

Kernel-based methods for the historical 'Map of France' registration

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Context

Old maps and historical data are an important source of information to assess spatial patterns of landscape in the past, their change, and the impact of these changes on the present biodiversity (Fig 1)

Difficulties in using historical spatial data are numerous because of their heterogeneity (difference in spatial scales, data formats, projection systems, quality, and so on). In order to compare these data with a current support, a key step is to assign a cartographic reference to the early map (i.e registering the old map).

Scientific and methodological issues

Testing three parameters for selecting Ground Control Points (GCPs)

- (1) Their distribution: regular or random
- (2) Their number
- (3) Their categories: remarkable points or road crossings

Testing potentialities of kernel -based methods to register an historical map

What's the better strategy to register old maps?

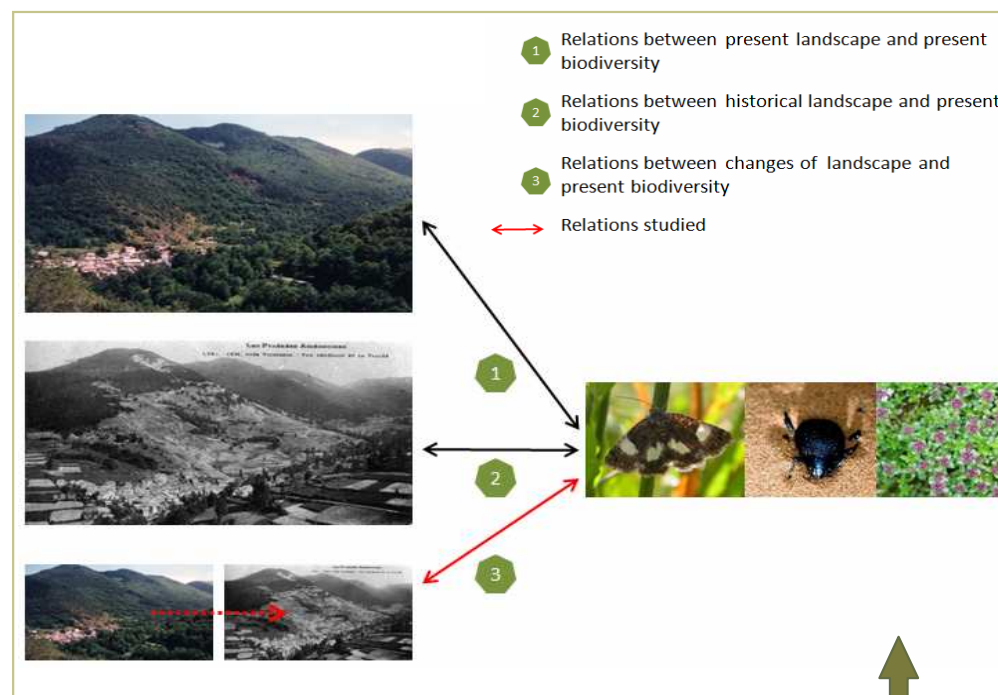


Fig. 1 Modelling species-habitat relationships

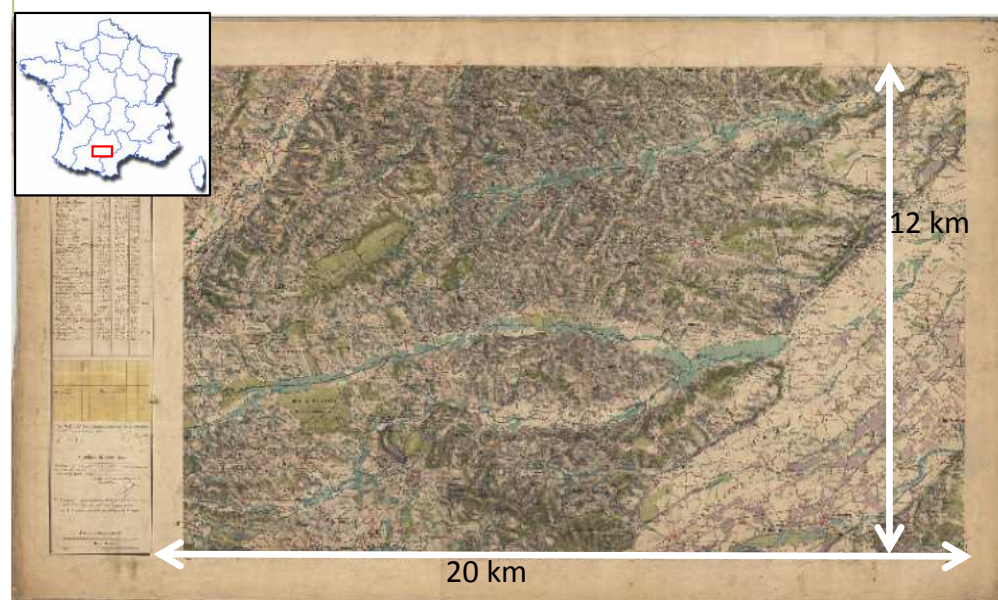


Fig. 2 Excerpt of historical 'Map of France' used in this study

Abstract:

An understanding of background becomes essential to explain the ecosystem functioning of the current landscapes. To reconstruct these trajectories, historical spatial data are numerous but led to various problems of sources, formats and supports. A major problem concerns their integration in actual coordinate system to enable comparisons with each other and actual sources. Previous works have already shown the superiority of the local methods (like a Delaunay-based method) compare to the global ones (like polynomial mapping models). They also highlighted the importance of selecting ground control points with a homogenous spatial distribution to improve the registration accuracy. Furthermore, while kernel based methods have already proved their efficiency for many other applications, they have been rarely used for map registration although they provide an interesting alternative.

