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Road profile identification utilizing acceleration of a moving vehicle

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【Background】

Road profile is one of the important indicators which represent conditions of roads and bridges. By keeping road profile as smooth as possible, not only riding comfortability of cars but also a lifespan of roads and bridges can be improved. Methods to identify road profile by utilizing acceleration data measured on a moving vehicle have been developed in recent years, which is so-called Drive-by inspection. The Drive-by inspection enables to reduce costs and labors more than existing methods, on the other hand it is hard to obtain high accuracy.

【Objective】

This study is intended to identify road profile using measured acceleration on a running vehicle in high accuracy.

【Approach】

A direct road profile identification by regularized least square minimization using dynamic programming is proposed. Regularization in the least square minimization improves robustness of identification. In order to choose optimum hyper parameter value, L-curve method is applied. Dynamic programming can avoid calculation of large-size inverse matrix, and improve the accuracy and calculation time.

【Publication plan】

・走行車両の加速度応答を用いた動的正則化最小二乗法による路面形状同定手法の提案，土木学会論文集A1,2022

・走行車両の加速度を用いた路面形状同定手法の比較検討，土木学会論文集A2（応用力学），Vol.76, No.2, I_77-I_88, 2020

【Results】

A filed experiment is carried out to measure acceleration on a running vehicle on expressway. The identified road profile by acceleration is well fitted with road profile measured by laser displacement sensors.