Eighth Workshop Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2017
Évora, Portugal, January 31st - February 3rd, 2017

VARIANCE COMPONENTS ESTIMATION IN MIXED LINEAR MODELS - THE METHOD SUB-D AND SUB-DI

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This work aim to introduce a new method of estimating the variance components in mixed linear models. The approach will be done firstly for models with three variance components and secondly attention will be devoted to general case of models with an arbitrary number of variance components. In our approach, we construct and apply a finite sequence of orthogonal transformations, here named sub - diagonalizations, to the covariance structure of the mixed linear model producing a set of Gauss-Markov sub-models which will be used to create pooled estimators for the variance components. Indeed, in order to reduce the bias, we apply the sub - diagonalizations to its correspondent restricted model, that is its projection onto the orthogonal subspace generated by the columns of its mean design matrix. Thus, the Gauss - Markov sub-models will be centered. The produced estimator will be called Sub-D. Finally, the numerical behavior of the proposed estimator is examined for the case of models with three variance components, comparing its performance to the ones obtained with the REML and ANOVA estimators. Numerical results show that Sub-D produces reasonable and comparable estimates, some times slightly better than those obtained with REML and mostly better than those obtained with ANOVA. Due to the correlation between the sub-models, the estimated variability of the variability of Sub-D will be slightly bigger than the one of the REML estimator. In attempt to solve this problem a new estimator will be introduced.

 ISBN: 978-989-98750-3-6

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