INACHUS: Technological and Methodological Solutions for Integrated Wide Area Situation Awareness and Survivor Localisation to Support Search and Rescue (USaR) Teams

INACHUS Project Press Release

July 3, 2017

The second INACHUS field test, held on May 31st 2017 in Lyon, France, demonstrated the project's Wide Area Surveillance solutions and Collapse Modelling tools to an audience of 16 end users specialised in USAR operations and structural engineers from Sweden, Belgium, the Netherlands and France.

In collaboration with CARDEM (http://www.cardem.fr/fr) demolition company, INACHUS partners identified a building in Saint-Fons appropriate for the 2nd field test and created a scenario for its collapse that mimicked earthquake conditions.

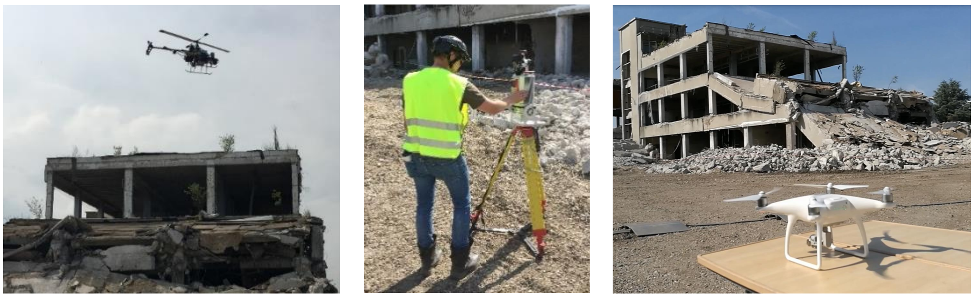
Before and after partial collapse

One of the goals of the field test was to demonstrate that INACHUS technological solutions could help USaR professionals to improve their situational awareness. This should be achieved by creating 3D models of the target building, which could in return:

- Aid in damage assessment
- Identify the location of potentially voids in an easier way
- Assess the stability of the structure
- Aid in determining possible rescue paths

(Wide area) Surveillance Tools and 3D Mapping

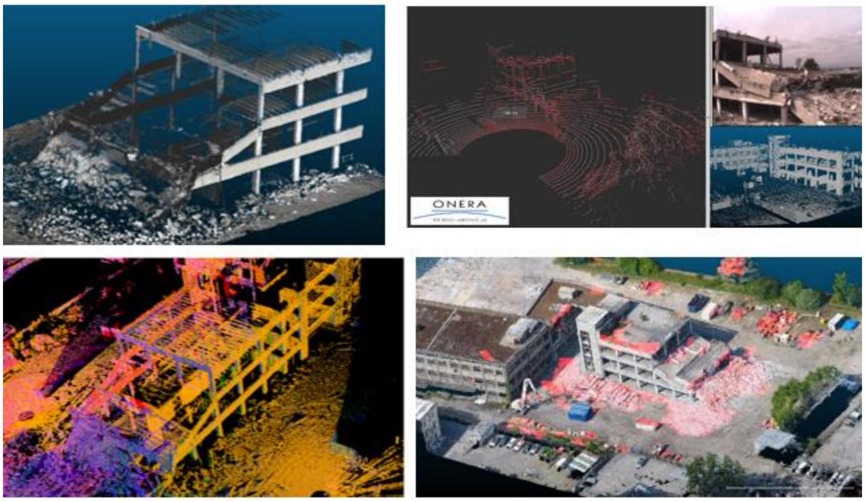
During the field test, end users had the chance to observe the imagery and 3D models created by INACHUS tools. Two UAV flights, one with a laser scanner and another with an optical digital camera, took place over the collapsed building. The same set up could easily be applied for wide-area surveillance of an entire affected area following an earthquake. Data was also collected from a ground-based laser scanner. The three data sets were then combined, and each served to highlight different features of the collapsed building.



