A LATENT VARIABLE APPROACH TO MULTIVARIATE QUANTITATIVE TRAIT LOCI

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There are now many methods for the identification of quantitative trait loci affecting single traits that fall within a generalized linear modeling framework. In many crosses, measurements are made of several traits, and there is interest in looking at genetic or environmental correlations.

We have developed a framework in which an observation model is used to relate the data on different traits to latent variables. The latent variables are assumed to follow a multivariate normal distribution, with expected values being a function of the genotypic and other covariates. This latter part of the model can be extended using the equivalent part of any standard QTL model. We are therefore able to separate out environmental correlations from genotypic correlations (pleiotropy, i.e. one locus affecting several traits).

We demonstrate this approach with data from an open cross of *Pinus sylvestris*, with 18 loci and 132 individuals. The traits analysed include growth and frost tolerance. We use a Bayesian approach to fitting the model, and estimate the presence of a QTL effect on a latent trait with SSVS (Stochastic Search Variable Selection). The analysis shows both genotypic and phenotypic correlations in the data, with (for example) one locus affecting frost tolerance, timing of budset and growth.