

# ICT-supported learning and training tools for terrestrial laser scanning applications

Erwin Heine <sup>(1)</sup>, Mario Santana Quintero <sup>(2)</sup>, Bjorn Van Genechten <sup>(2)</sup>

<sup>(1)</sup>University of Natural Resources and Applied Life Sciences, Vienna, Austria

<sup>(2)</sup> University of Applied Sciences St. Lieven, Belgium

## Introduction - 3Driskmapping project



3D Risk Mapping

co-financed by Education and Culture  
Leonardo da Vinci

**Aim:** create ICT-supported 'learning on demand' tools for the use of **terrestrial laser scanners** in documenting our built environment

**Users / Target groups:**

- academic institutions; in their current and future curriculum
- enterprises; for in-house training
- private persons; for advanced vocational training purposes

## Introduction – Content and Access



The package consists of a

- **theoretical introduction** on laser scanning and data processing
- number of **case studies** in the form of
  - online tutorials
  - lesson e-books
  - decision flowcharts for procuring projects with terr. laser scanning
- languages:



Access via a didactic portal on the internet free of charge :

- \* online course
- \* download all the course material

The screenshot shows the 3D Risk Mapping website. At the top, there is a logo for '3D Risk Mapping' and a navigation menu with 'About', 'Didactics', and 'ADM'. Below the logo, there is a search bar and a language dropdown set to 'English'. The main content area is titled 'Welcome to the Frontpage' and includes an 'About us' section, a 'Main Menu' with links to Home, About us, The proposal, Activities, Didactic content, Partners, Publications, and Contact Us - EN. A 'Login' form is visible, with fields for Username (containing 'student') and Password, and a 'Login' button. The footer of the website contains the text '3DRiskMapping: Learning tools for advanced three-dimensional surveying in risk awareness, 2006-2008(c)'.

3DRiskMapping

Meshes of St James in Leuven, Belgium

Home >> Preface

**Preface**  
Written by Administrator  
Tuesday, 09 September 2008 13:50

This publication compiles training material prepared in the framework of the project 'Learning tools for advanced three-dimensional surveying in risk awareness project (3DRiskMapping)', from October 2006 to September 2008, which has been co-financed by the Flemish Agency of the European Leonardo Da Vinci programme.

This tutorial is the result of an international cooperation of a multidisciplinary group of experts from universities and industries in Europe, including:

- Mario Santana Quintero and Bjorn Van Genechten, University of Applied Sciences St Lieven (Belgium)
- Marc De Bruyne, BnS (Belgium)
- Ronald Poelman, Delftech (The Netherlands)
- Martin Hankar, GlobeZenit (Belgium)
- Simon Barnes and Huseyin Caner, Plowman Craven (United Kingdom)
- Luminita Budei, Technical University of Iasi (Romania)
- Erwin Heine and Hansjörg Reiner, University of Natural Resources and Applied Life Sciences (Austria)
- José Luis Lerma García and Josep Miquel Biosca Taronger, Polytechnic University of Valencia (Spain)

The content is based on substantial scientific research and hands-on experience in the application of terrestrial laser scanning for capturing our built environment.

The theoretical part of the tutorial has been compiled by Bjorn Van Genechten with contributions from Huseyin Caner, Erwin Heine, José Luis Lerma García, Ronald Poelman, and Mario Santana Quintero, as well as support from all participants.

**Partners**

- KH St Lieven
- GlobeZenit
- BnS
- UPV
- BOKU
- Delftech
- TU Iasi
- PlowmanCraven

**Extranet**

- BOKU 3DRiskMapping

**Didactic Portal**

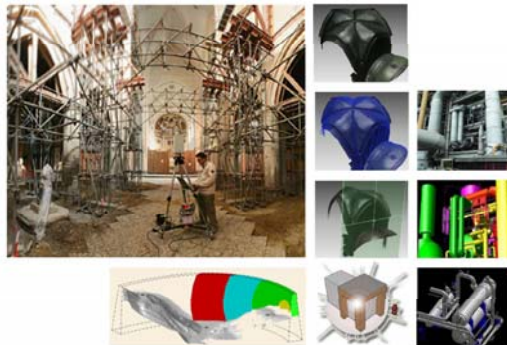
- Acknowledgements
- Preface
- How to use
- Key concepts: Glossary
- Theoretical Basics
- Decision Flowcharts
- Heritage Case Study
- Additional Case Studies
- Datasets and videoclips
- Information hub (links)
- Software demos
- Submit links
- Didactic material download

