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Looking ahead: Chances for a circleless „2D/3D total station“

A low cost instrument for surveying, recording of point clouds, documentation, image acquisition and visualisation consistently utilising snapshot feature of 3D cameras.

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Hardware

2D camera +

3D camera +

trigger for synchronisation

The circleless 2D/3D total station

The device is based on the 2D/3D-system which is theodolite-like mounted and set on a tripod, resulting in the 2D/3D total station

The system‘s most important feature is its ability to record 40,000 points in a single shot and not sequentially like in TLS, enabling all of the new measuring techniques shown here.

Software replaces circles, stitches and matches coordinates

How to run the circleless 2D/3D total station

The 2D/3D system is turned along the vertical and/or the horizontal axis. The angle between the positions must be determined via different methods.

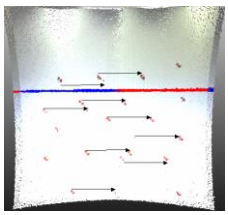
Panorama (2D camera)

A click into the panorama delivers 3D coordinates corresponding to each pixel.

Panorama requires surface texture.

Local coordinates (3D camera)

Neither texture nor structure are necessary when using the 3D camera: In this example the angle between two snapshots taken of a flat wall is calculated solely from coordinates.

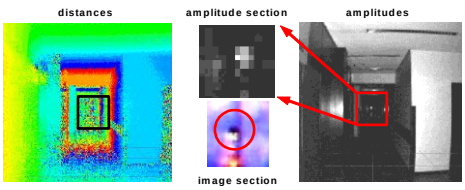


„Flags“ and „Flying pixels“ (3D camera)

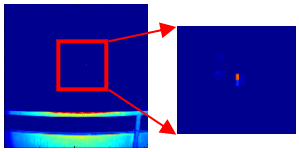
Supplementry data might be used to determine angles between the local coordinate systems:
Flags and flying pixels emerge in a similar way in the overlapping zones. Flags are set by the pmd camera to determine the state of the range detection; flying pixels are produced by overlay effects as well as at edges.

New possibilities for recording and surveying

Automatic point detection



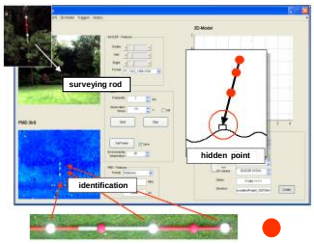
Point detection by combining long distances and high amplitudes



Distance to prisms or reflecting spheres:
prism reflector < 150m
reflecting sphere < 40 m
red sphere < 15 m

Georeferencing via

- automatic point detection
- point patterns
- a coded surveying rod
- a coded GNSS antenna



Staking out in one step

Using a conventional total station staking out has to be carried out step by step. Due to the 2D/3D station‘s snapshot at rates of 10 fps, the differences between a large number of points and the projected status may be minimized online.

Universality

All in one - a universal instrument

1. Measuring to chosen points

Single point destination as well as dynamic staking out

2. Recording point clouds

400,000 points/s like a laser scanner + measuring coordinate films

3. Taking Images & RGB-coloured coordinates

Combination of high resolution 2D-images with distances from the 3D-camera

One shot generates max. 5,000,000 RGB-coloured 3D coordinates at low costs.

To do

In order for the entire vision to come true

Improvement of distance accuracy, which is currently at 0,7cm + 2,4cm / 10m

Replacement of PMD-technique by real ToF (pulse EDM) to minimize systematic errors caused by optical overlay

Improvement of range as well as of point density of the 3D camera chip