



LABORATÓRIO NACIONAL  
DE ENGENHARIA CIVIL

# INGEO 2017

7<sup>th</sup> International Conference  
on Engineering Surveying

Proceedings

Editors  
**Kopáček, A.**  
**Kyrinovič, P.**  
**Henriques, M. J.**

**October 18 - 20, 2017**  
Lisbon, Portugal



# INGEO2017

## 7<sup>th</sup> International Conference on Engineering Surveying

MONITORING  
needs and solutions

# Programme

Laboratório Nacional de Engenharia Civil  
Portugal | Lisbon | October 18 - 20, 2017



Hour	Wednesday 18 <sup>th</sup> October	Thursday 19 <sup>th</sup> October	Friday 20 <sup>th</sup> October
9:00			
9:30	Opening session	TS4	TS7
10:00	PS1		
10:30		Coffee break	Coffee break
11:00	Coffee break		
11:30		PS3	PS5
12:00	TS1		
12:30		TS5	TS8
13:00			
13:30	Lunch	Lunch	Lunch
14:00	PS2	PS4	PS6
14:30			
15:00			
15:30	TS2	TS6	TS9
16:00			
16:30	Coffee break	Coffee break	Closing session
17:00	TS3		
17:30		Visit to Lisbon	
18:00	Poster		
18:30			
19:00	Conference Dinner		
19:30			
20:00			
20:30			
21:00			
21:30			

18<sup>th</sup> Oct., Wednesday

9h30

Opening Ceremony

10h00

PS1

## Civil Engineering Structures / Terrestrial Laser Scanning

Chair: Wolfgang Niemeier

### Do we need structural monitoring?

*José Manuel Catarino*

### 3D congruency – the point cloud problem

*Thomas Wunderlich*

Coffee Break

11h30

TS1

## Monitoring of Civil Engineering Structures I

Chair: Rinaldo Paar

Co-chair: Teresa O. Santos

### As-built documentation of anchor blocks of facade elements using TLS

*Ján Erdélyi, Alojz Kopáček and Peter Kyrinovič*

*This is a peer reviewed paper*

### Combined use of non-destructive methods for the survey of facades anomalies of heritage buildings with structural concrete elements

*José Dias, Luís Matias, Maria João Henriques, Maria Ribeiro and Teresa Santos*

*This is a peer reviewed paper*

### Estimation of wooden coefficient of expansion due to temperature and moisture with geodetic sensors

*Annette Schmitt and Volker Schwieger*

### Determining the non-verticality of tall chimneys using the laser scanning approach

*Aleš Marjetič and Gašper Štebe*

*This is a peer reviewed paper*

### Measurements of geometry of internal flues in multi-flue chimneys

*Edyta Puniach*

Lunch

14h00

PS2

## Historical Buildings / Potential of Classical Methods

Chair: Thomas Wunderlich

### Monuments and historic buildings: Applications and challenges in structural engineering

*Paulo B. Lourenço*

### The potential of classical surveying methods for health care monitoring of large structures

*Alojz Kopáček*

15h00

TS2

## Monitoring of Civil Engineering Structures II

Chair: Helena Cruz

Co-chair: Ján Erdélyi

Using IATS and digital levelling staffs for the determination of dynamic displacements and natural oscillation frequencies of civil engineering structures

*Rinaldo Paar, Ante Marendic, Andreas Wagner, Wolfgang Wiedemann, Thomas Wunderlich, Miodrag Roic and Domagoj Damjanovic*

*This is a peer reviewed paper*

Uncertainty evaluation of deflection measurements from FWD tests on road pavements

*José Neves and Edgar Cardoso*

*This is a peer reviewed paper*

Visual inspection automation with image processing

*Ana Fonseca, Dora Roque, Maria João Henriques and José Muralha*

Automated geodetic monitoring systems in new hydropower plants

*Elisa Almeida, Daniel Pimentel, David Fernandes, Carlos Pestana and Ricardo Araújo*

Assessment of cracks on concrete dams by image processing: the case-study of Itaipu dam, at the Brazil-Paraguay border

