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Computer Vision and Deep Learning Techniques for Pedestrian Detection and Tracking: A Survey

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Abstract

Pedestrian detection and tracking have become an important field in the computer vision research area. This growing interest, started in the last decades, might be explained by the multitude of potential applications that could use the results of this research field, e.g. robotics, entertainment, surveillance, care for the elderly and disabled, and content-based indexing.

In this survey paper, vision-based pedestrian detection systems are analysed based on their field of application, acquisition technology, computer vision techniques and classification strategies. Three main application fields have been individuated and discussed: video surveillance, human-machine interaction and analysis. Due to the large variety of acquisition technologies, this paper discusses both the differences between 2D and 3D vision systems, and indoor and outdoor systems.

The authors reserved a dedicated section for the analysis of the Deep Learning methodologies, including the Convolutional Neural Networks in pedestrian detection and tracking, considering their recent exploding adoption for such a kind systems.

Finally, focusing on the classification point of view, different Machine Learning techniques have been analysed, basing the discussion on the classification performances on different benchmark datasets. The reported results highlight the importance of testing pedestrian detection systems on different datasets to evaluate the robustness of the computed groups of features used as input to classifiers.

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