kubit

Software for Surveying, Construction and Architecture
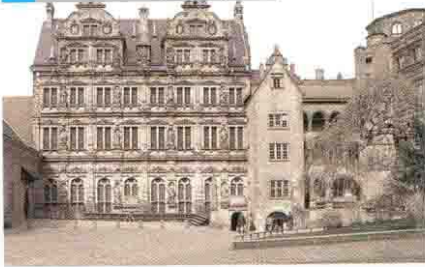
From Real World to CAD

> TachyCAD
> PhoToPlan
> PointCloud
> DistToPlan
> hylasFM

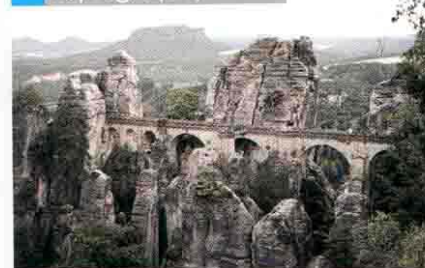## Application areas

Architecture

Process and industrial plant

LIEGEPLATZ 3

Infrastructure and civil engineering

Topography

Surveying equipment

Total station

Handheld laser

Camera

Laser scanner

AutoCAD modules

TachyCAD

> Measuring and drawing on-sit
> Total station as 3D mouse
  Geometry and additional pro
> On-site control of contents an

DistToPlan

> Bluetooth connection with ha
> Measurement of rooms, wind
  inventory directly on-site
> Calculation of areas referring

PhoToPlan

> From photograph to measura
> Image rectification by contro
  geometry
> Rectification of scanned map
> Mosaic for image plans

PointCloud

> Millions of measured points in
> Import, visualisation and eva
  3D laser scanner data
> Combined evaluation with o

From Real World to CAD

Whenever complex objects have to be recorded in a fast and exact way surveying professionals use kubit software. Based on the conviction that not only one single instrument or sensor exists to survey one object kubit's solutions combine all common surveying technologies with CAD functionality.