*Jónatas Valença and Eduardo S. Júlio*

*This is a peer reviewed paper*

**Coffee Break**

17h00

TS3

## Monitoring of Historical Buildings

**Chair: Paulo B. Lourenço**

**Co-chair: Peter Kyrinovič**

Monitoring the behaviour of MEO Arena roof

*Maria João Henriques, Helena Cruz, Dora Roque and Ana Fonseca*

*This is a peer reviewed paper*

Displacement and surface pathology monitoring of former Tejo Power Station building by combining terrestrial laser scanning, micro-geodesy, photogrammetry and GIS

*Adriano Oliveira, João Boavida and Bruno Santos*

Vertical displacements of engineering structures during reconstruction: Classification and prediction models

*Roman Shults*

17h45

Poster Session

**Chair: Alojz Kopáček**

Trigonometric levelling at extremely short lines of sight

*Zarko Nestorovic*

Comparison of 3D laser scanning and classical survey data deformation analysis of industrial facilities in oil refinery

*Almin Dapo, Luka Babic, Bosko Pribicevic and Antonio Antunovic*

Point cloud classification and track centre determination in point cloud collected by MMS on rail

*Elzbieta Pastucha*

Three years of monitoring using leveling and hybrid gravimetry applied to the geothermal sites of Soultz-sous-Forêts and Rittershoffen, Rhine Graben, France

*Gilbert Ferhat, Nolwenn Portier, Jacques Hinderer, Marta Calvo Garcia-Maroto, Yassine Abdelfettah and Umberto Riccardi*

19h00

**Dinner**  
(Travel by bus)

19<sup>th</sup> Oct., Thursday

9h00

TS4

## Concepts, New Technology and Software Development I

**Chair: Hans Neuner**

**Co-chair: Ante Marendic**

Fusion of laser-scan and image data for deformation monitoring – Concept and perspective

*Andreas Wagner, Wolfgang Wiedemann and Thomas Wunderlich*

*This is a peer reviewed paper*

The influence of different LocataNet configurations on positioning accuracy

*Igor Grgac, Rinaldo Paar, Ante Marendic and Ivan Jakopc*

*This is a peer reviewed paper*

A new approach to long-distance EDM: using intermode beating of broadband ultrashort laser pulses

*David Salido Monzú and Andreas Wieser*

*This is a peer reviewed paper*

Synchronization routine for real-time synchronization of robotic total stations

*Zan Gojcic, Slaven Kalenjuk and Werner Lienhart*

*This is a peer reviewed paper*

Deformation monitoring in the Internet of Things. Implementation of a multi-platform software package for modern sensor networks in engineering geodesy

*Philipp Engel*

*This is a peer reviewed paper*

**Coffee Break**

11h00

PS3

## Geotechnical Works / Ground Based Radar Interferometry

**Chair: Ana Fonseca**

**The role of monitoring in geotechnical works**

*Ana Quintela*

**Potential of Space Based and Ground Based Radar Interferometry for Deformation Monitoring**

*Wolfgang Niemeier*

12h00

TS5

## Monitoring of Geological and Hydrological Hazards

**Chair: Ana Quintela**

**Co-chair: Stella Pytharouli**

Deformation monitoring of Kostanjek landslide in Croatia using multiple sensor networks and UAV

*Ante Marendić, Rinaldo Paar, Hrvoje Tomić, Miodrag Roić and Martin Krkač*

*This is a peer reviewed paper*

Geodetic monitoring of the Adroit landslide, Barcelonnette, French Southern Alps

*Gilbert Ferhat, Jean-Philippe Malet, Anne Puissant, Delphine Caubet and Emilie Hubert*

*This is a peer reviewed paper*

Multi-method monitoring of the large and rapidly developing Pas de l'Ours landslide - Queyras, France

*Floriane Provost, Pierrick Bornemann, Elouan Faustin, Jean-Philippe Malet,*

*Clément Hibert, Anne Puissant, Marc Fleck, Gilbert Ferhat, Pascal Diot and Vincent Ségel*

Lunch

14h00

PS4

## Maritime Structures / Augmented Reality

**Chair: Ana Fonseca**

**Application of stereo-photogrammetric methodologies to the design and monitoring of maritime structures**

*Conceição Juana Fortes*

**Virtual and Augmented Reality: from the Lab to the Wild**

*Alfredo Ferreira*



15h00

TS6

## Monitoring of Coastal Structures

**Chair: Conceição Juana Fortes**

**Co-chair: José Nuno Lima**

**Towards a mobile monitoring tool for coastal structures inspection: The Ericeira rubble-mound breakwater test case**

*Rui Capitão, Alexandre Maia, Rute Lemos, Armanda Rodrigues and Conceição Juana Fortes*

