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UNIVERSIDAD POLITÉCNICA DE MADRID

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UPM INNOVATECH

Technical University of Madrid innovative research

Microalgae, a sea of solutions for global issues

Contents

HIGHLIGHTS

Technology investment trends in the United States

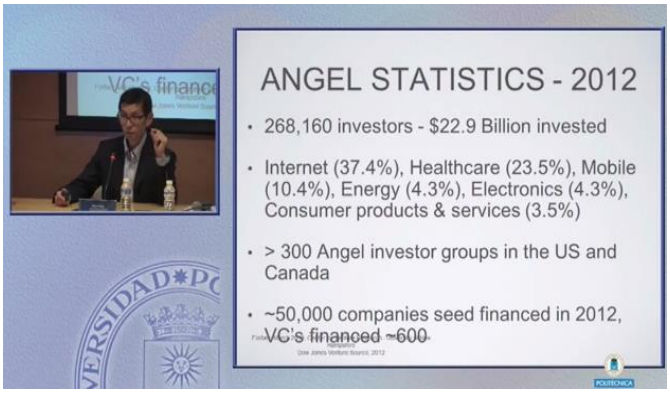
Do not hesitate to visit the following video.

You will have the opportunity to see the talk of Glenn Osaka after participating in the 1st UPM Innovatech International Workshop in Spain.

Glenn Osaka has an extensive experience in executive positions in ICT large companies. He is the former CEO of Reactivity Inc, a software company acquired by CISCO. Osaka is also the former director of a venture capital firm based in Silicon Valley and the former adviser of Insight Venture Capital (funds raised 7,6 $B) and Paypal, amongst other activities.

Osaka gave a general view of technology investment in the United States during his talk at the UPM Innovatech International Workshop: “Leading trends in technology investments and start-ups in California and the US”.

Glenn Osaka, with over 30 years of senior management experience in leading companies in the ICT sector as Juniper Networks, Cisco or HP, is a member of the International Advisory Board of the Support Center for Technological Innovation UPM.



Microalgae, a sea of solutions for global issues

New photobioreactor to produce microalgae

Nowadays there is a growing interest in microalgae on the grounds that they could potentially help to alleviate or solve some key issues of the society, such as:

- The need of animal protein for human food. This way, microalgae are seen as a raw material able to satisfy the need of a growing population of 7 billion of people. According to FAO, it is needed to produce over 60,000M of animals a year in order to convert plant protein into animal protein. These issues force researchers to explore for abundant and affordable sources of vegetal proteins to produce feed.
- The need of an energy source that is cheap, affordable, safe and renewable in order to reduce the use of fossil fuels.
- The need to reduce the increase of greenhouse gases emissions to the atmosphere, mainly CO_2 emissions which are responsible for the climate change.
- The need to reduce nitrogen and phosphorus concentrations in effluents from wastewater treatment plants in order to reduce water pollution.

From the financial, social and environmental point of view, society seeks sustainable solutions for the above-mentioned problems.

The microalgae biomass is a raw material that is thought to be used in the future for protein production and for industrial products such as liquid and gaseous biofuels.

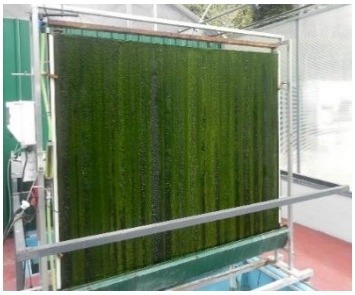
So far, diverse systems have been proposed for microalgae mass production, such as channels or lagoons in contact with the atmosphere or closed photobioreactors (PBR) made of glass or transparent plastic material. Microalgae are hanging in the aqueous medium in both systems, having a maximum microalgae concentration of 1 kg per cubic meter of medium. It is needed the recollection and concentration of this biomass for their industrial use (mainly by centrifugation) that generally involves a high energy consumption. All this lead microalgae biomass production into high cost.

