

<<脉冲耦合神经网络及应用>>

图书基本信息

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前言

There is no more complicated, advantaged and powerful device than the mammalian primate cortical visual system for image processing in nature. The pulse-coupled neural network (PCNN) is inspired from the investigation of pulse synchronization within the mammalian visual cortex, and has been widely applied to image processing and pattern recognition. Visual cortex is the passage for brain to acquire information from eyes and a part of brain central nervous system. Several biological models based on visual cortex were proposed through investigation of cat cortex and had been applied to image processing. The PCNN emulates the mammalian visual cortex, which is supposed to be one of the most efficient image processing methods. The output of the PCNN is a series of pulse images which represent the fundamental features of original stimulus, such as edge, texture, and segment. Neurons receive inputs from other neurons through synapses and are fired synchronously in certain regions, that is why the PCNN can be applied to image segmentation, smoothing, and coding. Another important feature of the PCNN is that the pulse images are able to be characterized to a unique invariant signature for the image retrieval. This book analyzes the PCNN in detail and presents some special applications and corresponding results based on our own researches. Contributions of the book have come from Hongjuan Zhang, Rongchang Zhao, Maojun Su, Dongmei Lin, Xiaojun Li, Guanzhu Xu, Xin Wang, Zaifeng Zhang, Xiaowen Feng, Haibo Deng, Li Liu, Xiaozhe Xu, Chunliang Qi, Chenghu Wu, Fei Shi, Zhibai Qian, Qing Liu, Min Yuan, Jiuwen Zhang, Yingjie Liu, Xiaolei Chen, and our graduate students at Circuit and System Research Institute of Lanzhou University.

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内容概要

Applications of Pulse-Coupled Neural Networks explores the fields of image processing, including image filtering, image segmentation, image fusion, image coding, image retrieval, and biometric recognition, and the role of pulse-coupled neural networks in these fields. This book is intended for researchers and graduate students in artificial intelligence, pattern recognition, electronic engineering, and computer science.

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章节摘录

插图：(1) If all the values in the structuring element are positive, the output image tends to be brighter than the input. (2) Dark elements within the image are reduced or eliminated, depending on how their shapes relate to the structuring element used. The degree of these effects depends greatly on the shape and values within the structuring element and the details within the image itself. Grayscale erosion is defined as the minimum of the difference of a local region of an image and a grayscale mask. The shape of the input mask (known as the structuring element, SE) is generally chosen to emphasize or de-emphasize elements in the image. It is used to smooth small light regions. The general effects of performing erosion on a grayscale image are as follows: (1) If all the values in the structuring element are positive, the output image tends to be darker than the input. (2) Light elements within the image are reduced or eliminated, depending on how their shapes relate to the structuring element used. The degree of these effects depends greatly on the shape and values within the structuring element and the details within the image itself. Grayscale morphological opening of an image is defined as the dilation of the erosion of the image. The result is the reduction of small positive regions within the image. Grayscale morphological closing of an image is defined as the erosion of the dilation of the image. The result is the reduction of small negative regions within the image.

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