3D real-time depth measurement

NET New Electronic Technology GmbH develops not only customized camera solutions, but is also able to offer suitable algorithms.

Therefore NET GmbH is competent to perform a depth measurement process for high-resolution sensors and high frame rates in real time. The special feature here is the real-time capability due to the use of an FPGA for the disparity calculation, which forms the basis for generating the depth information of a space.

Disparity is the spatial displacement between corresponding points in the left and right images when using a stereo camera. This displacement is in inverse proportion to the distance of the observed point in the sequence.
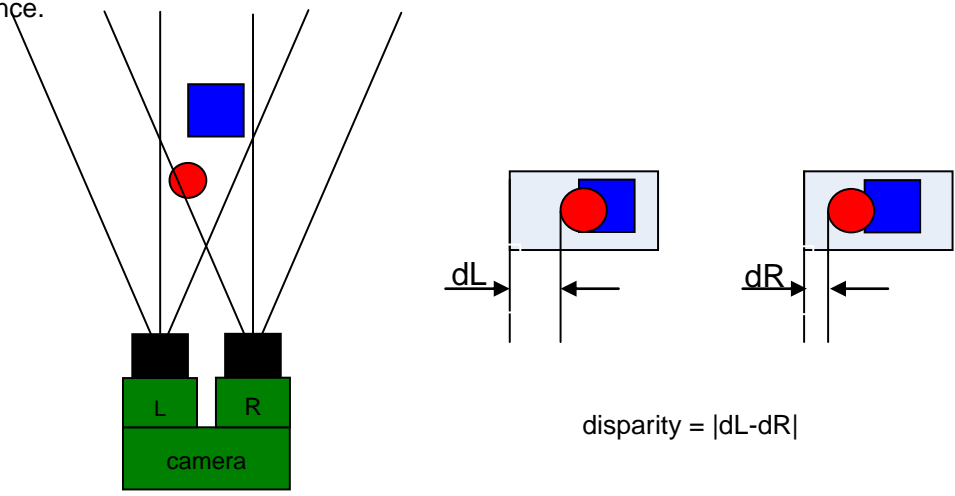

disparity = |dL-dR|

Fig. 1: Left and right images of a (stereo-) camera system

The disparity calculation is, as such, a process for reconstructing depth information gained from stereo images. The result of the calculation is a value per pixel that can be visually displayed as a depth map.
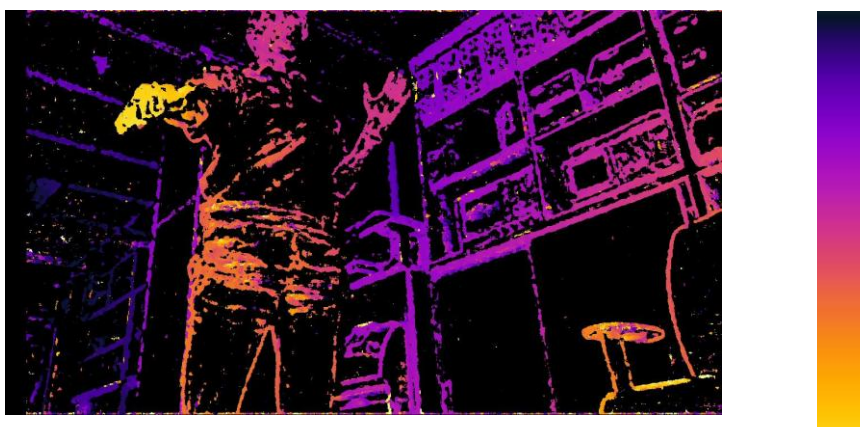

Fig. 2: Color display of a depth map

In the above image, pixels that are close to the viewer are displayed in white/yellow and distant pixels in blue/black. In order to make a calculation, the (stereo-) camera system is calibrated (rectified) for the measuring process. This ensures that the left and right images are on the same level, enabling a distortion-

free display. The calculation can only be made after this has been done.

Unique selling position: What makes it so special? What is new?

The use of an FPGA enables the calculation of 64 disparities with less that 1 msec delay by a 720p sensor at a 60Hz frame rate (75 megapixel/sec). This performance can ensure extremely fast response times for systems in the field of safety engineering, for example, for which short reaction times are of great importance.

What is the specific benefit for the customer?

The use of an FPGA guarantees the shortest delay time for every type of image processing. FPGAs allow the realization of a continuous, runtime-optimized data flow for computationally intensive stages of data processing, specifically for time-sensitive applications. By partitioning the complete system, the CPU or DSP load can - in combination with SW - be significantly reduced.

What industrial sectors are targeted?

In the fields of industry and production, depth measurement has a versatile and flexible range of applications as depth information forms the basis of systems that recognize, identify and track objects in a three dimensional space.

For the evaluation of 3D spaces, the depth map can, for example, support object detection in a virtual SD protection area. The information can also be used to control machines and robots, which behave (switch off, reduce speed, backtrack, etc.) according to the position and type of object (a human finger, hand or arm, or an appliance).

For this type of system, the guarantee of very short response and reaction times is of extreme importance. Detection capability is a further important feature of the system and must be guaranteed throughout the entire protection area under various working conditions.