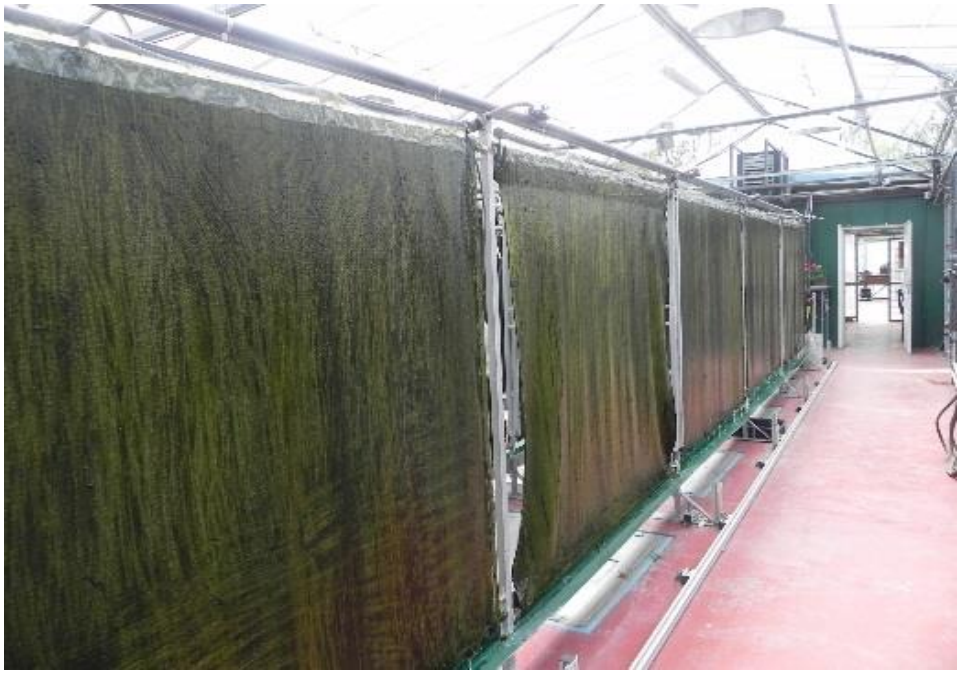
“Microalgae could be considered as the main raw material to feed over 60,000M animals which are needed for human food”

Regardless of the system, the current global production of dry biomass of microalgae is 10,000T/year, mainly Dunaliella, Arthrospira, Chlorella and Haematococcus. This amount is considerably low taking into account the wide range of products of these organisms. The market value of this biomass is between one and three billions of Euros amongst products of high added value such as pigments, amino acids, etc. The cost of these products is over €5/kg and other products for feed, fertilizers or energy less than €5/kg.

The photobioreactor developed by UPM

As an alternative to solve the problem of diluted algal biomass production, UPM, through the Group of Agroenergy (GA-UPM), has developed a laminar photobioreactor (PBR–L) to produce concentrated microalgae biomass, specially designed to use the CO2 and nitrogen oxides coming from emissions of industrial facilities as well as nitrogen and phosphorus from effluents of wastewater treatment plants. This photobioreactor has been nationally and internationally patented by UPM.





PBR-L consists of a series of vertical hollow panels, covered on both sides with fabrics sheets on which the algal population adheres giving rise to a biofilm of microalgae that can be harvested directly. The culture medium containing the required minerals for growth of microalgae, which can be an effluent from a wastewater treatment plant, flows down from the upper part of the fabric sheets, generating a microalgal flora on the outer part of the fabrics surface. Thus, the produced biofilm can be harvested by scraping.

The PBR-L developed by UPM has the following advantages:

- Low cost, between 3 and 10 times lower than conventional PBR.
- The concentrated biomass is collected without centrifugation. This feature reduces the energy consumption up to 50%.
- Modular design, easy installation and easy handling. It is applicable to small and large scale, and it is adaptable to the availability of materials.
- Microalgae can make a better use of light radiation.
- High efficiency when using flue gas, close to 100%.

PBR-L is a mature technology that has already passed the industrial prototype phase and it is ready for its commercialization.

UPM researchers

The Agroenergy group (GA-UPM) has a broad experience in biomass and environment.