hylasFM

> Capture data for CAFM
> Amendment of old or superseded
  CAD plans
> Automated evaluation of CAD drawings
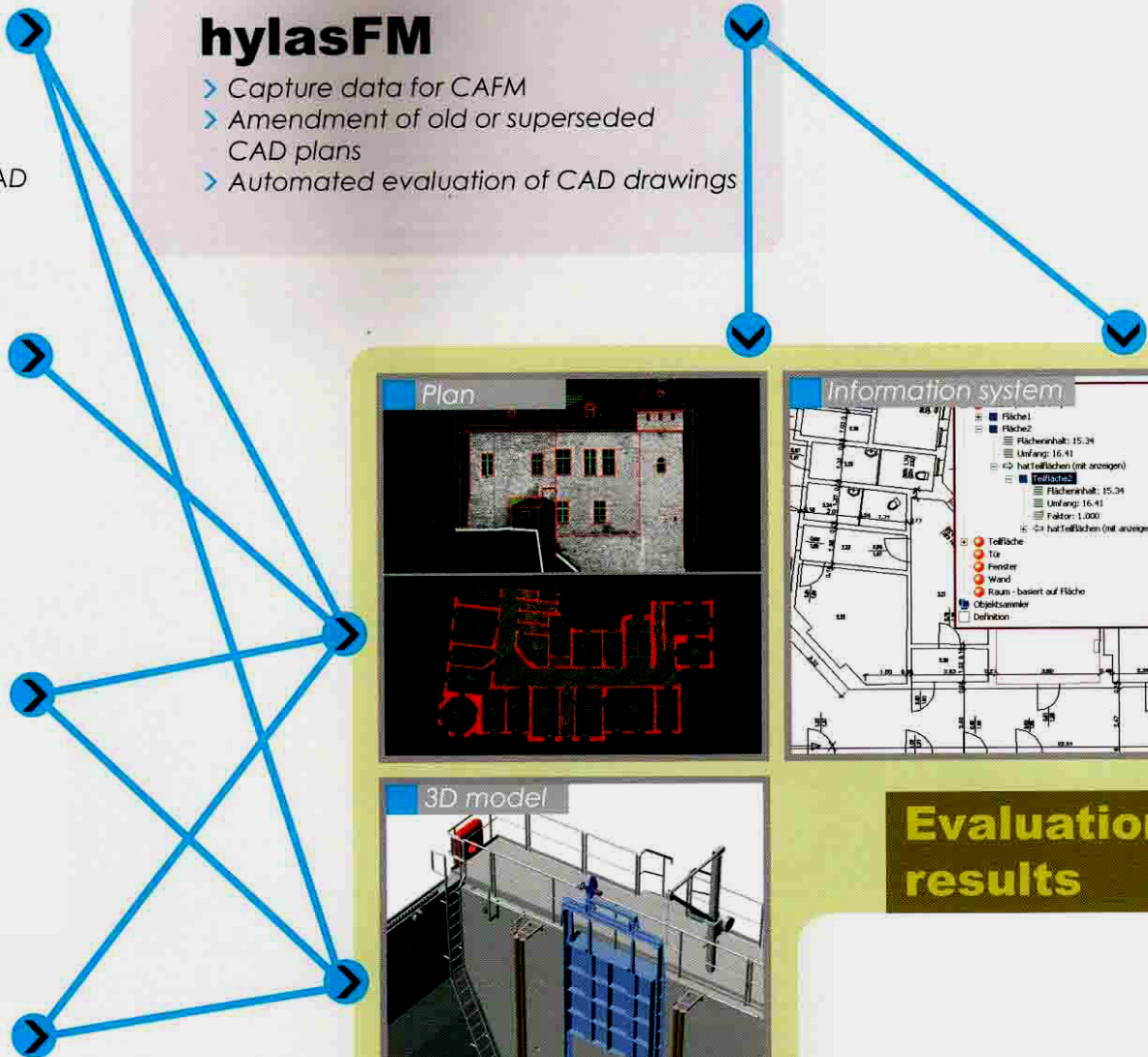
...erty data directly in CAD
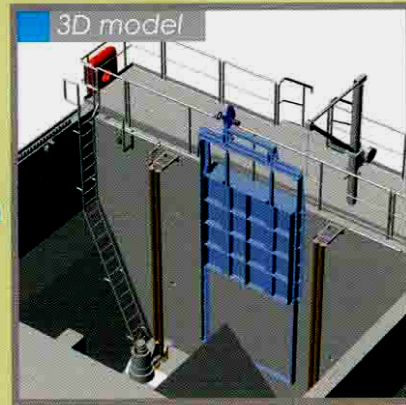...accuracy

...dheld laser
...ws, doors and any

...o common standards

...le plan
...points or reference

...and plans

...AutoCAD
...ation of

...nted photos

Plan

Information system

3D model

Evaluation results

CAD

The applications enhanced since 1999 facilitate and accelerate the acquisition of survey data and additional information in CAD and link geometric with structural information. The results are perfect and fit all requirements. All users will be convinced and delighted.

‡kubit

Products at a glance:

TachyCAD, DistToPlan

TachyCAD and DistToPlan combine on-site standard surveying instruments such as total stations and handheld lasers with CAD software. With TachyCAD, the surveying instrument acts as a 3D mouse inside the CAD software, whilst DistToPlan supplements TachyCAD with manual measurements. These measurements are combined on-site with the final CAD plan. This intelligent combination of both systems makes for a highly efficient surveying operation. The direct implementation of measurements enables the production of final plans on-site, so the results can immediately be compared with the real object. Office-based post processing effort is reduced and the costly repetition or addition of measurements is eliminated.

TachyCAD

PhoToPlan

The fastest way to create an as-built survey is by using a digital site image as a CAD template and drawing the exact CAD plan over it. That way, the photographic record of the site is combined with precise geometric information.

