TOP TEN

Diana Davletshina
University of Cambridge

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Generating and Updating Geometric Digital Twins for Highways

This research focuses on automating the process of generating and updating digital twins of roads using large-scale visual and spatial datasets to reduce related costs and enable further applications, such as performance optimisation, failure prediction and future scenario modelling. Road construction is one of the fields where poor performance is observed, with many cases of construction costs overrun. The growing population will increase the demand for roads, which are already in heavy use. It is important to construct and operate road infrastructure in such circumstances efficiently. The creation of digital twins for roads has a high potential to boost the productivity of the field. In this project, an automatic framework is presented for creating and maintaining a 3D model of objects and relationships in the Industry Foundation Classes format. The framework takes as input a coloured point cloud, which is obtained using a mobile laser scanner mounted on a driving car. The framework is composed of ground separation techniques for ease of further processing, semantic segmentation using deep learning, and prior knowledge for enhancing the results from semantic segmentation. Moreover, image fusion methods are considered for dealing with the sparsity of the input point cloud and the detection of small objects. In the scope of this project, frequent road items are identified for prioritisation. The framework's output is a high-quality 3D Industry Foundation Classes model.

Input coloured point cloud → Ground detection using plane fitting and car's trajectory → Separation of the ground from the rest of the points