SECTION E1

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An analysis of a non-replicated three-factor experiment using some improved methods

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Three-mode data pertain to measurements related to three factors or "modes". An important objective of any analysis of such data is to examine the interaction between these three factors simultaneously, as the interpretation of results is based on the presence or absence of this interaction. When independent replications are present for each combination of the three factors, usual method of analysis through ANOVA can be used to test the presence of three-factor interaction. When the experiment is non-replicated, the usual method fails. Out of several approaches, the most general approach that considers three-factor interaction simultaneously in such cases is the Tucker3 analysis. Tucker3 analysis alone is an exploratory approach. As a confirmatory approach, a method is available for testing for three-factor interaction in sub-areas of non-replicated three-factor experiments based on Tucker3 model. However, this method utilizes results of an approximate likelihood ratio test.

A MATLAB program is developed to simulate the exact null distribution of the above likelihood ratio statistic for limited cases. This exact approach can be used for testing three-factor interaction in sub-areas of three-way data under a single component Tucker3 model. The method is illustrated using data previously analyzed based on approximate results, now with the help of critical values generated from exact results. For this data set the results from the approximate method and the exact method agreed with each other. How ever, this may not be the case with larger data sets.

Acknowledgement: National Science Foundation (RG/2005/FR/01)

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