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# POINTS CLASSIFICATION BY A SEQUENTIAL HIGHER − ORDER MOMENTS STATISTICAL ANALYSIS OF LIDAR DATA

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Abstract. The paper deals with a new sequential procedure to perform unsupervised LIDAR points classification by iteratively studying skewness and kurtosis for elevation and intensity point distribution values. After a preliminary local shape analysis of elevation and intensity point distributions, carried out from the original discrete frequencies by a non parametric estimation of the density functions, the procedure starts by choosing the category of data (elevation or intensity) to analyse at first: the choice falls on the category better showing by a testing procedure a bi or a multi clustering distribution. The first point cluster is identified by studying the distribution skewness and kurtosis variations, after removing at each step the largest data values. The selected cluster is furthermore analysed by studying higher order moments behaviour of the complementary data category. This makes possible to find out potential sub clusters of the original selected one, permitting, in this way, a more effective point classification. Successive clusters are identified by applying the same iterative procedure to the still unclassified LIDAR points. For complex point distribution shapes or for the classification of large areas, a progressive analysis method, based on the partition of the entire data set into regular subsets, is proposed. Some real numerical experiments confirm the capability of the method proposed. The classification total errors in the experiments range from a minimum value of 1,2% to a maximum value of 8,9%.

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