

摘要

本论文使用机器学习以及图像处理的方法，进行了针对捆装圆棒材的自动计数的方法研究，本文也详细介绍了本次设计中构造数据集，棒材分类器和棒材计数方法等内容。

本文在构造数据集时，先将捆绑棒材图进行了高斯以及归一化的图像预处理，以棒材端面中心图像为正样本，以距离棒材端面中心点一定距离的图像用作负样本，编写 Python 程序来采集样本，将采集到的样本作为棒材分类器的数据集。在棒材分类器的设计过程中，棒材分类器的选择参照了在图像识别上应用最为广泛的 Lenet-5 模型，进行二分类，一种是棒材，另一种为非棒材。通过对 Lenet-5 模型进行训练，生成 checkpoint 模型用于棒材计数。在进行棒材计数时，选用滑动窗口来对测试图像进行采样，将滑动窗口采集到的样本送入 checkpoint 模型中，将模型反馈出的结果进行记录。在捆绑棒材图送入到卷积神经网络分类器的时候，编写程序生成一个与测试图水平长度和垂直长度相同的，用来对模型反馈的结果进行标记的图片，经过滑动窗口对侧视图进行一次遍历后，会在标记图上生成标记，通过图像的形态学操作将这些标记点构成连通区，通过对连通区进行计数，进而得到棒材的数目。

本次研究一共使用 169713 张样本用于训练分类器，在训练棒材分类器的时候，得到 100% 的准确率，测试分类器的性能时，得到 99% 的准确率。最后对 100 张棒材图片进行计数测试，准确率在 80% 左右，模型误差较小，进一步改进后有可能应用在棒材计数问题上。

关键词：机器学习；卷积神经网络；图像处理；Lenet-5 模型；连通域计数

Abstract

This paper uses machine learning and image processing methods to study the automatic counting method for round round bars. This article also details the construction data set, bar classifier and bar counting method in this design. .

In this paper, when constructing a data set, the bundled bar graph is first subjected to Gaussian and normalized image preprocessing. The center image of the bar end surface is used as a positive sample, and the image with a certain distance from the center point of the bar end surface is used as a negative sample. , Write a Python program to collect samples, and use the collected samples as the data set of the bar classifier. In the design process of the bar classifier, the Lenet-5 model in the convolutional neural network is used as a classifier to identify the center of the end surface of the bar. The classifier performs two classifications on the input image, one is the bar and the other It is a non-bar; by training the Lenet-5 model, a checkpoint model is generated for bar counting. When counting bars, the sliding window is used to sample the test image, and the samples collected by the sliding window are sent to the checkpoint model, and the results fed back by the model are recorded; the bundled bar graph is sent to the convolutional nerve When the network classifier, write a program to generate a picture that is the same as the horizontal length and vertical length of the test chart to mark the results of the model feedback. After traversing the side view through the sliding window, it will be generated on the marker map Marking, through the morphological operation of the image, these marker points form a connected area, and the number of rods is obtained by counting the connected area.

In this study, a total of 169,713 samples were used to train the classifier. When training the bar classifier, 100% accuracy was obtained, and when testing the performance of the classifier, 99% accuracy was obtained. Finally, 100 bar pictures were counted and tested, the accuracy rate was about 80%, and the model error was small. After further improvement, it may be applied to the bar counting problem.

Keywords:Machine Learning; Convolutional Neural Networks; Image Processing;

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