PhoToPlan software rectifies digital photographs and raster plans in CAD, maintaining accurate scale. The geometric properties of the objects that have been photographed or the control points that have been observed by the total station provide the basis of the rectification. The rectified images are inserted into CAD at the geometrically correct location at the proper scale. Special functions enable the fast definition of rectification planes and the creation of larger plans from a mosaic of single rectified images.

PhoToPlan

PointCloud

PointCloud and PointCloud Pro allow the visualization, analysis and processing of clouds with millions of points within AutoCAD, allowing all AutoCAD commands to be used for evaluation. The co-ordinates of each point are just one mouse click away. As manufacturer independent software, PointCloud is able to process the data from all common 3D laser scanners.

The Section Manager of PointCloud allows the easy management of segments of a point cloud. Once defined, sections or details can be referred to at any time. The clash detection facility enables the calculation of clashes between cloud points and CAD entities. Multiple functionality for fitting planes helps with the construction of corners and edges. PointCloud is not just limited to points; it is actually possible to use oriented images. In this unique way, PointCloud combines point cloud data with the often much higher resolution of a photograph.

PointCloud

hylasFM

Up to now, old or superseded CAD layouts and plans could only be evaluated and transferred into CAFM manually. Often, too, the transfer of badly prepared additional data has to be carried out manually.

HylasFM automates the evaluation and optimisation of such plans. Gaps are closed, duplicate lines removed and room and storey polygons created. Stamps or symbols for structural elements such as 'room', 'window', 'door' or 'inventory' are created, 2D plans can be transformed to 3D models of the building, areas calculated according to common rules, inventory items recorded and associated, and graphical symbols converted into evaluable blocks. A flexible and easy-to-adjust data model assures compatibility with all CAFM systems.
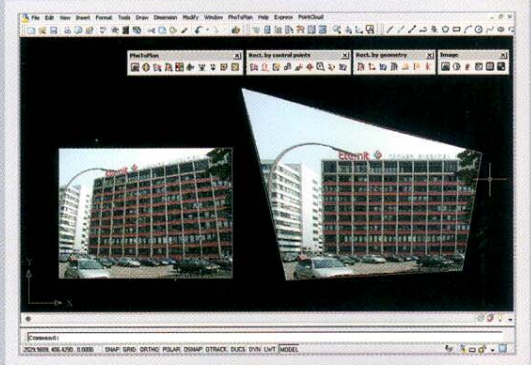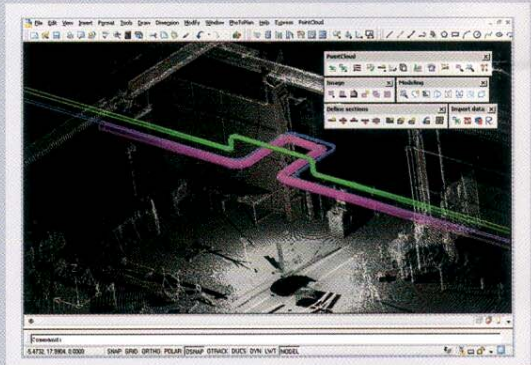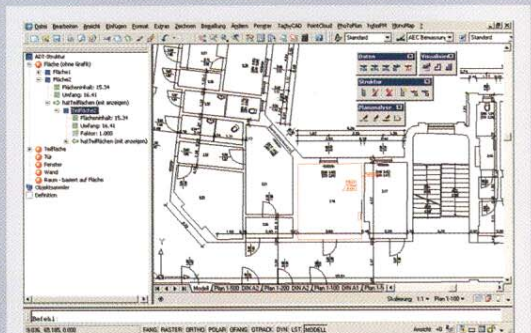
hylasFM

Technical Information about PointCloud

The following pages may give you a detailed overview of the possibilities using PointCloud. For further questions or comments please do not hesitate to contact us or one of our local resellers.

