

# Georeferencing Point Clouds - Meeting the Expectations of the User

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## SUMMARY

Point clouds are commonly used both for model creation and as a basis for design, and the users of point clouds and their derived products include groups with limited knowledge about geodata, reference systems, and data quality. There are several combinations of platforms and sensors that are used to produce point clouds, and there are also several methods that can be used for georeferencing point clouds. The choice of georeferencing method will impact the geometry of the final point cloud and all its derived products. Georeferencing a point cloud requires decisions regarding the reference surface and the horizontal scale, but there are no standardized ways of expressing these decisions as metadata. Some users of point clouds or their derived products will likely have a preference of whether the point cloud should follow the curvature of the Earth or a flat reference surface, and whether the horizontal scale should be as measured or reduced to a map projection. Other users might not consider these factors at all but will still hold assumptions regarding the geometry of the data. A more widespread use of point clouds and higher degrees of automation makes it necessary to be able to describe and manage these differences unambiguously. This paper gives an overview of common georeferencing methods used for terrestrial laser scanning and what type of point cloud they result in together with numerical estimates for the magnitude of the differences between the different point clouds. From the overview of methods and the numerical estimates, it is shown that the most significant geometrical differences can be handled by introducing two metadata parameters describing the shape and the horizontal scale of the point cloud. Future research should expand upon this and include mobile laser scanning as well as photogrammetry, and the consequence analysis should use error propagation theory to show how the georeferencing methods affect data quality over time.