基于马尔科夫的城市道路行驶工况构建方法 Driving Cycle Construction Methodology of City Road Based on Markov Process

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关键词： 行驶工况 构建 马尔科夫过程 最大似然估计 试验

摘 要： 将汽车行驶工况看作一个随时间变化的马尔科夫过程，利用最大似然估计法，将行驶工况分成6个不同状态，而每个行驶片段作为反映加速度变化的模型事件，更好地保持了车辆行驶过程中微小时间段内的速度变化特性。在此基础上提出了状态转移概率与相似性检验相结合的候选工况选择方法，建立了具有13个特征参数的评价准则。以合肥市典型道路为例进行了实际应用分析，并通过独立性检验，验证了马尔科夫方法应用于行驶工况的合理性。结果表明，在与试验数据进行模型事件加速度分布的K-S检验上，马尔科夫方法相似性水平为0.998、0.989和0.994，而传统方法的相似性水平则为0.788、0.036和0.992。因此其更符合实际道路的行驶工况。 The vehicle driving cycle was taken as a stochastic Markov process with time, which was divided into 6 different states by maximum likelihood estimation (MLE). And every driving segment, as the modal event reflecting acceleration variations, finely preserved the speed variation characteristic in tiny time segments of the vehicle driving process. Therefore, the selection approach of candidate cycles was put forward by combination of the states transition probabilities with similarity tests, and the new evaluation criteria with 13 characteristic parameters was established. The actual application analysis was carried out with an example of typical roads driving cycles in Hefei and the independent test was performed to validate the rationality of the Markov method for the driving cycle. The results showed that the similarity levels of the Markov method, on the K-S test of modal events acceleration distribution with experimental data, were 0.998, 0.989, 0.994, contrasting the traditional method, 0.788, 0.036, 0.992. Resultingly, the Markov method more accords with driving cycles of real roads.

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