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F1   What is PointCloud?

F2   What kind of AutoCAD versions does PointCloud supports?

F3   What type of 3D laser scanner are supported?

F4   How does the data import look like?

F5   How are the point clouds saved?

F6   How can the point clouds be organized?

F7   Why is PointCloud this fast?

F8   How big the point cloud can be?

F9   What kind of functionality is supported?

F10   How can I try out PointCloud?

F1   What is PointCloud?

PointCloud is an AutoCAD application for visualizing and working with 3D point clouds. The documentation of historical buildings and monuments, industrial plants and others can be done with the expected level of detail. Even other documents (e.g.
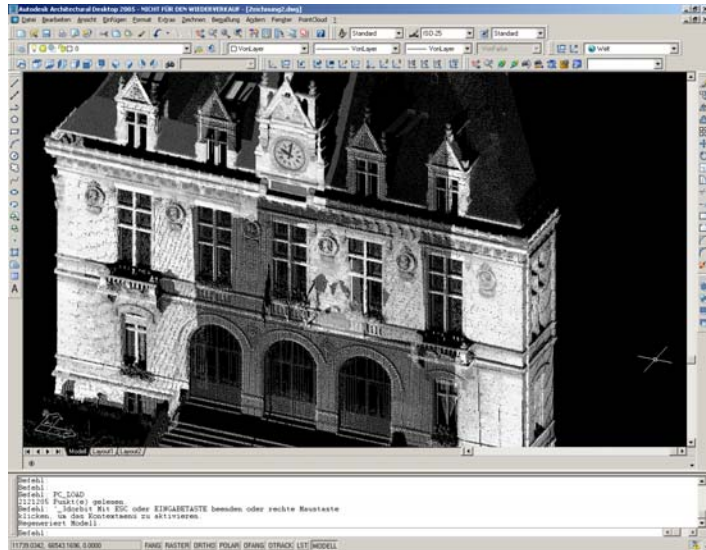
images, floor plans or other CAD elements) can be combined with the point cloud to be processed.

Millions of points captured with a 3D laser scanner can be used efficiently where all modelling tools are sufficiently present – in AutoCAD. Using the AutoCAD functionality "Object Snap", the user has access to every single point and its 3D coordinates. Therefore all AutoCAD commands – and also the functionality of third-party applications – know about the exact geometry of the scanned object.

F2   What kind of AutoCAD versions does PointCloud supports?

AutoCAD and AutoCAD LT 2000/2000i/2002/2004/2005/2006 and all vertical AutoCAD applications such as Architectural Desktop, AutoCAD Map, Land Developer etc. Since AutoCAD LT doesn't offer the comfortable 3D-Orbit functionality, it is advisable to avoid AutoCAD LT.

F3   What type of 3D laser scanner are supported?

Since all common 3D laser scanner (respectively the corresponding software) have the ability to export the data as an ASCII file, all types of scanner can be used without restriction (see also F4).

For some types of scanners PointCloud offers special import functionalities:

Orthophotos created with RealWorks Survey (Trimble) can be imported directly at the correct position in the drawing. It is also possible to import orthophotos and point cloud (scans) directly from a RiSCAN PRO project (Riegl).

So it is possible to post-process the 3D information of points together with the high resolution of an image at the same time. This combination is very powerful if there is the need to handle very small details or badly identifiable objects in the scan.

Users of FARO scanner (formerly iQvolution) have the possibility to work with an OEM version of PointCloud called FAROcloud.

F4   How does the data import look like?

All common scanners have the ability to export point clouds as an ASCII-file. This can be done for the coordinates (x, y, z) or for both, coordinates and colour values. The colour values can either be true-colour (x, y, z, r, g, b) or intensity/grey colour-coded (x, y, z, i). rgb-colour values are directly displayed as colours inside AutoCAD (i.e. true-colour since AutoCAD 2004). Intensity can be displayed as a grey value or as a rainbow spectrum.

