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Digital Twin for optimal positioning of an industrial machine vision camera

In industrial machine vision, camera positioning is traditionally a manual, iterative, trial-and-error process. Even if sufficient accuracy can be reached, this leads to prolonged downtime during initial installation and maintenance, especially for inspection tasks where the camera must be positioned at a precise location, orientation, and working distance. In addition, the operator-dependent nature of the conventional manual camera setup cannot often guarantee the reproducibility of machine vision inspection results. This is also crucial for setups in which multiple cameras work in parallel, performing the same task to speed up batch inspection, resulting in the possibility of slightly different outcomes between different cameras on the same object.
This work presents a Digital Twin that assists the operator in the camera positioning process. A calibration target is used both to perform camera calibration and to detect the current camera position, allowing feedback to the operator for fine-tuning the position of the camera.
An industrial case study on pharmaceutical inspection machines, a field subject to strict regulatory and acceptance rules, is presented. The machines need accurate positioning of the multiple cameras involved in the different inspection tasks, at different times: first assembly on the shop floor, re-assembly after shipping parts to the customer and after maintenance. In this context, manufacturers need the imaging configuration to be reproducible quickly and accurately. The proposed Digital Twin addresses this challenge providing continuous feedback on camera setup and is paired with a specifically designed calibration target, enabling more reproducible acquisition conditions.

Special/ Invited session

Digital twins for industrial machine vision systems and reference data generation

Classification

Both methodology and application

Keywords

Digital Twin, Camera Positioning, Machine Vision

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