Least square fitting with one explicit parameter less

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Abstract

It is shown that whenever the multiplicative normalization of a fitting function is not known, least square fitting by χ^2 minimization can be performed with one parameter less than usual by converting the normalization parameter into a function of the remaining parameters and the data.

Program Summary

Program title: `FITM1.`

Licensing provisions: none.

Programing language: Fortran 77 with standard extensions (tested with g95 on a Mac).

Operating systems: Any with a Fortran 77 compatible compiler.

RAM required to execute with typical data: 1 Mbyte.

Running time: Less than 1 second on modern PCs.

CPC Library Classification: 4.9 Minimization and Fitting.

Nature of the Problem: Least square minimization when one of the free parameters is the multiplicative normalization of the fitting function.

Solution method: Conversion of the normalization constant into a function of the other parameters and the data, resulting into one explicit fitting parameter less.

Key words: Fitting, Curve Fitting, , Least Square Fitting,

1. Introduction

The general situation of fitting by χ^2 minimization is that m data points $y_i = y(x_i)$ with error bars $\triangle y_i$ and a function $y(x; a_j)$ with $j = 1, \ldots, n$ parameters are given and we want to minimize

$$\chi^2 = \sum_{i=1}^{m} \left(\frac{y(x_i; a_j) - y_i}{\triangle y_i} \right)^2 \qquad (1)$$

with respect to the n parameters, where we neglect (as usual) fluctuations of the $\triangle y_i$ error bars.

In many practical application one of the n pa-