*This is a peer reviewed paper*

**The monitoring of rubble mound breakwaters. An assessment of UAV technology**

*Maria João Henriques, Rute Lemos, Rui Capitão and Conceição Juana Fortes*

*This is a peer reviewed paper*

**The use of UAVs in engineering geological surveys: mapping along Scotland's south-west coast**

*Olympia Tziavou, Stella Pytharouli and Jock Souter*

**Survey of a two-dimensional scale model of a rubble-mound breakwater using different stereo-photogrammetric techniques**

*Rute Lemos, Maria João Henriques, António Muralha, Ricardo Jónatas, Conceição Juana Fortes and Rui Capitão*

*This is a peer reviewed paper*

## Coffee Break

16h30

## Visit to downtown Lisbon

(Travel to the meeting point with the guides by subway)

20<sup>th</sup> Oct., Friday

9h00

TS7

## Terrestrial Laser Scanning

**Chair: Volker Schwieger**

**Co-chair: David Salido Monzú**

Evaluating the freeform modelling of point clouds by means of a test specimen

*Corinna Harmening, Gilles Teodori and Hans Neuner*

*This is a peer reviewed paper*

Using point cloud comparisons for revealing deformations of natural and artificial objects

*Christoph Holst, Lasse Klingbeil, Felix Esser and Heiner Kuhlmann*

*This is a peer reviewed paper*

Geodetic surface based methods for applications in civil engineering

*Claudius Schmitt, Benjamin Kromoser, Corinna Harmening, Johannes Falkner, Hans Neuner and Johann Kollegger*

*This is a peer reviewed paper*

Simplicity is the New Black: The BLK360 Story

*Vanda Kadlečíková*

TLS Data Georeferencing - Error Sources and Effects

*Jelena Pandžić, Marko Pejić, Branko Božić and Verica Erić*

*This is a peer reviewed paper*

Coffee Break

11h00

PS5

## Bridge Monitoring / GNSS Applications

**Chair: Alojz Kopáček**

**Dynamic Response of Bridges and its Monitoring Needs**

*Milan Sokol*

**GNSS: tools to monitor a dynamic Earth**

*Virgilio Mendes*

12h00

TS8

## Radar Interferometry Applications

**Chair: Heiner Kuhlmann**

**Co-chair: Dora Roque**

The use of InSAR technology to monitor ground and structural displacements

*Josep Raventos, Carles Couso and Javier Garcia*

*This is a peer reviewed paper*

Merging GBSAR and topographic surveys to measure pier deformations

*Giovanni Nico, Andrea Di Pasquale, Gianluca Miccoli and Filippo Maria Soccodato*

Ground based Synthetic Aperture Radar (GBSAR) interferometry: which advantages for the monitoring of concrete and earth-filled dams?

*Giovanni Nico, Marco Corsetti, Alfredo Pitullo and Andrea Di Pasquale*

Lunch

14h00

PS6

## Concrete Dams / UAV Applications

**Chair: António Batista**

**The role of survey methods in the monitoring of concrete dams**

*Domingos Silva Matos*

**Assessing exposure of infrastructure to natural hazards using unmanned aerial systems: case studies from the Andes, Portugal, Antarctica and Cape Verde**

*Gonçalo Vieira*

15h00

TS9

## Concepts, New Technology and Software Development II

**Chair: Gonçalo Vieira**

**Co-chair: Ján Erdélyi**

Monitoring system using low cost GNSS sensors: first experiments and performance evaluation

*Stefano Gandolfi, Luca Poluzzi and Luca Tavasciò*

A Bayesian procedure for analysis of short permanent GNSS baselines

*José Nuno Lima and João Casaca*

Systematic error elimination of inertial sensors using rotating platforms

*Lubica Erdélyiová, Pavol Kajánek and Alojz Kopáček*

Multi-sensor based augmented virtuality immersive technologies for large scale metrology applications

*Theodoros Xenakis, Vassilis Gikas and George Kaisarlis*

Assessment of accuracy of basic manoeuvres performed by an unmanned aerial vehicle during autonomous flights

*Pawel Cwiakala*

16h30

Closing Ceremony

# Sponsors

Platinum

- when it has to be **right**



---

Gold



---

Silver

