Poster ID: 27

Shota Nakada, 2nd Year Master Student
System Intelligence Lab, The University of Aizu

Generative Model-Based Anomaly Detection for Symmetric Industrial Products

Background

At factories or manufacturing sites, visual inspections are conducted to ensure the quality of industrial products. In recent years, various deep learning-based methods have been investigated for anomaly detection. In this research, we study anomaly detection for symmetric products. Using the symmetric property of the product images, we propose several image "normalization" methods that are useful to reduce the diversity of the data and obtain more effective generative deep learning models for anomaly detection.

The Proposed Method

Our proposed anomaly detection method consists of five steps using generative models such as variational auto-encoder (VAE) and generative adversarial network (GAN). Below are the basic steps for our anomaly detection method.

1. Image rotation. Rotate the images to make them "orientation invariant".
2. Image translation. Shift the images parallel to the x-axis and/or y-axis to make them "position invariant".
3. Creating models. Train the models only for "edges" and "corners".
4. Binarization. Create black-white image from the difference image.
5. Connected component extraction. Calculate the size of "defect".

Experimental Results

We trained VAE and GAN using 3000 normal images. Then we tested our anomaly detection method using 64 abnormal images and 500 normal images. Table 1 shows the results of the proposed method. Compared with existing method, these results are much better. However, in product anomaly detection, It is important to get Recall close to 100%. From Table 1 we can see that the proposed method is still not good enough for practical use. We are investigating methods to improve the performance.

Table 1: Anomaly detection results. Threshold means the size of defect.

threshold	3	4	5	6
TP	56	56	53	52
FN	8	8	11	12
FP	19	15	8	3
TN	481	485	492	497
Precision	74.7	78.9	86.9	94.5
Recall	87.5	87.5	82.8	81.2

Schematic diagram of the proposal

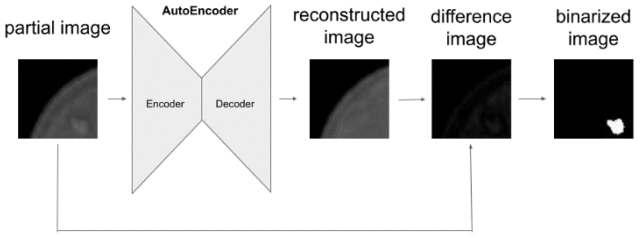

Fig.1.Binarization

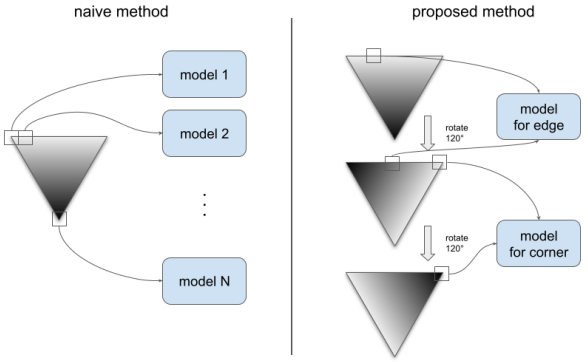

Fig.2.Creating models

Learn what is good, and know what is bad!