

BE GEO

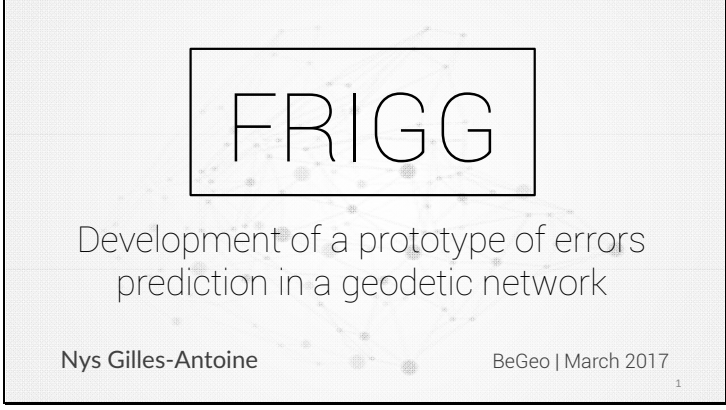
16 MARCH 2017
TOUR & TAXIS – BRUSSELS, BELGIUM

EEN ALOMVATTEND EN NATIONAAL CONGRES MET BEURS OVER GEO-
INFORMATIE

UN CONGRÈS NATIONAL ET GLOBAL AVEC UNE BOURSE DE L'INFORMATION
GÉOGRAPHIQUE.

Presentation made by Gilles-Antoine Nys, University of Liège at the Geospatial Awards. The mode of presentation was imposed: Pecha Kucha. Namely 20 slides of 20 seconds each, that is to say 6 minutes in total.

DIAPOSITIVE 1



FRIGG

Development of a prototype of errors prediction in a geodetic network

Nys Gilles-Antoine BeGeo | March 2017

1

Whether in topography or more generally in every scientific methodology, any kind of measurements is tainted with errors.

It is well known that it is impossible to dissociate these errors of the measurements.

DIAPOSITIVE 2



Tainted with errors

$\Delta\epsilon$

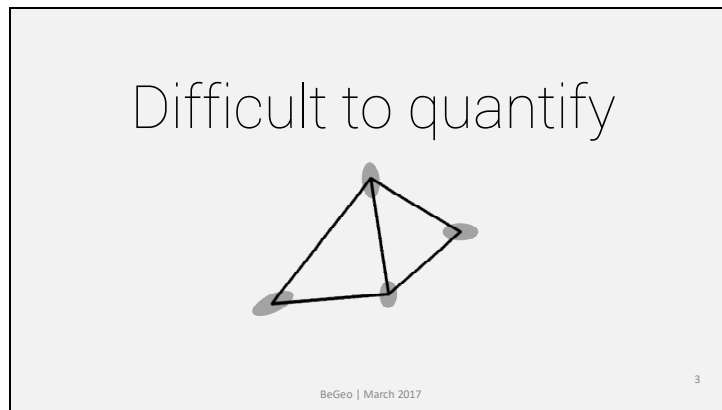
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2

They are altering our perception of the reality with varying degrees of gravity. We can't delete them but only reduce them.

This deformation is quite simple to consider when we speak about a linear configuration.

DIAPOSITIVE 3



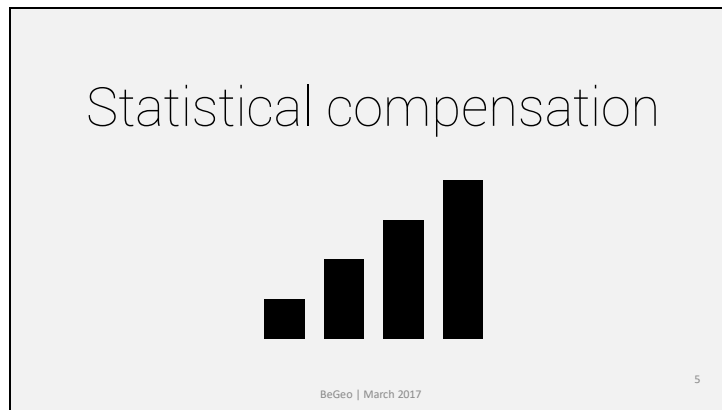
When it comes to a network for example, it becomes harder to quantify. Moreover, if this imprecision is really substantial, the relevance of the parent measure could be diminished. This may go so far as to make the measure obsolete.

DIAPOSITIVE 4



The operator's experience or rules of thumb often influence the choice of geometry for the survey network or the choice of the measuring instrument. The professional prejudices the amount of the technical errors that may appear.

DIAPOSITIVE 5



A posteriori, an evaluation of the set of errors in a project can be established. The theory of errors brings tools helping to adjust the approximations in a survey. You may reduce the mistakes made during the mission but you can't really affirm none remains.

DIAPOSITIVE 6



But all of these models are usable after work, when the mistakes have already been committed.

And this could be a huge loss because some time have been spent and some money invested.

