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A new method for multiple blunder detection in least squares adjustments by the analysis of the redundancy matrix elements

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Outlier is an observation which has a blunder and can make bias for the estimated parameters derived by LS adjustment. Post adjustment blunder detection methods are generally based on residual testing. Two conventionally accepted methods are Baarda's data snooping and Pope's Tau test. Both of them are efficient only when one outlier is present in the observational data set. In the condition of existence of multiple blunders, an iterative method based on the removal of the maximum standardized residual is used but experimentally we find that determination of real outliers may not be possible all the time. This can be examined simply by simulation methods like Monte Carlo. So the conventional methods may not be efficient in the presence of multiple blunders in the observations data set.

Due to the correlation between estimated residuals, one may not always be able to find the real outliers. Removing of some observations via the iterative method will result in the lower redundancy contributions for the rest observations. This can reduce the chance of reliable blunder detection. In the new method a pattern for the transfer of blunders between residuals by the attention to the correlation between them has been developed. This pattern is based on the relation between elements of the redundancy matrix. By using the pattern one will be able to guess which observations may be the real outliers and which observations in spite of the big value of their standardized residual, may be free of any blunder.