



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS

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**RESEARCH-TECHNOLOGY - INNOVATION
FOR SUSTAINABLE GROWTH**

Robotics in manufacturing industry

The cost-effective and rapid deployment of mobile robots in manufacturing SMEs and Mid-Caps through virtualization, is the goal of L4MS program



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Robotics in manufacturing industry

L4MS is an acceleration program for European Manufacturing SMEs and Mid-Caps to automate the intra-factory logistics. It is a one-stop-shop to get all technical and non-technical services needed.

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L4MS

Smart logistics for manufacturing



The goal of L4MS is to reduce the time and set-up cost of mobile robots by a factor of 10 for manufacturing companies. It provides complete virtualization of logistics automation with OPIL (Open Platform for Innovation in Logistics) together with a 3D simulator, to enable cost-effective deployment of exceptionally small flexible logistics solutions. It is extremely important that those solutions require no infrastructure change, no production downtime, and no in-house expertise.

The L4MS, has launched its first Open Call with €1.5million equity-free funding. The Open Call

for Application Experiments (AEs) will validate the cost-effective and rapid deployment of mobile robots in manufacturing SMEs and Mid-Caps through virtualization.

The Open Call for Application Experiments will validate the cost effective and rapid deployment of mobile robots in manufacturing SMEs and Mid-Caps through virtualization

“The experiments will demonstrate the value of the solution to really reduce the installation, deployment and configuration time and cost by a factor of 10. Automation of logistics will not only boost the productivity of manufacturing SMEs and Mid-Caps (reducing the production cost by

50%) but will also provide unprecedented flexibility on the factory floor for batch production”, points out **the Director of the nZEB Smart Home and of the Information Technologies Institute Dr. Dimitris Tzouvaras**

“**Automation of logistics** will not only boost the productivity of manufacturing SMEs and Mid-Caps (reducing the production cost by 50%) but will also **provide unprecedented flexibility** on the factory floor for batch production, **Director of the nZEB Smart Home and of ITI/CERTH, Dimitris Tzouvaras**

The CERTH/ITI participates in the L4MS program through its "nZEB Smart Home", which is also a Digital Innovation Hub. CERTH/ITI as a Satellite Node of the L4MS Network, offers its "**nZEB Smart Home**" Digital Innovation Hub to act as a digital innovation rich environment for deploying, evaluating and validating third-party solutions.

The CERTH/ITI nZEB Smart Home is a rapid prototyping & novel technologies demonstration infrastructure resembling a real domestic building where occupants can experience actual living

scenarios while exploring various innovating smart IoT-based technologies with provided Energy, Health, Big Data, Robotics and Artificial Intelligence (AI) services.

The near-Zero Energy Smart Home of CERTH/ITI is the first house in Greece that combines enhanced construction materials and intelligent ICT solutions creating a future-proof, sustainable and active testing, validating and evaluating environment.



