Support plane analysis

The support plane analysis is used for analysing fitting parameter error intervals. It works by calculating the reduced χ^2 along a 'cleverly' chosen path through the parameter space. For illustration let's start at the best fit parameter set, which can be regarded as a single point in the parameter space. Now we remove the parameter for which we want to calculate the error intervals from this location, that is, we take a single step parallel to its parameter axis. Now we adjust all the other parameters to “get down as far as possible” for this new situation. Usually this is done by keeping the removed parameter fixed and fitting all the other parameters. By this we deviate from the axis-parallel direction, in general. We then calculate the reduced χ^2 for this optimised paramter set. By iterating this procedure we get χ^2 as a function of the parameter of interest. The intersection points of this function with a given χ^2 confidence limit define the boundaries of the confidence interval of the parameter.

Advantages and disadvantages

Since fitting is used to derive a functional dependence of the reduced χ^2 minute convergence is of crucial importance, even more than for the bootstrap method. If the convergencve criterion is not strict enough, the χ^2 function suffers from numerical noise and is imprecise. Furthermore the support plane analysis is limited to least squares fitting and cannot be used with MLE.

On the other hand the computational effort to calculate the confidence interval of a single parameter is less than for the bootstrap method.

References

- Lakowicz JR (1999) *Principles of Fluorescence Spectroscopy*, 2nd edn. Kluver Academic/Plenum Publishers, New York

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