Measures: from paper to screen

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Outline

1. The matter
2. Current approach
3. Our proposal
The earth is represented on flat supports

- PAPER
- SCREEN
To represent actual earth distances on a flat support, it is necessary to apply a deformation module.

\[ m = 0,9996 \left( 1 + \frac{y^2}{2pN0,9996^2} \right) \]
Graphical errors (ge)

ge = 0.2 mm on sheet

Tolerance

t = ge x 2 ÷ 3 = 0.5 mm on sheet

1:2,000 Scale

t = 0.4 m x 2.5 = 1 m
Graphical errors ($ge$)
$ge = 0$ (scale of 1:1)

Nominal scale
1:2,000 (accuracy of the survey)

Scale of 1:2,000
$t = 0.25 \text{ mm} \times 2,000 = 0.5 \text{ m}$
### Paper

\[ D = (m \times d \times \text{scale}) \pm \text{ge} \]

Distance =
(measure \times \text{Deformation module} \times 
\text{Picture scale}) \pm \text{Graphical errors}

### Screen

\[ D = (m \times d) \pm t_{sn} \]

Distance =
(measure \times \text{Deformation module}) \pm 
\text{Nominal scale tolerance}
Same reasoning applies for measures of surfaces
Today, both creation and representation of images are almost completely digital.
Many popular web-based imaging services, as well as orthophotos, easily provide realistic and useful imagery.
The question is ...

Is the average technical skillness of the users of imagery systems sufficient to recognize the differences between on-screen measures and actual distances?
Current approach

Classic paper maps usually show information about deformation module and scale of the map.
Current approach

In digital cartography, instead, information about deformation module and nominal scale get lost.

Unfortunately, professionals that can autonomously evaluate such information are limited in number.
WHY?
Why not enable CAD and technical software to take into account such additional parameters when evaluating distances and surfaces?
CURRENT DIGITAL IMAGERY

GEOTIFF
- ModelTiepointTag
  - to associate a point of a raster to a coordinate system
- ModelPixelScaleTag = (ScaleX, ScaleY, ScaleZ)
  - to define how to scale raster coordinates to fit a coordinate system

ECW
- eCellSizeUnits
- eSizeY
- eSizeX
- fCellIncrementX, fCellIncrementY
- fOriginX, fOriginY
- szDatum
- szProjection

DWG
- drawing units (UNITS)
  - to associate pixel coordinates to actual ones

OUR PROPOSAL

3 NEW FIELDS IN IMAGE HEADERS

1. NOMINAL SCALE

2. DEFORMATION MODULE

3. ACCURACY
Some facts

- Digital imagery is rapidly substituting paper maps!
- Orthophotos are becoming more and more familiar!
- Imagery will be coupled to a lot of location-based information!
- The arena of users of such systems will grow larger and larger!
- However, cartographic culture will probably remain in the hands of a limited number of professionals!
Some facts

It is our duty to think, study and experiment solutions that can enable a wider and easier utilization of digital imagery.
But will we, as topographers, be as precise, or even more, than the informatic tools we use to represent the world in our works???
Our task:

turn difficult matters into
easy ones
Thank you for your attention!