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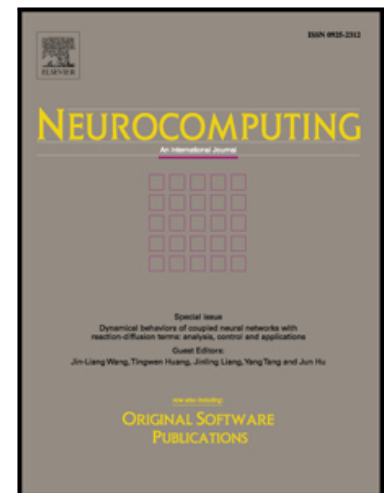
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Automatic Handgun Detection Alarm in Videos Using Deep Learning

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Abstract

Current surveillance and control systems still require human supervision and intervention. This work presents a novel automatic handgun detection system in videos appropriate for both, surveillance and control purposes. We reformulate this detection problem into the problem of minimizing false positives and solve it by i) building the key training data-set guided by the results of a deep Convolutional Neural Networks (CNN) classifier and ii) assessing the best classification model under two approaches, the sliding window approach and region proposal approach. The most promising results are obtained by Faster R-CNN based model trained on our new database. The best detector shows a high potential even in low quality youtube videos and provides satisfactory results as automatic alarm system. Among 30 scenes, it successfully activates the alarm after five successive true positives in a time interval smaller than 0.2 seconds, in 27 scenes. We also define a new metric, Alarm Activation Time per Interval (AATpI), to assess the performance of a detection model as an automatic detection system in videos.

Index terms— Classification, Detection, Deep learning, Convolutional Neural Networks, Faster R-CNN, VGG-16, Alarm Activation Time per Interval

1 Introduction

The crime rates caused by guns are very concerning in many places in the world, especially in countries where the possession of guns is legal or was legal for a period of time. The last statistics reported by the United Nations Office on Drugs and Crime (UNODC) reveals that the number of crimes involving guns

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