New Technologies for 3D Vision Systems

3D image processing is used in particular whenever volumes, shapes or the 3D position of objects will be analysed. Depth information can also be used to handle tasks in the examination of objects and images of defects that do not have enough contrast for 2D but do show a recognizable difference in heights

Typical Applications

Typical application areas for a 3D camera include the following:

- Detection of obstacles and “human” navigation of autonomously driving vehicles in an industrial environment, such as fork lifts

- Robot controlled gripping jobs on conveyor belts or bin picking

- Presence detection, checking and counting objects in a bin/box, even if they exhibit no contrast at all against the background

- Volume measurements of a wide range of objects

3D Technologies

3D image processing also offers various technologies. Those that are used most frequently right now are:

- **Stereovision and structured light**. Stereovision works according to the principle of a human pair of eyes. Two cameras are used to record two 2D images of one object. The same scene is recorded from two different positions and the depth information is assembled into a three-dimensional image with the aid of the triangulation principle.

- **Laser triangulation**. The process of laser triangulation uses a combination of a 2D camera and a laser light source. In this procedure, the laser projects lines or dots onto the scene in front of the camera.

- **Time-of-Flight**. The Time-of-Flight method is a very efficient technology to get depth data and measure distances. A Time-of-Flight camera provides two kinds of information for each pixel: the intensity value, stated as the grey value, and the distance of the object to the camera, namely the depth value. The use of 3D sensors with ToF (Time of Flight) technology and a 2D CCD or CMOS sensor with some of its sensitivity in infrared (NIR) can be used in combination for detection and classification.

The combination of different hardware and several algorithms that process the scene in parallel and ultimately produce a joint result leads to a high-quality and robust classification and detection.

The 3D technology with ToF cameras allows to determine the position of certain objects. If you now use a classification by an SVM / CNN with the Bag of Word Model (BoW), a collection of good descriptors (a good descriptor should have the ability to handle intensity, rotation, scale and affine variations), which is treated as a vector of performance counts, you can achieve a good performance for the detection and classification with a 3D positioning.

Apart of these techniques we use a high performance tracking, for the indexing of every object, so that the result will never mix up.

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