TRINITY – FhG IWU

Vision System / Quality Assurance

Implementation of vision system

A vision system serves as an aid for detecting optically detectable features and converting them into data that can be easily processed further, e.g. as switching signals for controls or text for quality documentation. Therefore, an overview of the main aspects to consider when implementing a vision system in a production system are given in the following. This module is supposed to support the participant's process of selecting and implementing an appropriate vision system. Following the aspects in this guide, the planning of workstations and production systems can be improved and streamlined. In the following, an explanation is given for inputs that have to be considered in order to implement a vision system.

Inputs

In a first step, the main objective of the vision system has to be defined. Depending on the objective, the chosen vision system needs different characteristics to fulfil its objective optimally. The possible objectives include among others "safety", "active influence on the process", "process stability (e. g. robot workspace monitoring)", and "automated quality documentation". The chosen objective has direct influence on characteristics such as resolution, ability to record video, tolerances, field of view and applied technical operating system. Whereas a system that has to ensure worker safety needs to scan a wider area to detect the presence of a human being, a vision system with the purpose of quality control has to focus on high resolution in order to detect a component's quality issues.

Derived from the objective the object that will be recognised by the vision system has to be characterised in a second step. The characterisation is dependent on the present processes and therefore not universal. This guide, however, gives a wide range of possible objects and features that might be occurring in the existing production process.

For safety purposes, it might be necessary to detect the presence of persons. If some form of human-machine cooperation is desired, gestures of persons might also have to be recognised by the vision system. The ability to recognise moving objects instead of static ones can also have an impact on the vision system's capabilities. If components have to be recognised, different aspects are to be considered. These include the detection of the component's presence, its position and orientation and its geometry. In order to do a quality check on components, more features need to be checked, such as the surface condition, colourfulness, existing cracks and the presence of labels. All of which influence the characteristics of the vision system.

In a third step, the existing boundary conditions have to be identified since they also have an influence on the vision system's characteristics. The speed in which the vision system must be able to operate is dependent on the production system's cycle times. The environmental conditions such as purity of the ambient air, different lighting conditions or special features of the detected surfaces (e.g. reflective surfaces or glass) have an influence on the technical mode of operation that can be used. It has to be decided whether the vision system should be stationary or robot guided. Another boundary condition is the used software interfaces of

the production system, to which the vision system must be compatible. The available budget or respectively the payback period of the vision system must be known, since a vision system might be quite expensive, depending on the needed features.

Once all these preliminary considerations and boundary conditions have been made, the concrete system must be selected for its specific application. Due to the high dynamics in this field of development and the constantly improving evaluation algorithms, it is necessary to approach the relevant manufacturers of such products in order to get the most suited vision system. If the quality requirements are not too high, inexpensive cameras can usually be used, but most attention should be paid to the evaluation software. This software determines the performance of the entire system. Moreover, with many systems, separate lighting is important for an economical overall result. A distinction needs to be made between incident light and transmitted light systems.

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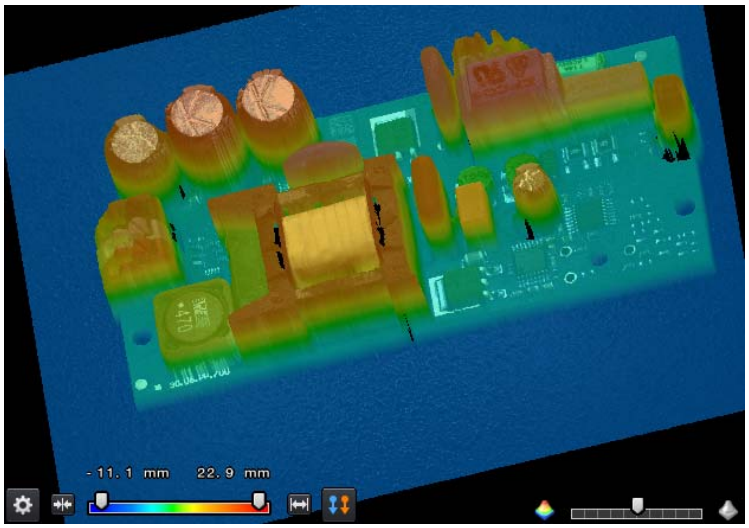

Figure 1: Example for checking the correct positioning of various electronic components