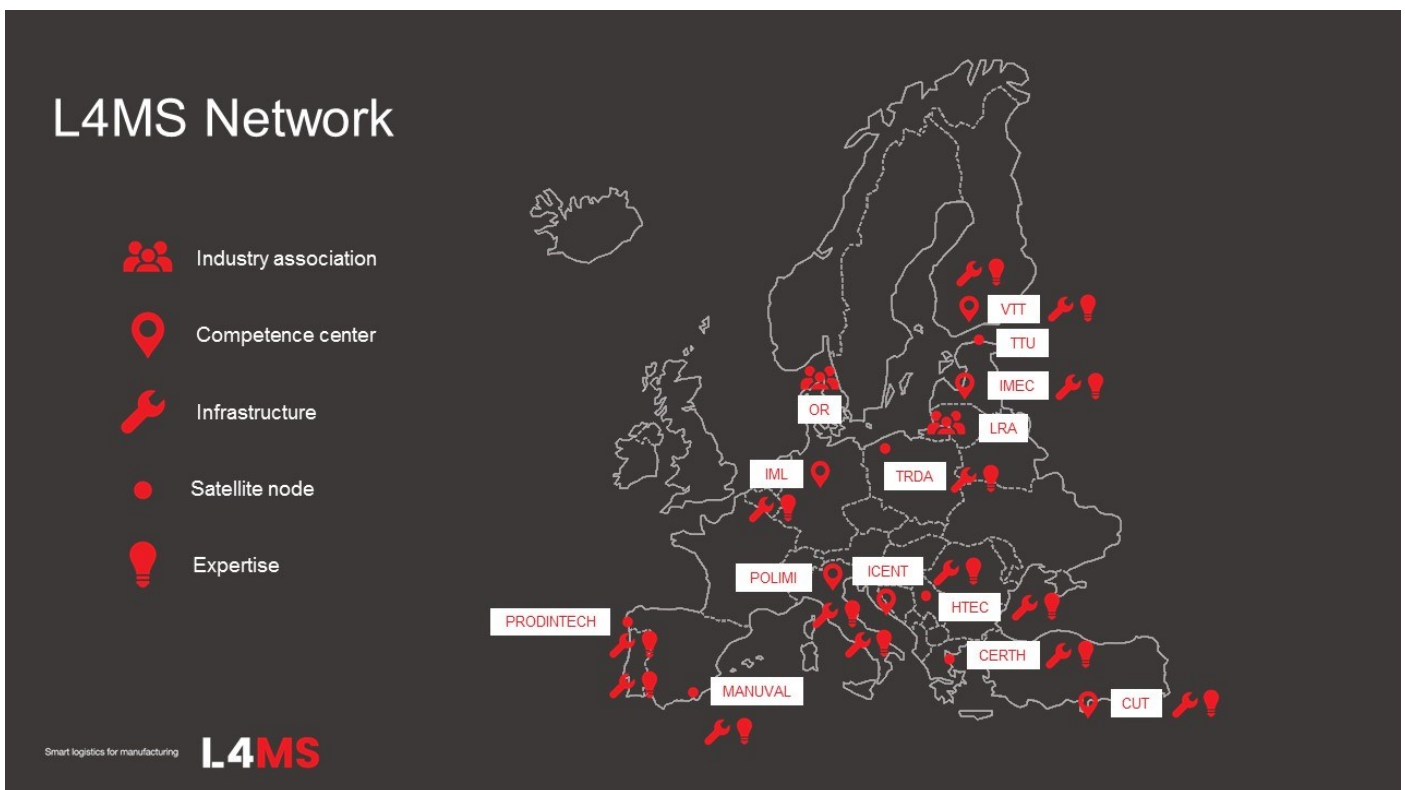
The CERTH/ITI nZEB Smart Home

With the purpose of "nZEB Smart Home" being the evolution of technology, inside the house can be found prototype robotic systems as well as various innovative technologies based on the "Internet of Things" network.

Since a prerequisite for submitting a proposal to the Open Call of the project is to create a consor-

tium between at least one industry and an organization, the "nZEB Smart Home" ecosystem consists the most suitable infrastructure to collaborate with during the program in order to deploy, evaluate and validate new technologies on numerous sectors", underlines Dr. Dimitris Tzovaras


“With the purpose of **"nZEB Smart Home"** being the evolution of technology, inside the house can be found **prototype robotic systems** as well as various innovative technologies based on the **"Internet of Things"**, Director of the nZEB Smart Home and of ITI/CERTH, Dimitris Tzovaras



The Pan-European network of service providers, in the framework of L4MS program

The L4MS offers Funding and Testing, Design support (ex: digitalization of logistic chain) OPIL integration, Trainings. The deadline for the Open Call is the 7th December 2018.

If you are interested, and you would like to challenge a spot in the program, please find more information on smarthome.iti.gr and l4ms.eu, or contact us at smarthome@iti.gr



Subjective Cognitive Decline: The vague sense of standing on a threshold

Greek researchers investigated whether specific brain regions, which have been found to be highly activated after negative facial stimulus, are also activated in different groups of people with **subjective cognitive impairment (SCI)**, mild cognitive impairment (MCI) and Alzheimer's Disease (AD) compared to healthy controls (HC). The endeavor to detect the very early signs of dementia with the possibility of developing interventions to slow its progression has provided the impetus for increased interest in **SCI**. **Ioylietta Lazarou**, psychologist—clinical researcher at the Information Technologies Institute talks about Subjective Cognitive Decline as well as the difficulty of its diagnosis.