## Didactic approach

### Characteristics of the didactic approach are:

- Tutorials cover various applications
- Real data of a measured object
- Use of the most advanced laser scanning tools to address the project needs
- Sufficient case study material to illustrate common problems of TLS in practice

## Teaching Material



### Consists of:

- 1) lesson ebooks
- 2) best practice training material
- 3) decision flowcharts
- 4) an information hub

## Lesson ebooks – Theoretic basics

Are designed to procure an theoretic background on laser scanning, including:

- the process of applying adequate technology
- the application of the technology for recording three-dimensional spatial information: process of collection and registration
- the application of software to provide three-dimensional spatial information: process of modeling and visualization

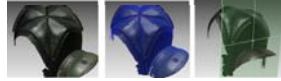


## 2 Training material – Best practice examples

designed as a hands-on training **based on real-life case studies**

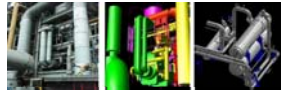
### – Heritage documentation (Church)

- Data processing and 3D modelling



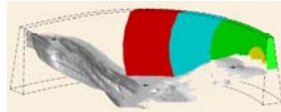
### – Industrial Case Study (FPSO vessel)

- Simulation the scan process



### – Deformation monitoring of a Dam

- Session planning and quality control



## 2 Training material – Didactic modules 1

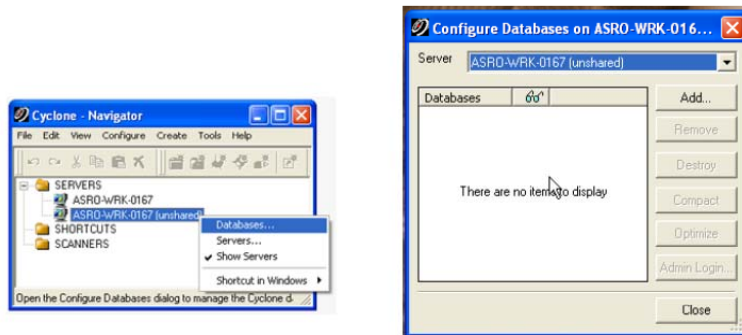
### Modular training

The pre-processed datasets offer the possibility to select individual modules for training for experienced trainees.

The trainee is guided through the entire course by:

- Interactive step-by step instructions
  - Cross-references as well as hyperlinks offer further information on the specific items.
- Video tutorials
  - the more complex processing steps are explained using short film sequences.

In the dialogue box, click the **Add...** button, then click the ... button next to **Database Filename** and browse to the scan database called: [St.James Church – Tutorial Inside – start -- Reduced.imp](#) (reduced dataset) or [St.James Church – Tutorial Inside – start.imp](#) (full dataset) . Select the \*.imp file and press the **Open** button. Back in the previous dialogue, just press the **OK** button and then press the **Close** button in the dialogue. This brings us back to the Cyclone Navigator.



Registration will be started with the inside scans. To register the inside of the Church a number of different registration techniques will be used (see video "[registration interior part1.avi](#)").

## 2 Training material – Didactic modules 2

- “To do” summary
  - to recapitulate all steps necessary to achieve the required result are available at the end of the chapters
- Self test “Question boxes”
  - The trainee is asked to explain the reasons for failures or errors that occurred during data processing
- Success control using pre-processed datasets
  - The trainee can compare the results achieved with the “correct” results at different stages of the course.

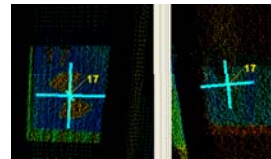
### 5.6.1.5. Finding errors

To compute the errors the scans need to be registered the scans. Open the *Registration menu* and start the *register* command. When this command is finished, the error column is filled and an error vector column has been added. These constraints can be sorted in descending order based on the error value, by clicking the header of the error column. In this way the constraints can be analysed. This shows the constraints that show high measurement errors to be examined and, if necessary, corrected manually (see video "[registration\\_interior\\_part6.avi](#)").

