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High-resolution industrial radiography using convolutional neural networks

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For the quality control of electronic products with high-density electronic packaging and corresponding multilayer printed circuit boards, x-ray inspection is not optional anymore. A combination of micro-focus x-ray source and fine-pixel high-resolution imaging detector is typical in industrial x-ray inspection systems for detecting micro-sized defects. This combination can further enhance image resolution by applying magnification during imaging while sacrificing the size of field of view to be inspected. The maximum magnification factor is however limited by the focal-spot size and the resolving power of the detector because of the well-known penumbra effect.

For a high-resolution radiography, we develop a de-blur filter using a convolutional neural network (CNN). We adopt the super-resolution CNN [1] and modify it for our purpose. For training the network, we use blurred images using the bi-cubic interpolation as the input images while the original images as the label images. Figure 1 shows the preliminary results, and the performance of the network is promising. Detailed description of the network design and its optimization will be given including the quantitative performance of the network.

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