Research Project Preliminary Project Statement

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Motivation

In industrial engineering settings, Data Matrix codes are often marked directly onto machined components to serialize them. The serialization process is carried out with either laser marking or dot peen marking. Although Data Matrix scanners work in ideal conditions, they often fail when used from mobile phones in this setting. Some of the reasons for why this occurs is due to poor quality cameras, the Data Matrix codes being physically small, on reflective (metal) surfaces, and due to poor lighting conditions. The majority of scanners are also not designed to recognize dot peen marked Data Matrix codes, a commonly used method of marking components which is cheaper than laser marking.

This project seeks to investigate how Machine Learning methods can be used to preprocess images in a way that results in standard scanners being able to better detect and decode the Data Matrix codes within them. The focus will be on laser marked components, but if time allows dot peen marked components will be considered as well.

Hypothesis

The project research will be made on the main hypothesis that methods such as object detection technology have advanced enough to be applicable in solving this problem.

A baseline object detection model will be established to detect a Data Matrix code within an image and crop to it. Another method such as affine transformation will also be explored. Once cropped to and rotated correctly, other methods can be used to improve the preprocessing further (image restoration techniques to correct for blur, reflections, etc.).

An image dataset provided by MAN ES will be used for training and comparing the performance of different models with current standard scanners such as libdmtx. As of writing the dataset contains 180 images, with the possibility of manually collecting more images at the MAN ES premises.

Supervisors

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