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信息科学

汽车声品质的GA-BP网络预测与权重分析

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摘要： 为了高效而准确地评价与控制车内噪声品质，以B级车稳态工况下副驾位置的车内噪声为研究对象，采用等级评分法对采集到的声音样本进行了主观评价试验，同时计算了7个客观参数。以客观参量为输入，声品质主观结果为输出，引入基于遗传算法的BP神经网络建立了声品质预测模型。实验显示该模型输出结果与实际评分的相关系数达到0.928，检验组的预测最大误差为±8%。以所建模型的连接权值，分析了客观参数对主观评价结果的贡献度，并以影响系数较大的参数为输入重新构建了预测模型。研究结果表明：稳态工况下，车内声品质主要受响度、粗糙度和尖锐度的影响，其预测模型可由这3个参数来描述。

关键词： 车内噪声　声品质预测　GA-BP神经网络　权重分析

Sound quality prediction and weight analysis of vehicles based on GA-BP neural network

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Abstract: This paper carried out a subjective evaluation test with magnitude estimation for 78 noise samples to evaluate the sound quality of vehicles. In the test, six types of B-Class vehicles were taken as the study objects and sound signals collected in co-driver locations at steady states as experimental samples. Meanwhile, seven objective parameters were calculated to describe the sound characteristics. By using objective parameters as inputs, subjective values as outputs, a GA-BP neural network was adopted to establish a sound quality prediction model. Experiments show that the model gives good predictions of high correlation (0.928) and low error ($\pm8\%$). Then, the network connection coefficients were used to calculate the impact weight of objective parameters on the results of subjective evaluation, and a new model with main parameters was established. As expected, the loudness, sharpness and roughness with a total relative importance of 83% are the most influential parameters in vehicle interior sound quality.

Keywords: vehicle interior noise　sound quality prediction　GA-BP network　weight coefficient analysis

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