

國立中央大學數學系

專題演講

主 講 人：張逸塵博士 (Isuzu Technical Center of America, Inc.)

演講題目：Road geometry estimation using vehicle trails: a linear mixed model approach

演講茶會：2022年04月28日(星期四) 3:30 p.m. ~ 4:00 p.m.

茶會地點：中央大學鴻經館M306

演講時間：2022年04月28日(星期四) 4:00 p.m. ~ 5:00 p.m.

演講地點：中央大學鴻經館M107

Abstract：

In this paper, we propose an estimation algorithm for the shape of the road using trails of leading vehicles via a linear mixed model (LMM) approach. A vehicle trail is essentially the motion trajectory of a vehicle where samples of the historical path are longitudinally collected from the same vehicle at different points in time. Such measurements can be obtained from the fusion system for single or multiple sensor tracking. The aim is to use trails of leading vehicles to depict the road geometry in highway scenarios. The proposed estimation method uses a polynomial-based road model and is built from a LMM, which is one of the most widely used statistical techniques. To avoid the overload of memory usage from trail samples, trail data are first processed by the newly developed compression and chopping mechanisms before being imported into the LMM framework. Moreover, the profile likelihood function is used to alleviate the computational burden and reduce the number of iterations in the Newton-Raphson algorithm in the LMM. Finally, the proposed method is then evaluated by two publicly available next generation simulation (NGSIM) datasets. The large-scale simulation results show that the road shape estimated by the proposed method has the root mean square error (RMSE) less than 0.5 meters in average for all ranges compared with the ground truth road shape. This suggests that our method provides an accurate road shape estimation and captures the shape of the road successfully.

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