Laser scanners; UAV (ONERA, left) and ground-based (FOI, centre), UAV with digital optical camera (ITC, right)

The laser scanners were using their ability to distinguish between different types of objects, for example, people, various building materials, vegetation, even precipitation and identifying large pieces of (building) material within the overall rubble pile.

Consequently, end users were provided with the ability to identify and highlight items in various colours and thus have a clearer understanding of the rubble pile. This is very important as it can help rescuers to get a clear view of the rubble and assist in determining the stability of the structure. It should be noted that the laser does not rely on bright conditions, but uses its own light.



Ground based laser scanner results (top left), results from UAV laser scanner (top right). Laser scan of the structure's skeleton (bottom left), UAV camera images with damaged areas (bottom right)

The UAV imaging tool on the other hand, provides quickly an image of the collapsed building, identifying the damaged areas, establishing a percentage of destruction and helping to prioritize the zone of intervention for USAR teams.

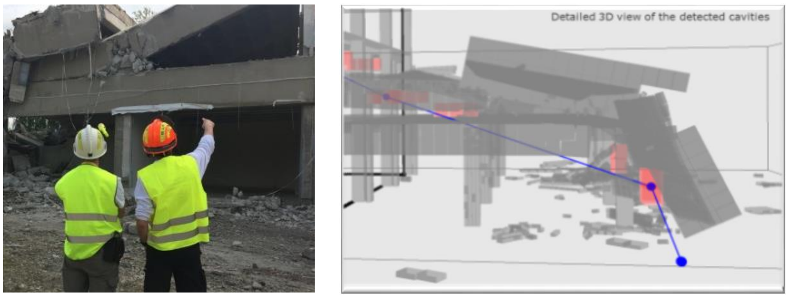
Building Collapse Simulation Software

In the field test, participants could also get a glimpse of the INACHUS tools that simulate building collapse caused from an earthquake or explosion. INACHUS partner ASI created a pre-demolition 3D model of the target building based on precise measurements taken from a site visit. Applying within the INACHUS tools, the known variables of the explosion provided by the demolition company led to a model that matched in a very large scale the actual rubble pile. The tool's purpose is to aid USaR teams in finding possible survivable spaces within a collapsed structure when applying the phenomenon variables in the INACHUS simulation tools.

Frames from a video sequence of the actual collapse and INACHUS collapse simulation software

Voids detection

The primary goal of the field test was to determine if INACHUS technological solutions could identify possible voids in the rubble where victims may be able to survive, or which rescuers could use when entering the rubble.

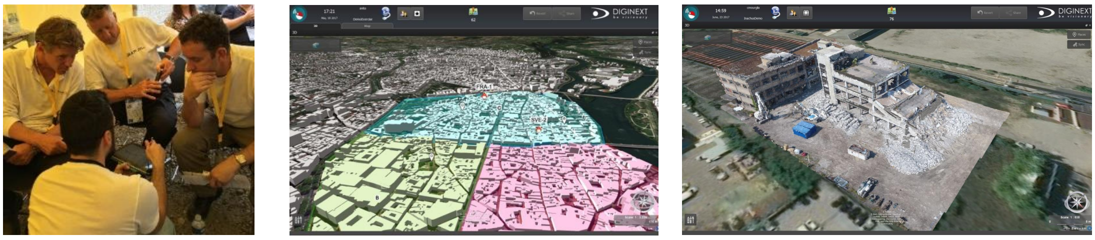


Participants discussing the possible presence of hidden voids (left), EMI's representation of voids (in pink) detected by the model.

After a visual investigation of the building, the end users could evaluate whether the pile of rubble and the present voids corresponded with the INACHUS models and simulation results. Participants could experience that the models offered a realistic view of the collapsed building and the possible voids within it. End-users participating in the event agreed that INACHUS could aid in decisions related to victim localisation and structural integrity during USaR-missions.