The import dialogue in PointCloud is easy to understand and adoptable to the different output formats (i.e. columns and separator etc.). Some scanner manufacturer are already supporting the PointCloud binary ptc-file format (see also F5).

F5   How are the point clouds saved?

Every (ASCII)-import leads to a ptc-file for the corresponding point cloud. Compared to the ASCII format, the ptc-file is handling the point cloud in a very compact manner. In addition, such an ptc-file can be loaded faster then a simple ASCII file because the points are already arranged in a way, that necessary points are displayed immediately. The points are automatically sorted in the 3D space. To allow this, a special functionality called Octree is applied (recursive division of a 3D space in 8 parts with the same size).

The ptc-file is referenced in the AutoCAD drawing like it is done also with images.

With the following products of third party manufacturer the ptc-file can be already created:

- RealWorks Survey (Trimble)
- IQScene (FARO)
- Polyworks (innovmetrik)
- Ilris3Dparser (Optech)

F6 How can the point clouds be organized?

Different parts of a point cloud (e.g. a single tube) can be coloured, displayed or hidden. A manager for visible sectors allows a convenient organisation of the point cloud for someone's own perceptions.

This, for instance, can be very useful when modelling special parts of the scanned object inside AutoCAD and all other information (i.e. points) are not of interest. The visible parts can be defined as a box, slice or even as free polygons.

Once a clash detection with an AutoCAD-solid was carried out, the overlapping parts are also listed as a visible sector and can be managed like this.
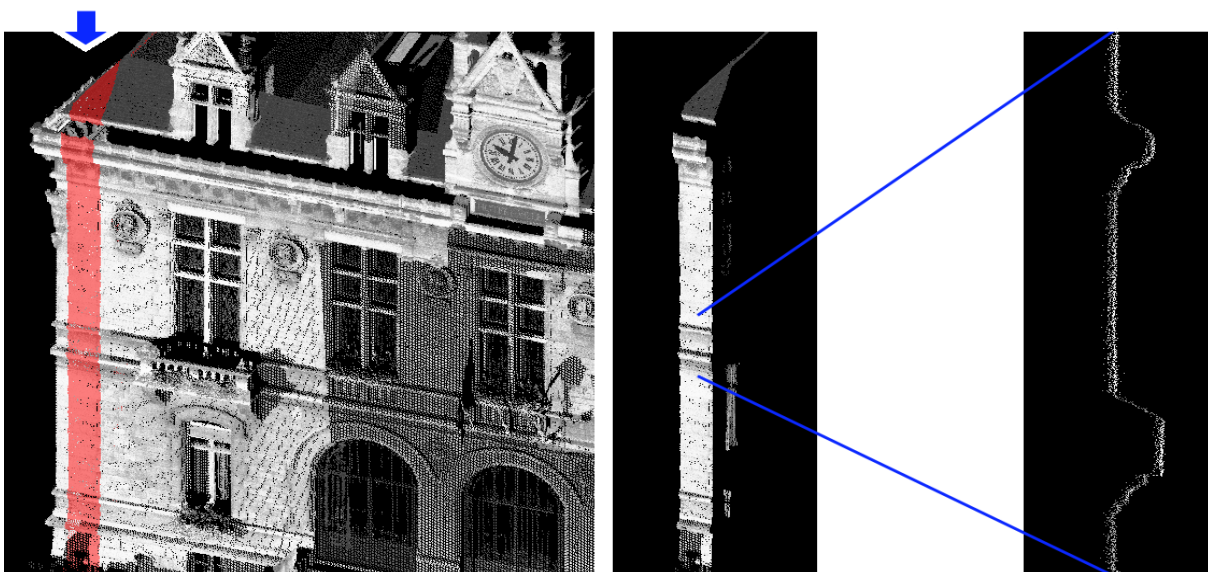

Illustration 1   Definition of a visible sector (in this case as a vertical slice); Hiding all other points; Vectorisation of a contour line.

