Focus Measure for synthetic aperture imaging using a deep convolutional network

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2019-04

Part Ⅰ Basic information

1. **Title:** Focus Measure for synthetic aperture imaging using a deep convolutional network
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Part Ⅱ Paper structure

1. **Introduction**

Purpose: Synthetic aperture imaging is the technique that mimics a camera with a large virtual convex lens using a camera array. A representative application of this technique is SAR(synthetic aperture radar). However, finding a good focus measure for synthetic aperture imaging remains a challenging problem. Extant methods are not effective and efficient enough. In this paper, the author employed CNN to address the problem. This novel method only needs one synthetic aperture and presents the advantage of discipline integration.

1. **Related work**

The detection of image’s clarity is a classical problem in the field of computer vision. After reading the related work, I searched the representative algorithms of this problem and summarized it. Basically, there are 15 algorithms applied most widely. Most of them are constructed on the basis of some hypothesis. SMD, for example, is based on the proposal that the sharper of the image, the more high frequency component it has. The perspective that a sharp image has more information and the entropy of information would be larger leads to the emergence of entropy function. These methods all have more or less limitations. The fusion of them has been tried by several researchers. This paper proposed a method which employed CNN to enhance the performance.

1. **Problem Description**

Problem: Determine whether the synthetic image is focused or not from one single image of a scene with the use of deep neural network.

1. **The Proposed Algorithm**
2. **Generate the dataset**

Compute the synthetic aperture images on different focal plane.

PS:I read the related paper(about how to generate the synthetic aperture). It was published in 2004 and some more efficient methods has been proposed these years.

1. **Fine tune VGG-16**

Use the generated dataset to fine tune VGG-16.

1. **Experiments and Discussions**

Dataset: ILSVRA(for pre-train of VGG16) generated dataset(for fine tune VGG-16)

Using VGG-16 to address this binary classification problem which determines a image is focused or not.

**Conclusion**

This method has high accuracy on the prediction problem. And it is robust for different weights of the training set does not influence the accuracy a lot. Furthermore, it is far more efficient compared with those methods need a consequence of images.

Part Ⅳ Perspective

This paper proposed a novel method to address the problem of detecting images’ clarity. It indeed enhance processing efficiency and accuracy based on the results. However, I suppose that there is still space for improvement. While I was searching the related work, I noticed that a method which combining wavelet discussion and neural network has been discussed. And I wonder that maybe we could also employ a classical algorithm to enhance the performance. Since the detailed results are not visible to me, I could just speculate that maybe some errors emerge from images with same features. And a manual correction could be effective to make a progress.