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Deep Skeleton: Learning Multitask Scale Associated Deep Side Outputs for Object Skeleton Extraction in Natural Images

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Abstract – *It represent a two-stage method to extract the accurate and smooth skeleton of a specified Skeleton in the gray image based on geometric characteristics of the boundary. In the first stage, according to the statistical intensity disparity between the sample points and the Skeleton, an energy function is constructed, and then a novel segmentation model is proposed to extract any specified Skeletons in the gray image by the variation method. In the second stage, on the basis of the segmentation, an improved skeleton extraction algorithm is given in virtue of the shortest path connection approach. Some examples show the robustness and insensitivity of the presented algorithm to the perturbation and noise, respectively.*

INTRODUCTION

A few years ago, the creation of the software and hardware image processing systems was mainly limited to the development of the user interface, which most of the programmers of each firm were engaged in. The situation has been significantly changed with the advent of the Windows operating system when the majority of the developers switched to solving the problems of image processing itself. However, this has not yet led to the cardinal progress in solving typical tasks of recognizing faces, car numbers, road signs, analyzing remote and medical images, etc. Each of these "eternal" problems is solved by trial and error by the efforts of numerous groups of the engineers and scientists .As modern technical solutions are turn out to be excessively expensive, the task of automating the creation of the software tools for solving intellectual problems is formulated and intensively solved a broad. in the field of image.

PROBLEM STATEMENT

The problem definition of skeleton detection is to determine the skeleton of an object in a given image (object localization and skeleton detection) and which category each object belongs to (object classification). So the pipeline of traditional skeleton detection is that to convert a normal image to binary by detecting the given object. And by detecting the skeleton of the produced binary image.

THINNING

Thinning is a morphological operation that is used to remove selected foreground pixels from binary images, somewhat like erosion or opening. It can be used for several applications, but is particularly useful for skeletonization. In this mode it is commonly used to tidy up the output of edge detectors by reducing all lines to single pixel thickness. Thinning is normally only applied to binary images, and produces another binary image as output.

EXISTING SYSTEM

In the existing system presented a noval fully convolutional network with multiple scale-associated side outputs to address the skeleton detection problem.

By observing the relationship between the receptive field sizes of the different layers in the network and the skeleton scales they can capture, here introduced two scale-associated side outputs to each stage of the network. The network is trained by multi-task learning, where one task is skeleton localization to classify whether a pixel is a skeleton pixel or not, and the other is skeleton scale prediction to regress the scale of each skeleton pixel. Our method achieves promising results on two skeleton extraction datasets, and significantly outperforms other competitors.

THICKENING

Thickening is a morphological operation that is used to grow selected regions of foreground pixels in binary images, somewhat like dilation or closing. It has several applications, including determining the approximate convex hull of a shape, and determining the skeleton by zone of influence. Thickening is normally only applied to binary images, and it produces another binary image as output. The thickening operation is related to the hit-and-miss transform, and so it is helpful to have an understanding of that operator before reading on.

PROPOSED METHOD

The proposed system's aim is to detect the given object in the given image and their skeletons from a known class, such as people, horses or humans in an image. Generally, only a small number of instances of the object are present in the image, but there is a very large number of possible locations and scales at which they can occur and that need to somehow be explored. Each detection of the image is reported with some form of pose information. This is as simple as the location of the object, a location and scale, or the extent of the object defined in terms of a bounding box. In some other situations, the pose information is more detailed and contains the parameters of a linear or non-linear transformation. A gray scale image will be convērted to the binary image with more accurate and reduced noises and from that binary image we will bring up the skeleton.

- More accurate
- The user interface is simple and good.
- Easy to debug the system
- Very less code
- More secured as the applications was developed in python programming language.

This work proposes a new architecture for skeleton extraction, which is built on the HED network. HED is used for edge detection. We connect the proposed Loc-SSO and ScalePred-SSO layers to the last convolutional layer in each stage except for the first one. EachLoc-SSO is connected to a slice layer to obtain the skeleton score map for each scale. Then from all these SO layers, we use a scale-specific weight layer to fuse the skeleton score maps for this scale.

CONVOLUTION NEURAL NETWORK

The name "convolutional neural network" indicates that the network employs a mathematical operation called convolution. Convolution is a specialized kind of linear operation. Convolutional networks are simply neural networks that use convolution in place of general matrix multiplication in at least one of their layers.

A convolutional neural network consists of an input and an output layer, as well as multiple hidden layers. The hidden layers of a CNN typically consist of a series of convolutional layers that convolve with a multiplication or other dot product. The activation function is commonly a RELU layer, and is subsequently followed by additional convolutions such as pooling layers, fully connected layers and normalization layers, referred to as hidden layers because their inputs and outputs are masked by the activation function and final convolution.

RECURRENT NEURAL NETWORK

A **recurrent neural network** (**RNN**) is a class of artificial neural networks where connections between nodes form a directed graph along a temporal sequence. This allows it to exhibit temporal dynamic behavior. Derived from feedforward neural networks, RNNs can use their internal state (memory) to process variable length sequences of inputs. This makes them applicable to tasks such as unsegmented, connected handwriting recognition or speech recognition.

CONCLUSION

Proposed a new network architecture, which is a fully convolutional network with multiple multi-task scale associated side outputs, to address the unknown scale problem in skeleton extraction. By studying the relationship between outputs in the network and the skeleton scales they capture, we showed the importance of our proposed scale-associated side outputs for (1)

guiding multi-scale feature learning, (2) fusing scale-specific responses from different stages and (3) training with multi-task loss to perform both skeleton localization and scale prediction. The experimental results demonstrate the effectiveness of the proposed method for skeleton extraction from natural images. It achieves significant improvements over the alternatives.

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