

COMBINING MOTION INFORMATION  
WITH APPEARANCE INFORMATION  
AND UTILIZING OF MUTUAL INFORMATION  
ENCODED AMONG IMAGE FEATURES  
OF THE SAME OBJECT  
FOR BETTER DETECTION PERFORMANCE

運動情報を外観情報との結びつけ及び  
同一物体の画像特徴によりエンコードされた相互情報の利用  
——検出性能の向上のため

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## ABSTRACT

Object detection is a fundamental perceptual skill in human, and plays an important role in machine vision area. Effective object detection methods can help with video surveillance, driving assistance, etc. Researchers improve performance of detection methods mainly by proposing better representative models, better classifiers, or more efficient methods for solution space exploring.

In this work, the performance of detection methods is improved from a different aspect. The work explores the information which are not made fully use of by previous methods. And the efforts are two-fold: 1) utilizing of motion information by combining it with appearance information, and 2) utilizing of mutual information encoded among the image features of the same object. Three detection methods are proposed accordingly.

The first detection method is developed for real-time applications. In a hierarchical way, this method makes time-consuming steps in its pipeline deal with fewer instances, and combines motion information with appearance information very efficiently. This method gives promising detection results in real time, and gives 100% detection rate and 0% false alarm rate in one of the experiments.

Since the performance of the first method in complex scene is not promising, the second method is proposed. This method extends the Implicit Shape Model to incorporate motion information, and outperforms the state-of-the-art method on two datasets. This method also performs well in distinguishing near objects and similar different-class objects.

To improve the efficiency of the second method, the third method is proposed, which is Pyramid Matching Score for detection. The method does pyramid matching during training and matching for efficiency, and makes use of the mutual information encoded among the image features of the same object, which improves detection performance.

## 論文要旨

物体検出は人間の中の基本の知覚能力で、マシン・ビジョン・エリアに重要な役割を果たします。2つの主なカテゴリーの検知方法があります: スライディングウィンドウを使用する方法、およびハフ変換に基づいた方法。最近の研究は、提案する、よりよい代表的なモデル、よりよいクラシファイヤーおよびよりよい解空間探索方法によって検出性能を改善します。この論文は3つの方法を提案します。2つの方法が運動情報を外観情報との結び。1つの方法が同一物体の画像特徴によりエンコードされた相互情報の利用。