INTERVIEW: **AMALIA DROSOU**

Ms. Lazarou, Subjective Cognitive Decline, has a central position in your study. Why is it so important?

Subjective Cognitive Decline has gained great interest the last decade since it is considered as a very interesting field of study in neuroscience. In particular, the emergence of anxiety that occurs in the elderly when they start to forget while there is no organic or objective etiology has been considered to be of the utmost importance with a high predictive value for Alzheimer's disease. Just keep in mind that about 6.6% and 2.3% of individuals with Subjective Cognitive Decline are switching to the stage of Mild Cognitive Impairment and Alzheimer's disease respectively within a year.

The study shows that SCI does not base neither on organic nor on objective indicators. How difficult is to diagnose it?

Indeed, people with Subjective Cognitive Decline have values within normal range in both neuropsychological tests and clinical - neurological examination, which is also a key criterion for categorizing them as such. In daily clinical practice, the elderly may have been misdiagnosed as healthy rather than with Subjective Cognitive Decline, and many of the apparently clinically and mentally healthy but having subjective complaints have been evolved to the Alzheimer's disease stage after some time.



Therefore, the diagnosis of Subjective Cognitive Decline due to Alzheimer's disease is a great challenge not only for research purposes but also for the everyday clinical practice. Unfortunately, the neuropsychological tools which are being used today in order to identify dementia-related cognitive impairment are not sufficiently sensitive to detect this relative small cognitive impairment that occurs in

people with Subjective Cognitive Decline. Therefore, many attempts have been made so far in order to determine the Subjective Cognitive Decline, but it is still a "grey territory" with no a specific biomarker to accurately indicate the diagnosis or which are the characteristics of the individuals who will be switched to dementia after some time.

“ In particular, **the emergence of anxiety** that occurs in the elderly when they start to forget while there is no organic or objective etiology has been considered to be of the **utmost importance with a high predictive value** for Alzheimer's disease

Which methods did you use while conducting your study?

All of our participants were selected with specific criteria for joining one of the four groups and tested with all required clinical and neuropsychological tests by Professor Magda Tsolaki (A 'Neurological Clinic of AHEPA) and her scientific team to categorize them as Healthy Controls, Subjective Cognitive Decline, Mild Cognitive Impairment or Alzheimer's disease. Inclusion and exclusion criteria as proposed by the SCD-I Working Group have been applied so that participants with Subjective Cognitive Decline are due to Alzheimer's disease - related cognitive decline and not of other cause (e.g., Depression). Then our MKLab in CERTH - ITI, led by Researcher A Dr. Ioannis Kompatsiaris and the researchers Dr Spyros Nikolopoulos, Katerina Adam and Kostas Georgiadis, performed the examination of all participants using the high density EGI GES 300 electroencephalogram with 256 electrodes to study potential changes of brain function among groups, after the presentation of negative emotion facial stimuli. In total, we presented 34 images of human faces with negative emotions (Anger and Fear) and we

seek for any differences in ground of the amplitude and latency of event related potential component N170.

Ms. Lazarou, could you share with us the results?

The results of our study showed significant differences both in response as well as the intensity of activation of specific brain areas between the healthy controls and the participants with Subjective Cognitive Decline, Mild Cognitive Impairment and Alzheimer's disease. Significant differences were also found in the topographic analysis, which confirmed these observations, since the severity of the disease was found to significantly affect the activation of specific regions of the brain. In particular, less activation was observed in the frontal and temporal lobe of participants with Subjective Cognitive Decline compared to healthy controls, a finding which implies that the apparent brain organization of people with Subjective Cognitive Decline is similar to the other two groups (Mild Cognitive Impairment and Alzheimer's disease), showing intermediate values between Healthy Controls and Mild Cognitive Impairment.