METHODS

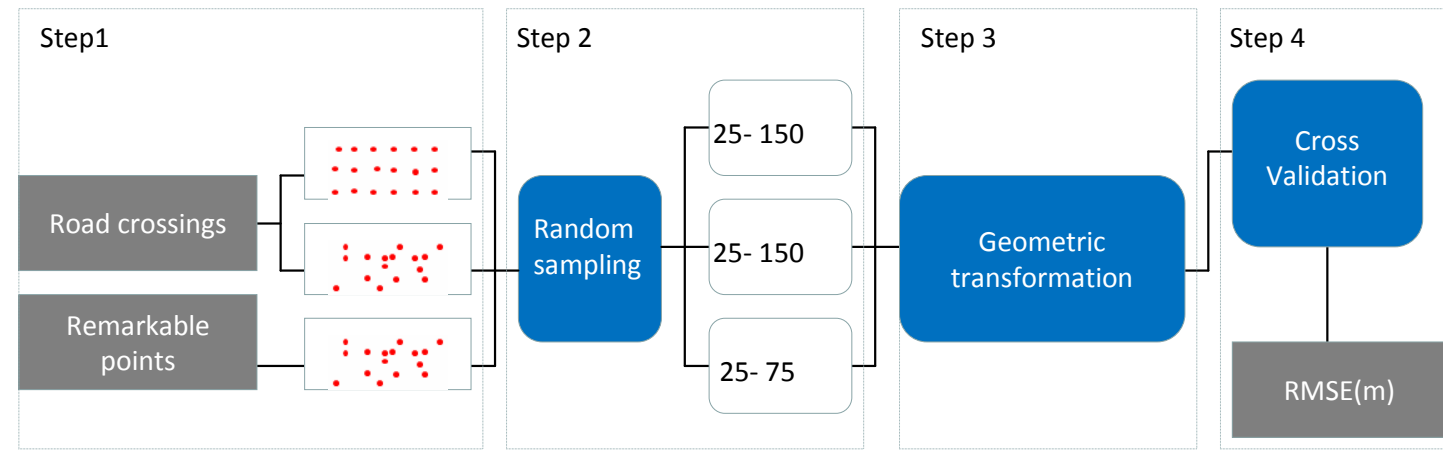


Fig.3 Experimental protocol. RMS(m) = mean of RMS

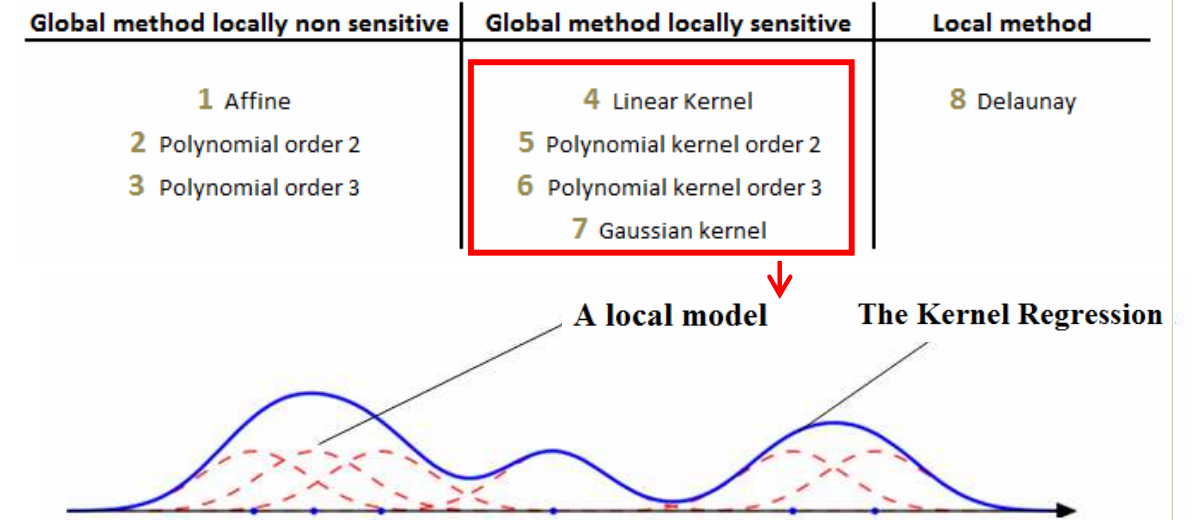


Fig.4 Succession of local models and Kernel regression

RESULTS

RMS = root mean square error
RMS(m) = mean of RMS

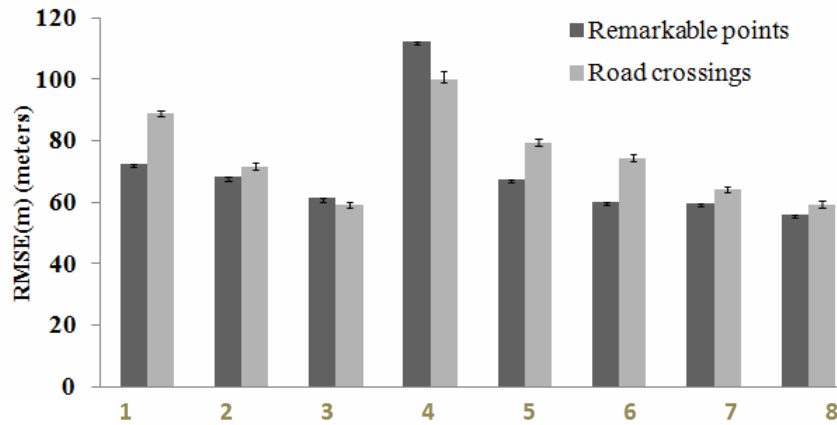


Fig. 5 Comparison between remarkable points and road crossings for 150 GCPs

