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CO-REGISTRATION OF 3D POINT CLOUDS BY USING AN ERRORS-IN-VARIABLES MODEL

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Abstract. Co-registration of point clouds of partially scanned objects is the first step of the 3D modeling workflow. The aim of co-registration is to merge the overlapping point clouds by estimating the spatial transformation parameters. In the literature, one of the most popular methods is the ICP (Iterative Closest Point) algorithm and its variants. There exist the 3D least squares (LS) matching methods as well. In most of the co-registration methods, the stochastic properties of the search surfaces are usually omitted. This omission is expected to be minor and does not disturb the solution vector significantly. However, the a posteriori covariance matrix will be affected by the neglected uncertainty of the function values. This causes deterioration in the realistic precision estimates. In order to overcome this limitation, we propose a new method where the stochastic properties of both (template and search) surfaces are considered under an errors-in-variables (EIV) model. The experiments have been carried out using a close range laser scanning data set and the results of the conventional and EIV types of the ICP matching methods have been compared.

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