Msplit Estimation as a Method for Processing Heterogeneous Data

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SUMMARY

Msplit estimation is a modern estimation method that is a development of the maximum likelihood estimation. The basic assumption of Msplit estimation is that an observation set is a mixture of realizations of at least two different random variables. In other words, the observation set might consist of different observation groups (aggregations), which differ from each other in location parameters. The main objective of Msplit estimation is to assess such parameters as different versions of the split functional model parameters. The first and basic variant of Msplit estimation is called the squared Msplit estimation, and it can be derived from the assumption that the measurement errors are normally distributed. Since this variant is sensitive to outlying observations, the absolute Msplit estimation has been introduced. This variant can be regarded as the least absolute deviation method development. It can be proved that the absolute Msplit estimation is less sensitive to outlying observations than the squared Msplit estimation. Both variants found several practical applications in geodetic data processing, e.g., deformation analysis, detection of gross errors, coordinates transformation, or laser scanning data processing. The last application seems especially interesting nowadays when the LiDAR technique becomes very popular. The laser scanning results, usually in the form of a point cloud, often contain measurements of different objects, e.g., terrain surface, buildings, engineering structures, or vegetation cover. Therefore, point clouds should be considered heterogeneous observation sets. Thus, such sets seem adequate to be processed by applying Msplit estimation. The paper shows the practical application of Msplit estimation in processing laser scanning data; approximation of one surface or two surfaces from a single observation set. The results are compared to the least squares estimation. One can conclude that both variants of Msplit estimation might provide better results, and for some types of point clouds, they should be recommended.