

Autonomous Alignment-Monitoring for large-scale Conveyor Systems using UAVs, Photogrammetry, and Machine Learning

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ABSTRACT

Support structures of relocatable large-scale outdoor conveyor systems are prone to unintended movements over time due to vibration induced by their moving parts, as well as the usually non-solid foundation ground. These movement can lead to a misalignment of the system's individual segments which in turn can cause an increase in power consumption as well as a potential belt ripping and therefore a breakdown of the system. This article proposes a novel approach to autonomously monitor the alignment of large-scale conveyor systems utilizing aerial images captured via unmanned aerial vehicles, semantic image segmentation via deep learning, 2D-to-3D label transfer using photogrammetry and 3D point cloud analysis. The feasibility of the method is demonstrated on a working prototype. One of the main challenges is to find a good balance between precision and reliability on the one hand and computational costs on the other.