.uni-muenster.de:8180/intamap/WebProcessingService

http://intamap.geo.uu.nl:8180/intamap/WebProcessingService

http://intamap.aston.uc.uk:8080/intamap/WebProcessingService


Tomcat instance and 52 North WPS implementation

Rserver running interpolation algorithm
This method automatically interpolates a series of sensor observations.

Using this URL, you can specify a full SOS GET request, or just provide a URL that will be used to send the 'SOSRequest' parameter to. If the SOSRequest parameter is empty and the URL is not a valid GET request then an exception will be raised. Also, we only support the Observations and Measurements 'Measurement' type as a result from a SOS request.

The POST payload for a SOS request to be sent to the URL contained within SOSURL.

This parameter is a full valid SOS GetObservation request. The result of this request once sent to the URL contained within the SOSURL should be an ObservationCollection containing Measurement elements.
Minimum input: ObservationCollection \((x,y,z)\) points with value

Other inputs: Domain

Prediction Type (median, variance, probability)

Method Name (interpolation method)

OutlierDetection (flag)

MaxTime (max time to interpolate)
- `<wps:Data>`
  - `<wps:ComplexData>`
    - `<om:ObservationCollection>`
      - `<om:member>`
        - `<om:Observation gml:id="MEUSE1">`
          - `<om:samplingTime/>`
          - `<om:procedure/>`
          - `<om:observedProperty/>`
          - `<om:featureOfInterest>`
            - `<sa:SamplingPoint>`
              - `<sa:sampledFeature/>`
              - `<sa:position>`
                - `<gml:Point>`
                  - `<gml:pos>181072.0 333611.0</gml:pos>`
                - `</gml:Point>`
                - `</sa:position>`
            - `<sa:SamplingPoint>`
          - `<om:featureOfInterest>`
            - `<om:result>11.7</om:result>`
        - `</om:Observation>`
        - `<om:member>`
          - `<om:Observation gml:id="MEUSE2">`
With minimum input the server will try to:

1) Check data for extreme values, anisotropy
2) Run pre-processing algorithms if necessary
3) Determine the best interpolation method
4) Run interpolation
5) Return output with report of methodologies and procedures done
Output as UncertML

Schema developed by INTMAP that describe uncertainty associated with data
Data description

Response also contains interpolation results
Hopely the computer will return data to set a map like this
Another service to cross validate data

http://remwps2.jrc.ec.europa.eu/cgi-bin/wps.py

Inputs:
Data observation
Interpolation report of interpolation server
Using INTAMAP

Try INTAMAP

For a demonstration of the INTAMAP interpolation service, paste the contents of a CSV file containing observations you wish to interpolate in the box below and click 'Interpolate'. Each row in the file should represent an observation and have three or four columns: the x coordinate of the feature of interest, the y coordinate of the feature of interest, the result, and optionally the standard deviation. The CSV file should not contain a header.

Request Details

Load sample data (smaller data sets take less time - indicated time is for the psgp method):

\texttt{NO2\_diffusion\_tube\_central\_Scotland\,(\texttt{NO2}\_\texttt{cs}3\_\texttt{subset}\_\texttt{time}\_\texttt{10a})}\hspace{1cm}

\hspace{1cm}

\hspace{1cm}

Click to visualise

- Perform basic outlier detection
- Enable Google Earth visualisation - requires observations EPSG code:

WARNING: INTAMAP does not currently support interpolation in lateral, however, when Google Earth visualisation is implemented this will be possible.
Thank you for the attention :)