To Do: Sort the Error column and check the error values.

In the error column the first 4 (*reduced dataset: 2*) constraints have an error measure of more than 2 meters, also *Target 17* is involved in all these constraints. By double clicking on a constraint, *Cyclone* opens both *ScanWorlds* involved in the 2 viewers below.

Question 3: Double click the second constraint matching *ScanWorld 5* and *ScanWorld 6* and zoom to target 17. What is wrong with target 17?

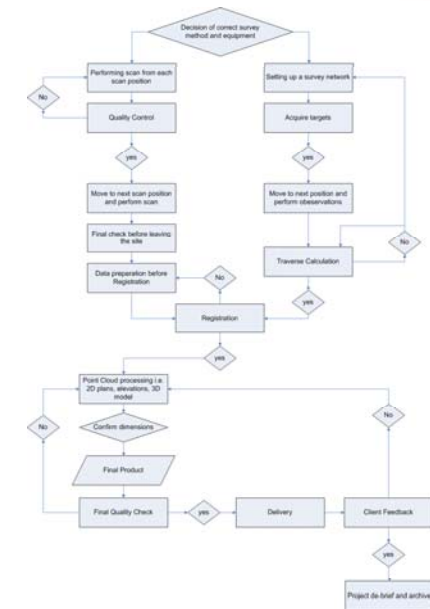


#### Success control:

The registered dataset up to here is saved in the file "[St.James Church – Tutorial Inside – Registration Finished.imp](#)" (link to reduced dataset).

## 3 Decision flowcharts

- Interactive flowcharts were developed to find adequate solutions to different questions
- are individually coordinated with the requirements of the respective processes
- each stage of the cycle provides the trainee with information on how to apply this technique adequately



## 4 Information hub\_1

VLAAMS LEONARDO DA VINCI  
AGENTSCHAP vzw

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### Didactic material

#### Documents

| Order by: <a href="#">Name</a>   <a href="#">Date</a>   <a href="#">Hits</a>   <a href="#">Ascendant</a> | Date added         |
|--|--------------------|
| Material didáctico (teoría y tutoriales) (Español)   | Hits: 2 02/13/2009 |
| Material didactic (teorie și tutoriale) Română   | Hits: 7 02/13/2009 |
| Didaktische Material (Theorie und Übungen) (Deutsch)   | Hits: 1 02/13/2009 |
| Didactisch materiaal (Teorie en tutorials) (Nederlands)  | Hits: 1 02/13/2009 |
| Didactic content: theory and case studies (English)  | Hits: 8 02/13/2009 |

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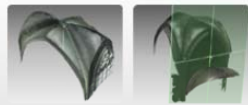
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## 4 Information hub\_2

### Information hub (links)

- Government and international organizations
- Application organizations
- Hardware and Software
- Further reading
- Visualization (3D)



## About us



3D Risk Mapping project team consists of 8 partners from 6 EU-countries, with both extensive experience in 3D-modelling and training. The partnership's experience to the project includes:

- vocational universities with different levels of specific experience and also a lot of experience with Leonardo-projects;
- surveying companies on a different scale and with different types of customers;
- expert in training and instruction in the field of 3D-scanning and modelling.

Our partners are:

- University College St Lieven (Belgium)
- GlobeZenit (Belgium)
- BnS Engineering (Belgium)
- Universidad Politecnica de Valencia (UPVLC) (Spain)
- DelftTech (The Netherlands)
- University of Natural Resources and Applied Life Sciences, Vienna - Institute of Surveying, Remote Sensing and Land Information (Austria)
- Plowman Craven (United Kingdom)
- Gh Asachi Technical University of Iasi (Romania)

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**3DRiskMapping: Learning tools for advanced three-dimensional surveying in risk awareness, 2006-2008(c)**

**Universität für Bodenkultur Wien**

**Department of Landscape, Spatial and Infrastructure Sciences**  
Institute of Surveying, Remote Sensing and Land Information

**Dr. Erwin Heine**

Peter Jordan-Strasse 82, A-1190 Vienna  
Tel.: +43 1 47654-5104, Fax: +43 1 47654-5142  
erwin.heine@boku.ac.at , <http://ivfl.boku.ac.at>