High Resolution Multi-Lane Road Surface Mapping Using 3D Laser Profilers

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SUMMARY

Road Transportation Ministries and asset managers around the world usually require annual inspections of their roads and infrastructures in order to plan maintenance operations. Road surface defects (texture, cracks, rutting, IRI – smoothness) are important data that need to be measured and serve as input data to PMS (Pavement Management Systems) software. These defects are likely measured using 3D laser sensors that acquire the shape of the road surface in order to evaluate its condition. Once it is determined that the road condition has degraded to the point that it needs to be rehabilitated and resurfaced then a high precision survey of its surface is usually required. This survey is typically used by the engineers as an input to 3D CAD road design software that can then be output to control 3D pavers and millers using laser tracking total stations.

What we propose is a way to reuse the 3D road surface condition data to create the road surface model so as to avoid having to do expensive manual road surface surveys that require road closures.

This article proposes a totally new approach that provides a way to tag collected high resolution high accuracy transverse road profile data acquired by a LCMS system (Laser Crack Measuring System - Pavemetrics) combined with a highly accurate GNSS-INS system (Applanix POS-LV - Trimble) to measure both road surface condition and to generate a survey grade accuracy terrain map of any road surface.

This article will describe how the information provided by the 3D LCMS system, DMI, Applanix POS-LV, GPS with local RTK corrections and post processing (POSPac-Trimble) software are used to generate the road surface models. The accuracy of the models created are evaluated comparing them to surveyed control points and determining the repeatability measurements of multiple

runs.

Results will show that using this method it is possible to generate much higher resolution survey grade road surface models that can be used for resurfacing applications using 3D paving and milling equipment from the original 3D data that was used to evaluate the actual condition of the road surface itself. This process results in significant productivity improvements, optimization of the quantity of material that needs to be carried in and out, lower survey costs, decreased traffic interruptions and improved safety of surveyors while improving the quality and resolution of the road surface models.