A New Approach to Interval Mapping of Quantitative Trait Loci Using Sib-Pairs

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Abstract

Fulker and Cardon (1994) adapted the idea of interval mapping (Lander and Botstein, 1989) to the regression model for mapping quantitative trait loci (QTL) using sib pair data (Haseman and Elston 1972). In principle, the interval mapping approach is more powerful for detecting QTL effects. However, there is a common pitfall in all interval mapping models, that is, the usual statistic for testing QTL effects does not obey the classical statistical theory and hence critical values of the test can not be appropriately determined. In this article, we develop a new approach to interval mapping with sib pair data in order to avoid the foregoing pitfall. A modified Wald statistic is proposed to test QTL effects. The asymptotic distribution of this modified Wald statistic is well determined and hence the critical values of the test can be correctly determined. Simulation studies demonstrate that the modified Wald test effectively controls the error of false positiveness and retains the power of an ideal likelihood ratio test.