F7   Why is PointCloud this fast?

The most important reason for the high performance is very simple: Only those points are displayed which are actually visible. This very easy and effective principle needs a sophisticated computing behind since the software has to determine which points have to be displayed. So it is possible to display only the number of points the display is consisting of. This is a maximum number of 0.7 Mill. points (1024x768) even if the point cloud has 30 Mill points.

Due to this, PointCloud is always showing the points with the correct draw order. Points which are situated in the background (behind other points) are not displayed. So it is easier for the operator to understand and to work with the cloud.
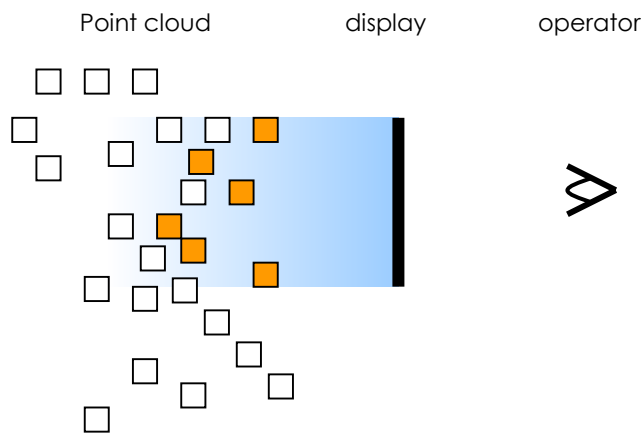

Illustration 2   Only the points in the front (dark points) are visible for the operator and are drawn from PointCloud. While zooming, panning or applying the 3D-orbit, the visible set of points is changing.

Compared to usual AutoCAD-points, the points within PointCloud are very 'light-weighted'. AutoCAD-points are holding additional information like layer-name, point-style etc. Data in PointCloud don't have all of these information in order to save storage space and to increase performance. Even though the point cloud is a single AutoCAD element (custom entity), the user has access to the every single point of the point cloud. The object-snap 'point' is supported and so a common processing of the data (drawing polylines, dimensioning etc.) can be done.

While applying the 3D-orbit, the point cloud is thinned out for a fast rotating and navigating.

F8   How big the point cloud can be?

Holding a 2GB RAM on a new computer, the point cloud (with true-colour information) may consist of 30 Mill. points. Or as a rule of thumb: There is the need of 65MB RAM to handle 1 Mill. points.

F9   What kind of functionality is supported?

- Import of (true-coloured) point clouds from every type of scanner.
- Displaying all necessary points with correct draw order and best resolution.
- Supporting the AutoCAD object snap 'Node' (see illustration).
- Simultaneous post-processing of orthophotos (plane information on a high resolution) and point clouds (detailed information in the depth).
- Organisation of the point cloud data using visible sectors.
- Switching visible sectors on and off.
- Clash detection with AutoCAD-solids.
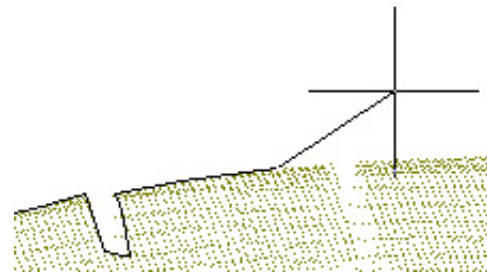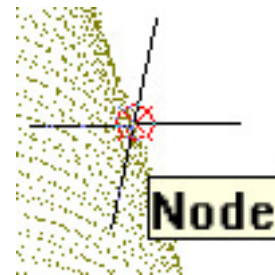
F10   How can I try out PointCloud?

PointCloud and all of its functionality can be fully tested using the free demo version. Different point cloud data sets are included in the download. In addition, the user is able to test his own data, too. To do so, please contact kubit or visit the kubit website for more information (contact details are listed on the first page of this documentation).