Enhancing Position Measurement Accuracy with Object Detection Bounding Boxes: A Case Study on Compressor Holes Measurement

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Abstract:

In the compressor manufacturing process, human error can occur when inspecting the positions of holes on the compressor. In response, image processing is employed as a replacement for manual inspection. However, traditional image processing methods have limitations when dealing with complex backgrounds. Therefore, object detection is applied to detect holes in images, using the center of the bounding box as a representative for the hole's center to measure distances. However, due to the uncertainty of the bounding box, the detected center position varies, reducing measurement accuracy. This research proposes a two-stage approach to enhancing position measurement accuracy of holes on compressors. In the first stage, YOLOv4 detects the holes positions in the image, and the detected regions are cropped for further processing in the second stage. The second stage uses image processing techniques to accurately determine the hole's center. This method ensures that the detected holes center is closer to the actual center and remains stable, improving measurement accuracy. The proposed approach achieves a repeatability of 0.02 mm.

Keywords:

Image Processing, Machine Vision, Measurement System, Object Detection, YOLOv4.