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3D CATENARY CURVE FITTING FOR GEOMETRIC CALIBRATION

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Abstract. In modern road surveys, hanging power cables are among the most commonly-found geometric features. These cables are catenary curves that are conventionally modelled with three parameters in 2D Cartesian space. With the advent and popularity of the mobile mapping system (MMS), the 3D point clouds of hanging power cables can be captured within a short period of time. These point clouds, similarly to those of planar features, can be used for feature-based self-calibration of the system assembly errors of an MMS. However, to achieve this, a well-defined 3D equation for the catenary curve is needed. This paper proposes three 3D catenary curve models, each having different parameters. The models are examined by least squares fitting of simulated data and real data captured with an MMS. The outcome of the fitting is investigated in terms of the residuals and correlation matrices. Among the proposed models, one of them could estimate the parameters accurately and without any extreme correlation between the variables. This model can also be applied to those transmission lines captured by airborne laser scanning or any other hanging cable-like objects.

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