

Identification of corroded areas in an image

1. Overview of the problem

Civil infrastructure is often subject to adverse environmental conditions, which can accelerate the onset of corrosion. When areas of an infrastructure are severely corroded, remediation steps such as painting needs to be taken to prevent further degradation. A popular example is the frequency re-painting of the Sydney Harbour Bridge to keep it free of rust.

Current maintenance plans for most infrastructures employs scheduled painting without much consideration of the state of the asset corrosion. However, it results in some areas that are painted unnecessarily and critical areas are not painted quickly, leading to exponential degradation of structural members.

2. Objective

The aim is use a data driven approach to evaluate corrosion spread across an asset. The input data is a large dataset of high quality dense image data. The dataset variability is high (e.g. different lighting conditions, perspective, scale, etc), and it is initially unlabelled. Each image's location and orientation is available and is referenced to a fixed reference frame.

Corroded areas need to be identified in each image. Information from the multi-perspective images also need to combined to present a unified result on the distribution of corrosion across the asset. The output is the percentage of corrosion coverage on the asset surface.

3. Project tasks

The tasks of the project are split into two parts. The first part is to present a proposal summarizing your solution to this problem. Please submit a report discussing how you will break down the problem and solve for the corrosion spread. Discuss the particular algorithms and methods used in each step of the process, and present a data flow for your proposed solution, from input images and metadata to corrosion coverage. Finally review the different factors that impact the accuracy and precision of the result, and what steps can be taken to improve performance. In the second part, you will implement your suggested solution and to try to apply it in example of image that contains corroded areas. You will need to discuss its performance in your report.

4. Recommended tools

- Image analysis
- Computer vision
- Pattern recognition
- Deep learning
- Pattern localization
- Object localization

5. Sample images

Below are a few images of a single type of asset which clearly show corroded areas. The assets are various however are all metallic and may be painted, additionally the backgrounds of the assets are highly variable. The images are captured in an outdoor environment, meaning that they are subject to illumination changes. The image processing algorithm needs to be able to handle these changes.

