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信息科学

用简化脉冲耦合神经网络实现交通标志图像的类Euclidean距离变换类内特征提取

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摘要： 脉冲耦合神经网络(PCNN)提取的特征序列的旋转不变性降低了道路交通标志类内匹配识别的准确性,为了提取更有利于形状分类的特征向量,本文利用PCNN的自动波扩散特性,简化了PCNN模型。采用简化PCNN模型产生的类Euclidean距离图像作为分类特征,利用最小方差值进行匹配分析,并通过实验选取了最佳PCNN参数。针对道路交通标志图像库GB5768-1999的实验结果表明,采用获得的类Euclidean距离图像作为特征向量进行分类匹配,在选定边缘图像的迭代次数N为16,反馈输入固有电势V_F为0.65,动态门限固有电势V_T为100,卷积核矩阵为5×5时,最小方差值均出现在对应的标准图像位置。结果表明,简化PCNN的类Euclidean距离变换能够有效提取二值边缘图像的形状信息。 该方法优于传统PCNN熵序列的特征向量方法,类内区分效果更加明显。

关键词： 交通标志 脉冲耦合神经网络 自动波扩散 类Euclidean距离 特征提取

Realization of within-class feature extracting based on Euclidean-like distance transform for traffic signs using simplied PCNN

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Abstract: The recognition accuracy of with-in class matching traffic signs is dropped because of the rotation invariance in feature sequences extracted by conventional Pulse Coupled Neural Network(PCNN). In order to get a new feature vector with stronger classification ability, the PCNN mode was simplified according to its automatic wave diffusion characteristics. An Euclidean-like distance image was used as the new feature vector, and a match analysis was carried out by the minimum variance. Then, optimal parameters of PCNN were acquired through experiments. The experimental results based on GB5768-1999 traffic signs show that when the Euclidean-like distance transform based on simplified PCNN is used as the feature vector for classification matching, the variance of test image corresponding to standard images can achieve the minimum value in acquiring edge image with the number iterations of 16, magnitude adjustments of feeding input of 0.65,magnitude adjustments of dynamic threshold of 100, and convolution kernel matrix in 5 × 5. It concludes that the Euclidean-like distance transform based on simplified PCNN can expand the shape information of edge images effectively. It is superior to the feature vector based on entropy sequence, and is fit for the identification of target images in with-in classes.

Keywords: traffic sign Pulse Coupled Neural Network(PCNN) automatic wave diffusion Euclidean-like distance transform feature extraction

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