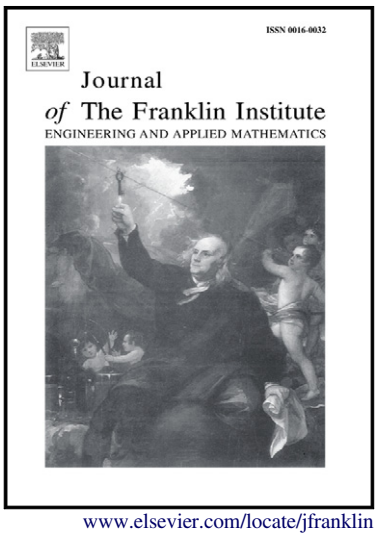

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Embedded Feature-selection Support Vector Machine for Driving Pattern Recognition[☆]

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Abstract

In this work, a more efficient and robust driving pattern recognition technique, extended Support Vector Machine (SVM) with embedded feature selection ability, has been introduced. Besides statistical significance, this proposed SVM also takes into account the accessibility and reliability of features during feature selection, so as to enable the driving condition discrimination system to achieve higher recognition efficiency and robustness. The recognition results of this extended SVM are compared with results from standard 2-norm SVM and linear 1-norm SVM, using representative driving cycle data to demonstrate the function and superiority of the new technique.

Keywords: Driving Pattern Recognition, Support Vector Machine, Feature Selection, Second-order Cone Programming

1. Introduction

Today the emerging hybrid electric powertrain technology of Hybrid Electric Vehicles (HEVs) and Plug-in HEVs (PHEVs) supports various powertrain operation modes and flexible control to ensure better operational efficiency of the Internal Combustion Engine (ICE) and electric motors/generators (M/Gs) with improved fuel economy and reduced emissions. These HEVs/PHEVs are also more sensitive to different driving conditions than a conventional ICE vehicle, owing to the broader range of possible control decisions and operation modes [1]. If the driving control strategy of an HEV is not suitable for the current driving condition, vehicle performance (such as fuel-consumption and emissions) can be even worse than that of a conventional vehicle [1, 2]. This is the reason for the wide adoption of driving condition recognition in the control systems of HEVs [3]. Effective driving condition recognition is also essential for the Driving Assistance systems for both conventional vehicles and HEVs/PHEVs [4]. In both cases, the recognition efficiency and robustness of the

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