ANALYSIS OF DEEP LEARNING METHODS FOR LICENSE PLATE RECOGNITION

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License plate recognition (LPR) is a typical computer vision task [1], as it is based on the use of machine learning algorithms and models to automatically recognize characters in images. Although LPR technologies are developing quite rapidly, there are still several issues that can complicate the development of such software: variety of license plate shapes and sizes; variety of fonts and colors; lighting conditions; presence of noise and other objects; poor image quality.

Currently, deep learning methods are one of the most popular tools used for LPR. The main types of neural networks that are used are following: Convolutional Neural Networks (CNN) are used to determine the location of the license plate in the image and its internal structure; Recurrent Neural Networks (RNN) are used to recognize sequences of characters on the license plate; Fully Convolutional Networks (FCN) are used to recognize license plates with different number of characters. In addition, there are hybrid models that combine different types of neural networks to achieve better recognition results, such as Faster R-CNN, which uses a Region-based Convolutional Neural Network (R-CNN) to suggest regions containing license plates and Fast R-CNN to further process these regions and recognize license plates. The main advantages of this method are high recognition accuracy and self-learning capability, which allows for even better accuracy over time. However, large amounts of data [2] are required for training, and powerful hardware is required to work effectively with neural networks.

Another approach using deep learning is YOLO (You Only Look Once). YOLO is an object recognition algorithm that uses deep neural networks to detect and classify objects in an image in real time. The basic idea of YOLO is that the image is divided into a grid, and then each grid cell is assigned several bounding boxes (frames) in which objects can be located. After that, for each box, the probabilities of the presence of different classes of objects are determined and the coordinates of the box are adjusted if the object is located in it. YOLO belongs to the object recognition architectures called Single Shot Detectors (SSD). But YOLO is not free from drawbacks. Some of them include: low accuracy for detecting small objects; poor performance with overlapping objects; requires a large amount of computing resources; poor performance with low quality or low resolution images; YOLO does not work well with images that have different sizes or projection ratios.

References:

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