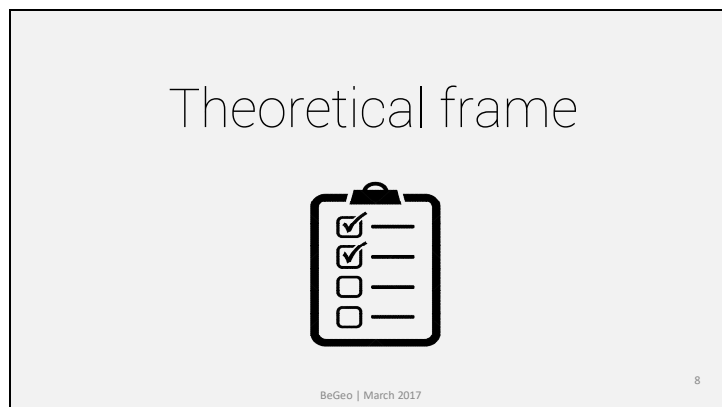
Perhaps, the customer wouldn't t contact you for the next mission he will order.

DIAPOSITIVE 7



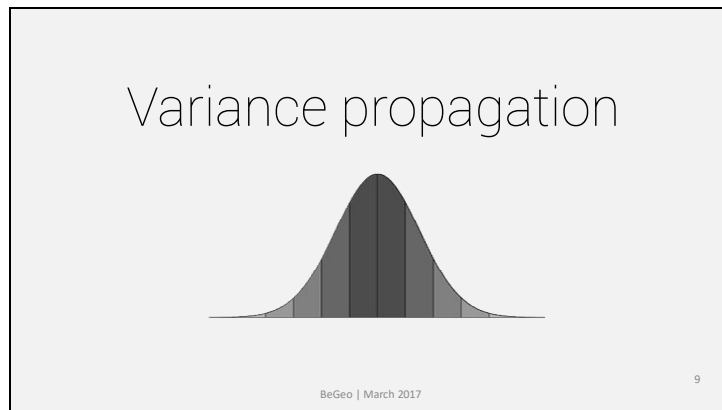
So what if we could determine an approximation of these errors before the mission?
We would be able to accept a mission with the knowledge of its good proceeding.
The customer would be at ease if you may tell him: I will work that way and that's the way because of this or that.

DIAPOSITIVE 8



For this purpose, we need a good and solid framework.
Based on well-known theories, my master thesis shows how to get an approximation of the technical errors we may encounter.

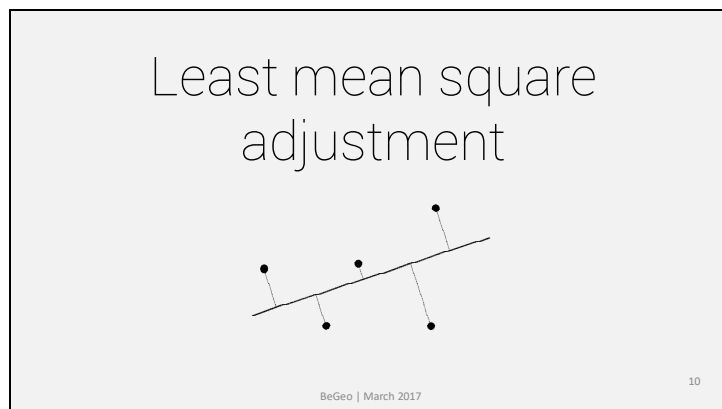
DIAPOSITIVE 9



It is mainly based on the variance propagation and discusses the link between it and the matrix calculation.

However, in topography, we use this system for a simple configuration, as consecutive sightings or simple loops

DIAPOSITIVE 10



The least mean square adjustment is usually used *a posteriori* on the coordinates of the stations to correct them.

In this method, the configuration of a system is represented by observation or/and condition linear equations.

DIAPOSITIVE 11

Taylor Series

$$T_n(x) = \sum_{i=0}^n \frac{f^{(i)}(a)}{i!} (x - a)^i$$

11

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The problem is that LMS requires linear equations as I said. And those we have are obviously not.

Distance and bearing equations needed to be linearized with Taylor series.

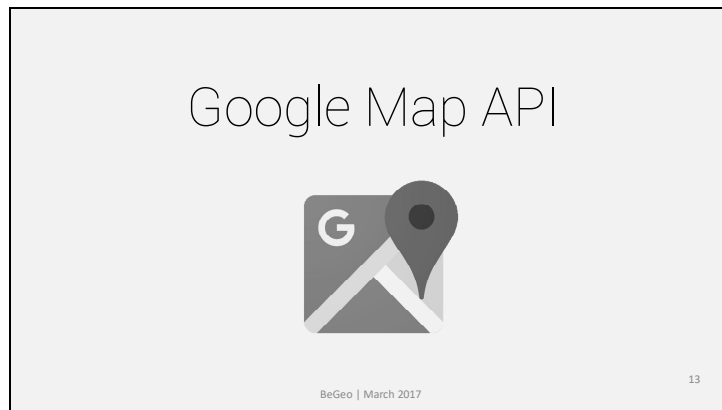
DIAPOSITIVE 12



All these statements had to be expressed in a common and well-known standard to be communicated.

