REML ESTIMATION OF VARIANCE PARAMETERS IN NONLINEAR MIXED EFFECTS MODELS USING THE SAEM ALGORITHM

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Nonlinear mixed effects models are now widely used in biometrical studies, especially in pharmacokinetic research or for the analysis of growth traits for agricultural and laboratory species. Most of these studies, however, are often based on ML estimation procedures, which are known to be biased downwards, especially for the variance components. A few REML extensions have been proposed, mainly for approximated methods. The aim of this presentation is to propose a novel REML estimation procedure for these models, based on an integration of the fixed effects and a stochastic estimation method. This approach was implemented via the SAEM algorithm (Stochastic Approximation EM algorithm), which proved to be much faster than the classical Monte Carlo EM algorithm thanks to a recycling of the simulated variates from one iteration to the next. A simulation study showed that the proposed REML estimation procedure considerably reduced the bias observed with the ML estimation, as well as the residual mean squared error of the variance parameter estimations, especially in the unbalanced cases. An application of this estimation procedure is presented for the modelling of growth in lines of chicken.