

Design and Evaluation of a Machine Vision System for Identifying Cracked PV Panels

Jerome Wynne

July 7, 2017

1 Problem Description

This work developed a system for automatically identifying cracks in PV panels from their 2D grayscale computed tomography images. A sample of five images in shown in Figure 1. 50 images were provided, of which 38 were deemed to be cracked. The criteria

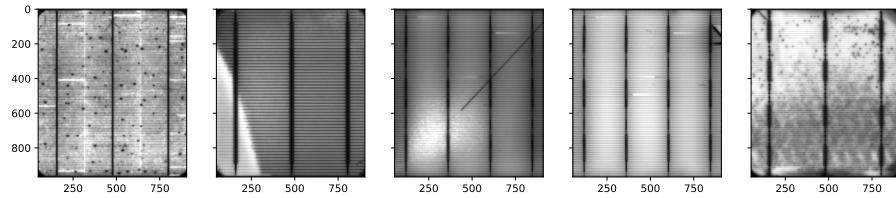


Figure 1: Scans of the PV panels that were analyzed for damage. The first, third, fourth, and fifth panels from the left contain cracks. Pock-marks similar to those seen on the first panel were not regarded as cracks.

for labelling a given mark as a crack were as follows:

- A dark line propagating diagonally for at least 50 pixels
- Was no more than 15 pixels in width (transverse to crack axis, see Figure 2)

As can be seen in Figure 3, it was sometimes difficult to ascertain whether a given mark was a crack or a scratch. For the purposes of this work, the latter were considered to be fainter and wigglier - heuristic measures in the absence of any conveniently quantifiable differences. The labels themselves consisted of manually drawn binary masks, an example of which is shown in Figure 4. These masks were validated by a panel inspector.

Desirable properties of this system

1.1 Data Pre-Processing

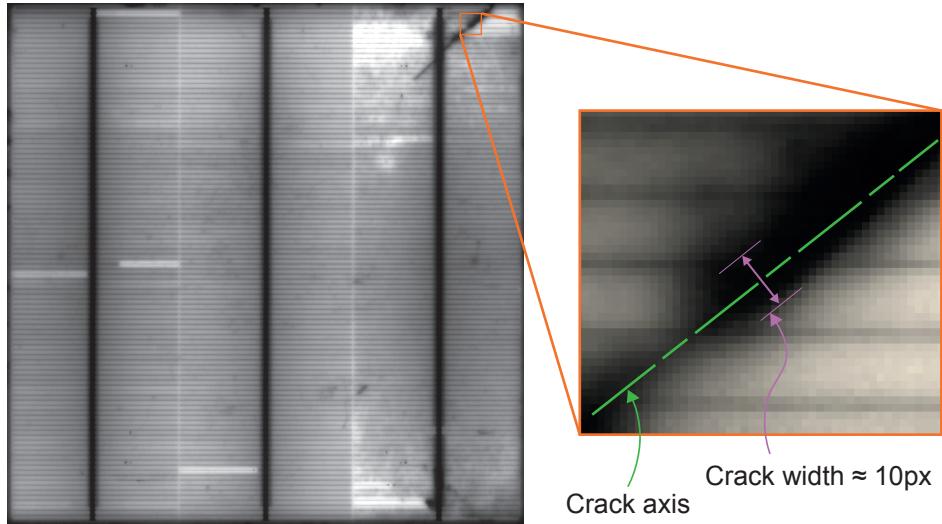


Figure 2: Crack anatomy.