Preparation and presentation of the experimental procedure to the participant by the researcher

“ In total, we presented 34 images of human faces with negative emotions—**Anger and Fear** and we seek for any differences in ground of the **amplitude and latency** of event related potential component N170

In which way all these results help you address the disease in the future?

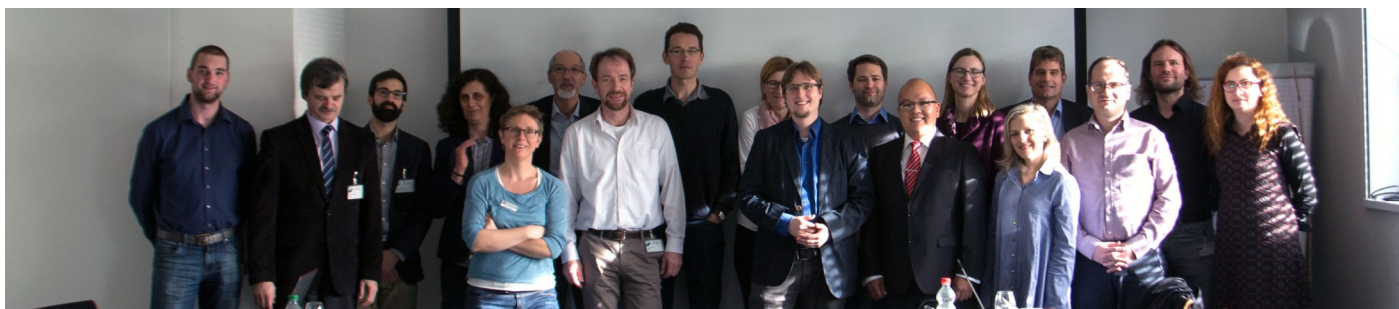
One has to think that 1 out of 20 elders over 65 is being affected by Alzheimer's disease and 1 in 2 people over 85 suffer from the disease. Unfortunately, to date there is no existing medication to inhibit the progression of the disease. Therefore, early diagnosis of Subjective Cognitive Decline and the application of tests that will show us from the beginning who will be developed into Mild Cognitive Impairment or Alzheimer's Disease is one of the greatest challenges currently in Alzheimer's research. The development of specific guidelines for an accurate and timely diagno-

sis using specific biomarkers based on the knowledge about the causes of Subjective Cognitive Decline, will contribute towards to the improvement of the mental state of the elderly population over time. The findings of our study demonstrate that by using advanced neuroimaging techniques, we can get information about brain function and those areas that are more susceptible to the early stages of the disease, with the ultimate goal of slowing down the progress of Alzheimer's disease pathology.



Power to gas: **Green hydrogen**

Green hydrogen produced by electrolysis might become a key energy carrier for the implementation of renewable energy as a cross-sectional connection between the energy sector, industry and mobility. [Proton exchange membrane](#) (PEM) electrolysis is the preferred technology for this purpose, yet large facilities can hardly achieve FCH-JU (Fuel Cells and Hydrogen Joint Undertaking) key performance indicators (KPI) in terms of cost, efficiency, lifetime and operability. Consequently, a game changer in the technology is necessary.



PRETZEL consortium will develop a 25 kW PEM electrolyzer system based on a patented innovative cell concept that is potentially capable of reaching 100 bar pressure. The electrolyzer will dynamically operate between 4 and 6 A/cm² and 90°C achieving an unprecedented efficiency of 70%. This performance will be maintained for more than 2,000 h of

operation. Moreover, the capital cost of stack components will be largely reduced by the use of non-precious metal coatings and advanced ceramic aerogel catalyst supports. Likewise, the system balance of plant (BoP) will be optimized for cost reduction and reliability.



