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Driver Workload Estimation using a Novel Hybrid Method of Error Reduction Ratio Causality and Support Vector Machine

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Abstract

Measuring driver workload is of great significance for improving the understanding of driver behaviours and supporting the improvement of advanced driver assistance systems technologies. In this paper, a novel hybrid method for measuring driver workload estimation for real-world driving data is proposed. Error reduction ratio causality, a new nonlinear causality detection approach, is being proposed in order to assess the correlation of each measured variable to the variation of workload. A full model describing the relationship between the workload and the selected important measurements is then trained via a support vector regression model. Real driving data of 10 participants, comprising 15 measured physiological and vehicle-state variables are used for the purpose of validation. Test results show that the developed error reduction ratio causality method can effectively identify the important variables that relate to the variation of driver workload, and the support vector regression based model can successfully and robustly estimate workload.

Keywords

Driver workload estimation; Driver behaviour; Causality detection; Machine learning; Nonlinear system identification; Correlation analysis

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