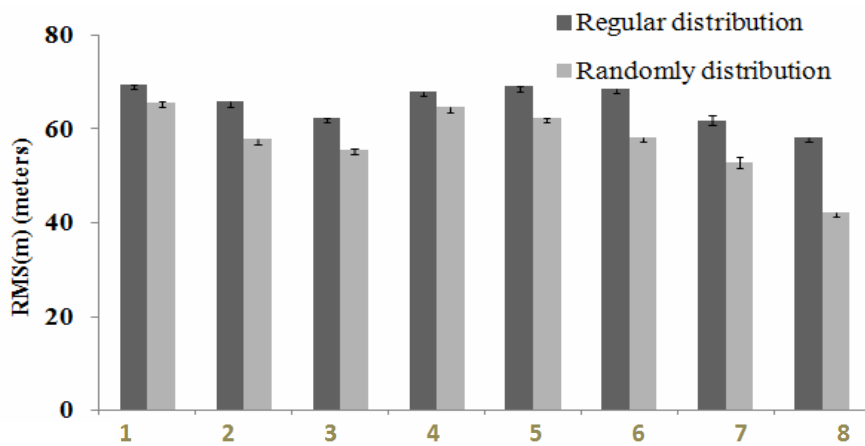


Fig. 6 Comparison between regular and randomly distribution for 150 GCPs

- Remarkable points more accurate than road crossings (Fig.5)
- Randomly distribution provides better geometric transformation (Fig.6)
- An important number of GCPs is required (Fig.7)
- Kernel based methods more efficient than conventional methods (Fig.7)

