

## Abstract of thesis

### Optimization of the classification process of dynamic boxing scenes by image segmentation

The thesis is focused on the application of computer vision in video analysis, with particular emphasis on sports such as Olympic boxing. With the increasing amount of data generated by cameras, it is becoming crucial to design automatic image analysis methods that provide valuable information about the scenes being recorded. The paper focuses on the use of advanced video analysis algorithms to support coaches and athletes by carefully examining athletes' techniques, weaknesses, and potential areas for improvement. Particular attention has been paid to boxing scenes, where speed of movement and reaction are crucial.

This thesis examines the problem of analyzing video frames, where significant objects occupy only a few percent of the scene. Existing image classification methods, focusing on scenes where significant elements are clearly visible, prove to be insufficient in such cases. To address this challenge, a new approach to segmenting the image before classification is proposed, which can significantly reduce data processing time and increase the efficiency of analyzing dynamic boxing scenes.

The statement of the thesis includes the assumption that an appropriate segmentation approach can reduce data processing time and CPU utilization while maintaining high video frame classification performance. The main goal is to design a video segmentation method that allows efficient data processing in the context of counting punches in boxing, even if the relevant objects occupy less than 1.5% of the video area.

The study also conducts the construction of its own database containing video footage of boxing fights, which is essential for testing and improving the proposed algorithms. This process involves collecting, manually labeling, and analyzing large amounts of video data, which is crucial for further experiments.

The structure of the thesis is divided into six main chapters, beginning from the basic concepts of image processing, to machine learning issues, to a detailed description of the challenges of video frame classification in the context of boxing. Each chapter makes a significant contribution to the understanding of the complex problem and includes research results that highlight the effectiveness of the proposed methods in analyzing the behavior of boxing fighters. The thesis concludes with a discussion of the author's approach to video segmentation, which demonstrates significant reductions in time and average CPU utilization during data processing, which is crucial for effective analysis of dynamic sports.

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