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学术探讨

一种基于猫视皮层细胞机制的改进的Sobel算子

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摘要 目前最常见的边缘检测算子是Sobel算子,但是它存在对非0°和非90°朝向的边缘检测时,其输出幅度不强、抗干扰和抗亮度变化弱的问题。通过仔细比较Sobel算子与猫(以及雪貂和猴)的初级视皮层的简单细胞对场景边缘检测原理的不同,提出了更接近于猫的初级视皮层中的简单细胞的工作机制的边缘检测算法——改进的Sobel算子。实验结果表明:改进的Sobel算子不仅保留了经典的Sobel算子的优点,而且提高了45°、135°朝向的边缘输出幅度,增强了抗干扰性和亮度适应性。

关键词 Sobel算子 改进的Sobel算子 初级视觉皮层 简单细胞 边缘幅度 漏检边缘
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Improved Sobel operator based on mechanism of cells in primary visual cortex of cat

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Abstract
The most frequently used edge operator is Sobel operator in extracting the edge of an image.However,Sobel operator has low output amplitude and poor properties of anti—noise and anti—fluctuating of brightness when detecting the edges with no orientations of 0° and 90°.Here,we compared the difference between the Sobel operator and the mechanism of detecting edges by simple cells in the primary visual cortex of a cat (including ferret and m*onkey*).Then we proposed an improved Sobel operator.The improved Sobel operator is more similar to the mechanism of the simple cells in the primary visual cortex of a cat.The experimental results show that the improved Sobel operator not only maintains the merits of classic Sobel operator,but also increases its output amplitude,and enhances the properties of anti—noise and anti—fluctuating of brightness to the orientations of edges of 45° and 135°.

Key words Sobel operator improved Sobel operator primary visual cortex simple cell edge amplitude lost edges

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