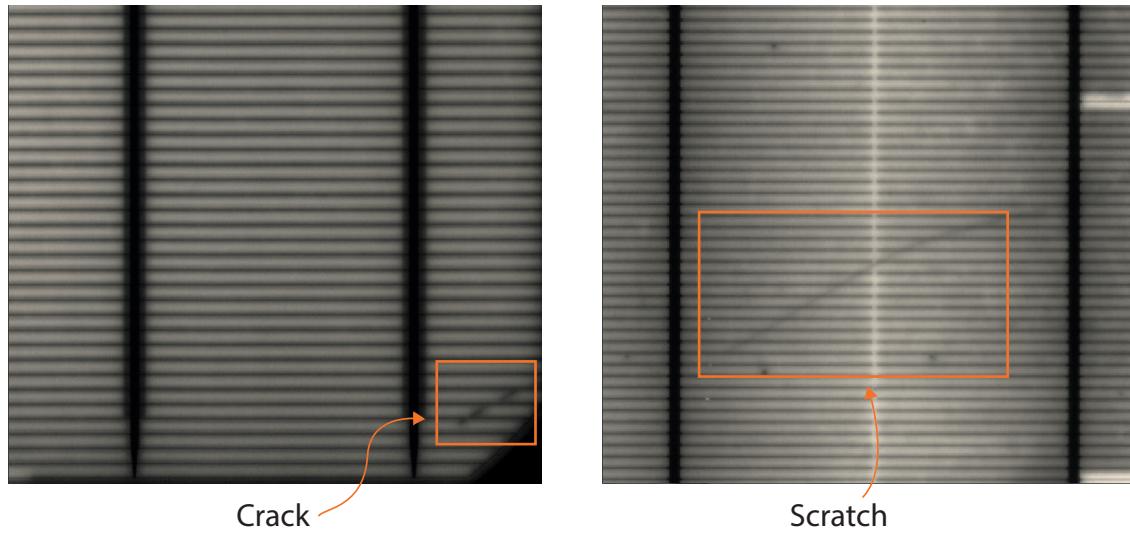


Figure 3: Distinguishing between cracks and scratches was difficult in certain cases, making ground truth labels somewhat subjective.

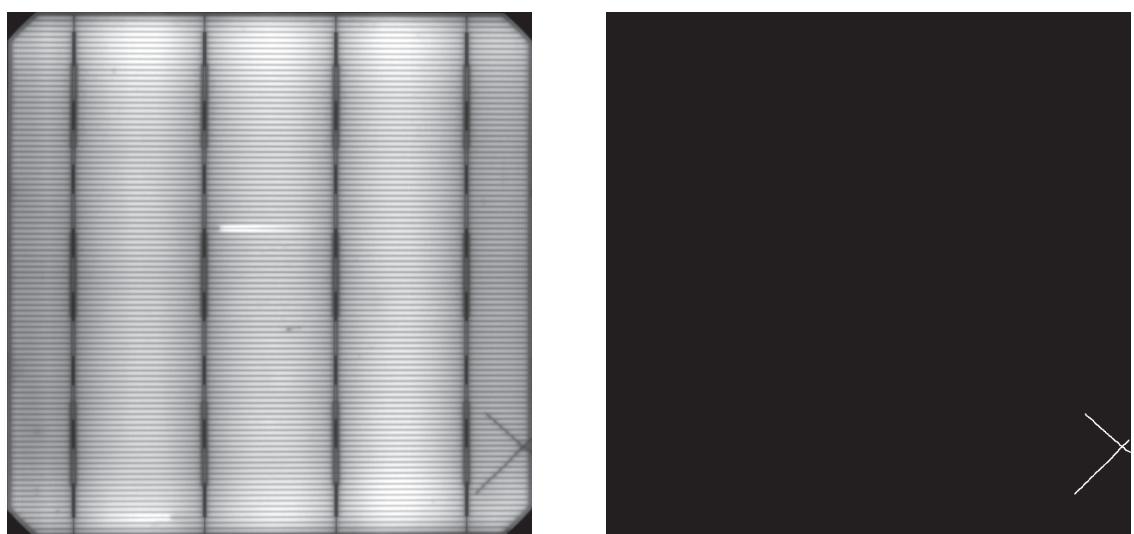


Figure 4: An image and its associated set of labels.