Emergency Support System (ESS) and Common Operational Picture (COP) Interface

Finally, progress on the ESS was shown, allowing participants to digitally complete the INSARAG forms required during large-scale response missions. With INACHUS, data is shared instantly and can be used by various levels of command to greatly improve situational awareness and response coordination. Further aiding in these areas is the COP interface, which shows sectors and corresponding activity within sectors. Moreover, the 3D point clouds and simulation models could be visualized in the post-processing stage of the pilot demonstration, which demonstrates the effort that is made within the project with regard to the integration of the project tools. Participants were very interested in the development of these tools, which they anticipate adding significant value to their current operations.



End users tested the digital INSARAG forms in INACHUS* ESS software *(left); Screenshot from INACHUS* COP *interface showing sector and 3D buildings (centre) and acquired 3D point cloud and the geo-referenced simulation model (right).

All end users participants reacted positively to project developments shown in Lyon. They offered useful feedback for continued progress and expressed interest in remaining involved in the project's development.

The focus of the first field test, held in Ågesta, Sweden in June 2016, was on victim localisation tools. The focus of the second field test was on wide area assessment tools and collapse modelling tools. A third field test will be held in April, 2018 in Netherlands, demonstrating the first integrated version of the INACHUS tools. The project's final field test, to be held along the French and Italian border in Winter, 2018, will demonstrate the fully integrated INACHUS system.

For more information about INACHUS project please visit our website (https://www.inachus.eu/) or contact the Project Coordinator **Dr. Angelos Amditis** (a.amditis@iccs.gr), ICCS Research Director and Head of I-Sense Group.

Keep up with INACHUS' latest progress by following us on social media:
Facebook (https://www.facebook.com/pages/Inachus-USaR-Research-Project)
Twitter (https://twitter.com/InachusUsar)
LinkedIn (https://www.linkedin.com/grp/home?gid=8385769&trk=my_groups-tile-grp)
YouTube (https://www.youtube.com/channel/UCBz08Jf7tVT08x5LevztXcQ).

Editor notes

Duration:	1 January 2015 - 31 December 2018
Total cost:	13.944 267,76€
EC contribution:	9.885.037,58€
	"This project has received funding from the European Union's Seventh Framework Programme for research, technological
Coordinator:	Institute of Communication and Computer Systems, (ICCS), Dr. Angelos Amditis
Partners:	• **Institute of Communication and Computer Systems** (ICCS), http://i-sense.iccs.ntua.gr/ • **EXODUS S.A** (EXUS), , https://www.exodussa.gr/ • **Totalförsvarets Forskningsinstitut** (FOI), http://www.foi.se

	• **Crisisplan B.V.** (CBV), http://www.crisisplan.nl • **Office National D'etudes Et De Recherches Aerospatiales** (ONERA), http://www.onera.fr • **IK4-TEKNIKER** (TEK), http://www.tekniker.es/ • **Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut** (EMI), http://www.emi.fraunhofer.de/ • **Cinside AB** (CINSIDE), http://www.cinside.se • **Applied Science International Europe SRL** (ASI), http://www.appliedscienceint.com/ • **DIGINEXT** (DXT), http://www.diginext.fr • **Laurea University of Applied Sciences** (LUAS), https://www.laurea.fi • **Entente Pour la Foret Méditerranéenne** (EPLFM), http://www.entente-valabre.com/ • **Specialistisch bijstandsteam (USAR.nl),** https://www.usar.nl/ • **Stiftelsen SINTEF** (SINTEF), http://www.sintef.no/ • **University of Twente, Department of Earth Systems Analysis, Faculty of Geo-Information Science and Earth Observation** (ITC), http://www.utwente.nl • **Schüßler-Plan Ingenieurgesellschaft MBH**, ScPl, http://www.schuessler-plan.de • **Södertörns brandförsvarsförbund** (SBFF), http://www.sbff.se/ • **TELINT RTD Consultancy Services LTD** (TELINT), http://www.telint.eu/ • **BYTE COMPUTER S.A.** (BYTE), http://www.byte.gr • **Micro2Gen** (M2G), http://micro2gen.com/