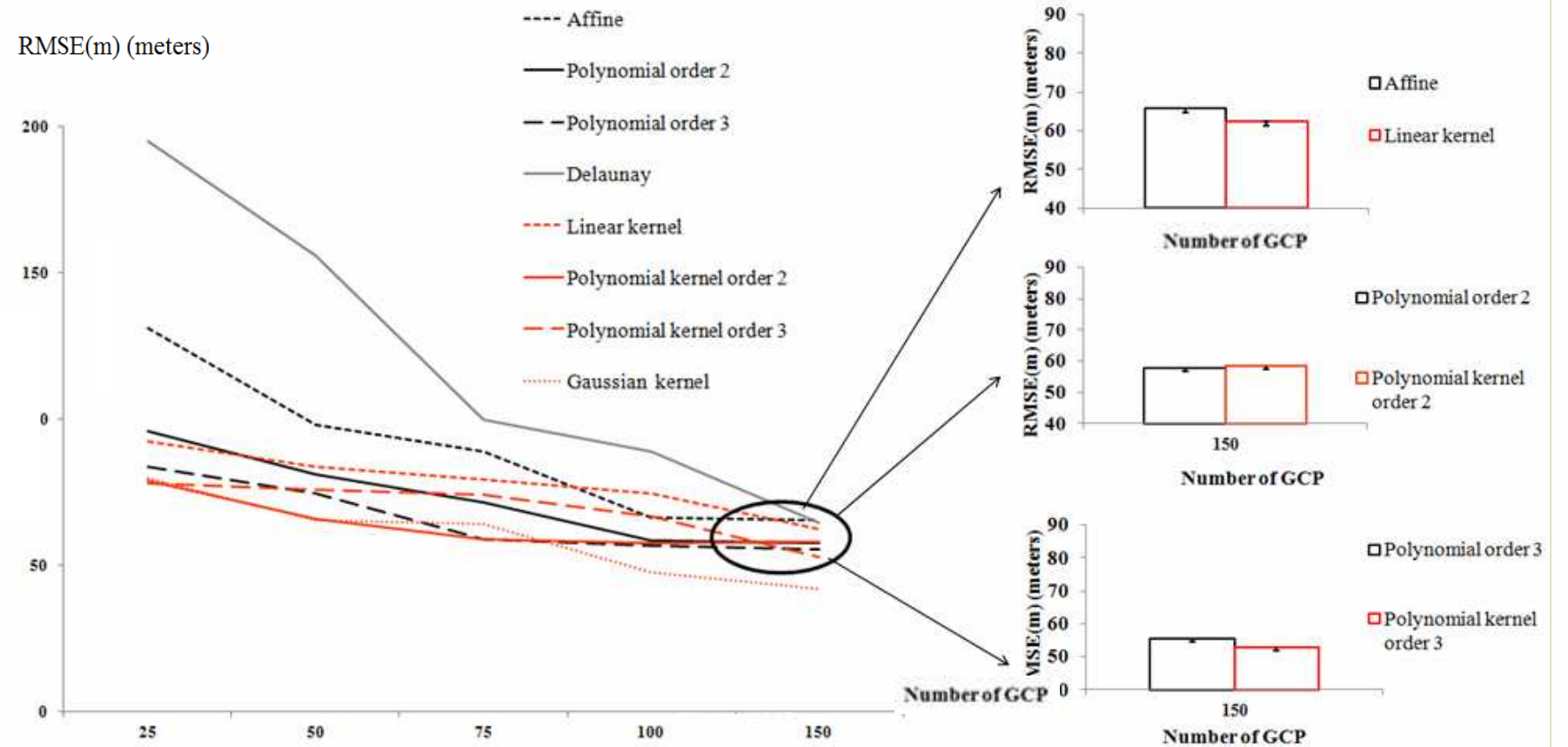


Fig. 7 RMSE(m) trend according to number of GCPs and the different transformations models

