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MATNET: A neural network for medial axis transformation

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Abstract

This paper describes a novel neural network, called MATNET, to perform the medial axis transformation which is often used to extract a stick-figure-like representation from a binary object for pattern analysis or recognition. The MATNET is derived from the structure of the retina, which consists of five neural layers, namely, receptors, horizontal cells, bipolar cells, ganglion cells, and response. In principle, the horizontal cell is implemented for distance computation; the bipolar cell (B-net) and the ganglion cell (G-net) are implemented for calculation of local minimum and local maximum, respectively. The B-net and G-net are concerned with the maximal neural network (Maxnet). The properties of Maxnet are also discussed. Experimental results show that the MATNET performs reasonably.

本論文所提出的中心轉換之類神經網路是根據人眼視網膜的神經元層面

節制的。其本上，這此神經完屬負組，根據間斷相組圖，未率經組圖，轉緩相

我們的一套系上，建置在視完明信號下後文系統細胞群下本十糸細胞下系統細胞層，和神經節級細胞層。在我們所設計之中心軸轉換神經網路中，水平級細胞層專司刺激訊號點到B刺激訊號點間之"訊號應差計算"（即是傳統中心軸轉換之"距離計算"），雙極細胞層專司局部訊號最小值計算（即是找出目前刺激訊號點到參刺激訊號點之最近距離），而神經節細胞層則專司局部訊號最大值計算（即是找出最中心軸刺激訊號點）。整個訊號傳遞過程是由接受訊號細胞層取得訊號，經由水平細胞層平行處理取得所有的"距離"資料，再經由雙極細胞層和神經節細胞層求得最後結果。其中水平細胞層專司水平情報處理，其細胞間的特殊連結設計，使得所有的距離資料可以容易地以平行處理方式一次反應出來。雙極細胞層和神經節細胞層採用著名的最大值類神經網路來實現。基於傳統最大值類神經網路有"對消效應"的缺點，我們提出神經鍵係數的修正克服此種效應。

實驗確定了此模型的可行性。

Key words: medial axis transformation, maximal neural network

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