PRETZEL targets will be pursued in a 3 years research effort with a budget of 2 M€ funded by the European Fuel Cells and Hydrogen Joint Undertaking – FCH JU. The consortium is:

- **DLR:** Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany (project coordinator)
- **WHS:** Westfälische Hochschule Gelsenkirchen, Bocholt, Recklinghausen, Germany
- **ARMINES:** Association pour la Recherche et le Développement des Méthodes et Processus Industriels, France
- **UPT:** Univesitatea Politehnica Timisoara, Romania
- **Adamant Composites Ltd.,** Greece
- **GKN Sinter Metals Filters GmbH** Radevormwald, Germany
- **CERTH:** Centre for Research and Technology-Hellas, Greece
- **IBERCAT:** Soluciones Catalíticas Ibercat, S. L., Spain
- **iGas Energy GmbH,** Germany

The project at CERTH is realized by and in the **Laboratory of Process Systems Design and Implementation (PSDI)** of the Chemical Process and Energy Resources Institute.



Researchers' Night 2018 in Thessaloniki: People at the center of Research!

This year's Researchers' Night in Thessaloniki attracted for one more time thousands of visitors who explored the enchanting world of science by witnessing numerous technological advances. The event was organized by the Centre for Research and Technology Hellas with the support of the European Union and took place at Thessaloniki Concert Hall, on September 28, 2018.



More specifically during this the open science event, visitors of all ages walked around the Interactive Technology Exhibition, where they had the opportunity to find out about the RAMPCIP project, the Robotic Assistant for patients suffering from Mild Cognitive Impairment as well as the support of “my AirCoach”

project offers to asthma patients addressing their needs on daily basis. Moreover, visitors got involved in the development of sustainable travel plans in the city of Thessaloniki and got informed by the researchers about the Precision Network Medicine in Oncology and the emerging opportunities for Greece.



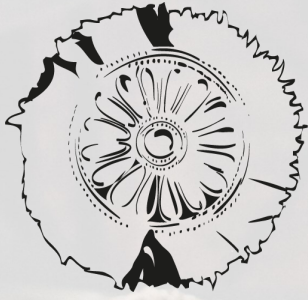
It is important to be mentioned that this year's night event concluded projects to mark the European Year of Culture Heritage 2018. In this context visitors had the chance to explore among others how science and research –through the Scan4Reco project for instance– can be used for the benefit of heritage and to experience a walk around the historical square Gendarmenmarkt of Berlin inside a virtual reality environment.

During the night people had also the opportunity to engage themselves in a variety scientific experiments of Physics, Chemistry and Biology. What was notable was the keen interest of the younger participants, who explored the joy of research through plentiful digital research games.



This year's Researchers' Night featured the music band The Dude and singer Alexandra Sieti, who entertained the visitors by covering a wide range of sounds including funk, blues and jazz. The event closed with "The Street Value of Science", a scientific and musical journey, where Thanasis Konstandopoulos from CERTH pointed out the importance of research to society underlining at the same time the crucial role of music and the arts in general. In

this context he presented in a simple way research topics arising from the great challenges of our time accompanied by live music by one of Europe's most dynamic Blues Rock groups, "Nikos Dounousis and the Backbone". The Street Value of Science, also participated in the central program of the Athens event through its live broadcast at the National Technical University of Athens.



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The **Centre for Research and Technology-Hellas (CERTH)** founded in 2000 is one of the leading research centres in Greece and listed among the TOP-20 E.U. institutions with the highest participation in competitive research grants.

Today CERTH includes the following five institutes with indicated major fields of research:

- **Chemical Process and Energy Resources Institute (CPERI)** Sustainable & Clean Energy, Environmental Technologies, Chemical & Biochemical Processes, New Functional Materials
- **Information Technologies Institute (ITI)** Informatics, Telematics and Telecommunication Technologies, Safety and Security
- **Hellenic Institute of Transport (HIT)** Smart Sustainable Mobility, Transport Safety
- **Institute of Applied Biosciences (INAB)** Agri-biotechnology, Health Translational Research, Informatics for big bio-data
- **Institute for Bio-economy and Agri-Technology (IBO)** Bio-economy, Agri-technology

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