PROBLEMS CAUSED BY BIASED DATA IN MODELS OF CATALOG ADJUSTMENT

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ABSTRACT. Working with catalogues requires an increasing precision. A powerful tool has been the comparison between different catalogues. To this aim contribute both the sophistication/refinement of the models of adjustment and the more careful treatment of the data.
We introduced a mixed method for the study of the relative orientation between the catalogues Hipparcos and FK5 [2], obtaining results comparable to those of other authors. We also introduced the VSH model of first order (rotation+ deformation), but the coefficients were obtained by a simple least squares adjustment because we were interested only in the relative rotation between the catalogues (The corresponding calculations for the spin were published in [3]).
The good distribution of the data (density and homogeneity), makes reliable the coefficients even applying a simple least square method. In particular, the value of $d_{1,0}$ was high enough as to be taken into account in later studies.
Very recently, Mignard and Klioner [5] have published a paper to introduce the use of VSH (of arbitrary order) in the comparison of catalogues. After reading it, we verified that their $d_{1,0}$ value was practically the same that the one obtained by us. We considered, then, to carry out the calculations again, with our method [2] (and [3]), being the results corroborated. We can affirm that our method is compatible with the developments in VSH given by Mignard et al. [5] and it makes useful contributions when the catalogues are not homogeneous. Some questions arise regarding with the advantages of our technique, the orthogonality or the choice of the kernel. Due to reasons of space, we will only highlight some of these points:

1. We have considered the meaning of functional orthogonality that allows the calculation of coefficients of a development on the basis of the calculation of determined integrals.
2. The mathematical methods must be used in particular problems and its utility is given related not only to a consistent theory, but also to contrastable numerical results.
3. The method VSH handles vectors in 2D in its theoretical formulation. We also consider vector fields (it is true, though, that the method is also applicable to scalar fields and, therefore, more general than the VSH) and, in fact, after having compared the coefficients calculated by us in [2], with those of Mignard et al [3] and with ours again [4], they coincide.
4. There are scalar and vectorial kernels (see [1]). Kernels and methods of kernel regression do exist for several dimensions. Nevertheless, the low technical difficulty from a mathematical point of view, makes not necessary their use. Provided that we work on the surface of a unitary sphere, the only vectorial spherical involved are the spheroidal and toroidal and the vector field can be developed using them. For the calculation of the components of the vector field over points regularly distributed over the sphere we can use the simple method of kernel regression or a method of local kernel polynomial regression. Computationally, the first is more economic and, in addition, it is sufficient for the problem that we are studying. We can easily carry out the estimations up to high orders estimations.
5. The choice of the kernel has very little impact [6].
6. It is not mathematically adequate the use of the method of the least squares with biased data and an unbiased model.

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