So the parameters asked to compute the algorithms and the answers are given in the ISO Standards.

DIAPOSITIVE 13



Even if we now have a good knowledge of the phenomena, without any contextualization, its benefits won't be useful.

So I decided to develop a prototype as a Google Map API. The real site is easily apprehended.

DIAPOSITIVE 14



To implement the matrix calculation and to draw into the Google Map tile, I developed a Graphical User Interface using the Matlag GUI.

So the user can manage the disposition of his stations and know the best configuration of the network.

DIAPOSITIVE 15



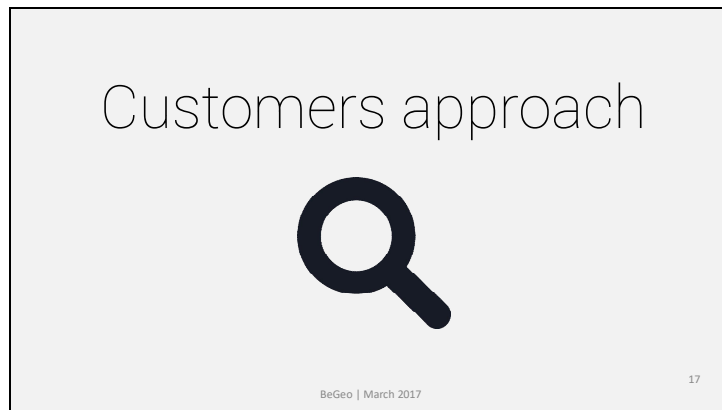
Finally, the potential benefits are very large, as much for the professionals as for the contractors or even in teaching.
It is the first time prediction is considered in topography. It gives us not only a theory but a prototype to understand and a simple way to communicate about the landmeters work !

DIAPOSITIVE 16



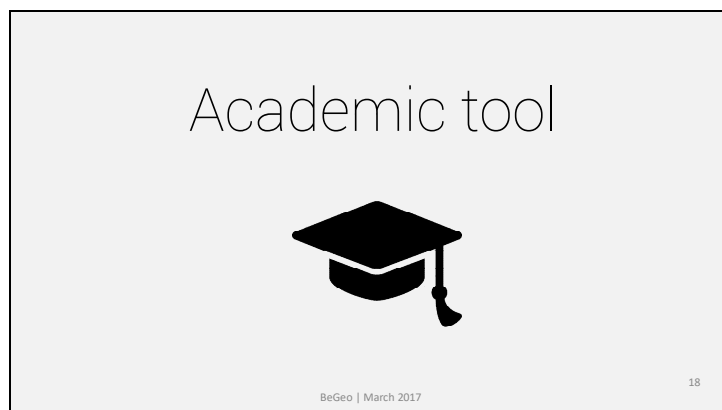
For the surveyors, the prior knowledge the precision of their works is a guarantee of quality. Simplified by the illustration in the Google Map environment, the discussions with the customers are easier.

DIAPOSITIVE 17



For the customer, who is not conscious of what he is able to call for or what the landmeter are apt to provide, this could be helpful too.
You no longer need to be an expert to use this intuitive tool.

DIAPOSITIVE 18



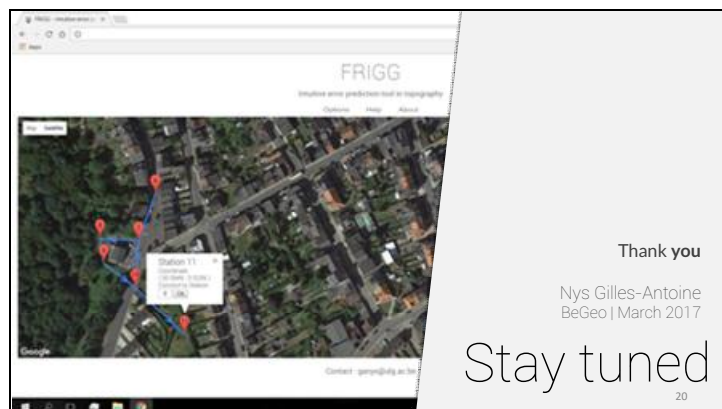
On the other hand, the software could be used in an academic way.
The contextualization and the representation of the precision, that could be too abstract for the neophyte, is easily shown and understood.

DIAPOSITIVE 19



It is part of a dynamic that is increasingly focused on the web and the pooling of knowledge. The users could exchange and discuss many possibilities and together, reach a better understanding.

DIAPOSITIVE 20



It is not only a progress for the professionals but also for all those with whom they have to collaborate.

What about the future?

I am currently developing a web page so that my tool is available to as many people as possible.