The GA-UPM is headed since its creation by the professor Jesús Férnandez, an emeritus professor of UPM. He obtained his PhD in Agricultural Engineering from UPM and has a bachelor's degree in Biological Sciences from the Universidad Complutense. He is an expert on plant production and the usage of aquatic plants for sewage treatment.
He is the author of numerous publications and has addressed 25 doctoral theses.

Maribel Martín Girela has a bachelor's degree in Biology from the Universidad de Granada. She is a predoctoral fellow in the Agroenergy group of UPM and is collaborating in microalgae production works through PBR-L.

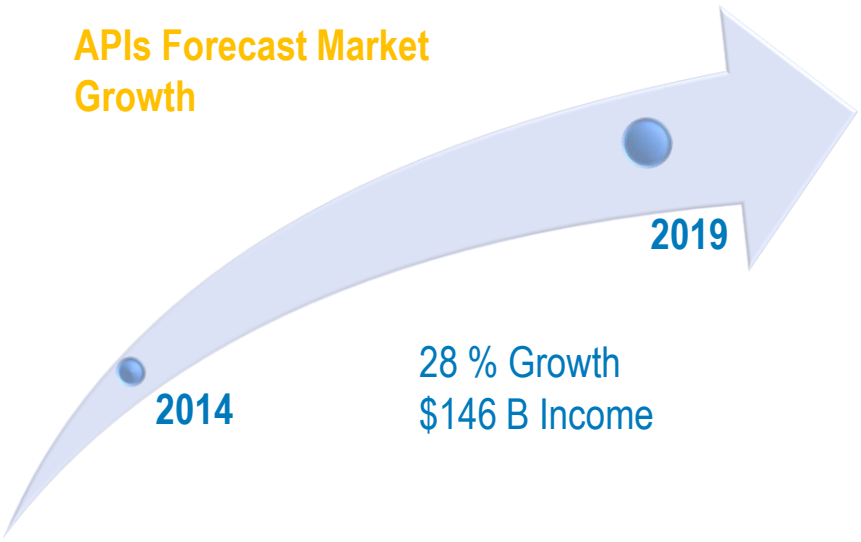
Prof. Jesús Fernández González
Emeritus professor – UPM

Maribel Martín Girela
A predoctoral fellow in the Agroenergy group - UPM

Fi-WARE, the great european challenge for the new wave of the Internet

Future Internet is approaching at breakneck speed and the market of application programming interface (APIs), that plays a key role, is focused on the Internet of Things, Smart cities and big data. Big companies, aware of this situation, are making their first moves through the Amazon and Google platform. The European Union supports the FI-WARE initiative, which is headed by the spanish multinational company, Telefónica.

It is an innovative infrastructure based on open cloud for the creation and delivery of applications and services of Future Internet. Further information can be found at the UPM innovatech blog through the QR code.



Source: Market Research Reports (http://bit.ly/1ox1UmK)

21st century robotics: challenges and opportunities

Rafael Aracil, the former director and the prime mover of the Automatic and Robotic Center (CAR,) a joint centre of UPM and CSIC, talks about the innovative component of the robotics.

Question: What features distinguish CAR from other centres?
Answer: CAR is a strong research unit in Robotics and has the highest number of researchers in Spain whose results are of first level. This centre has 12 R&D groups focused on diverse applications of robotics: automated guided vehicle and aerial vehicles or submarines without driver. It has other applications such as the development of robotic systems for agricultural work or maintenance of electrical systems and medical robotics for surgery or rehabilitation. Projects from nearly all areas have already transferred to the industry or are potentially marketable devices shortly.

Q: Taking into account your extensive career. What are the challenges of robotics today?
A: Over the last few years, a new phase of robotics has developed rapidly. This new phase is focused on devices in the service of man to help in daily tasks. They are service robots and have many applications such as medical support or automation or to help with uncomfortable, unhealthy or very heavy tasks. This way, the centre focuses its research on this area and in some cases collaborates with other industries.

Q: Humanoid robot, drones or ROVs. Is the sector living its big moment?

A: These developments are having a popular impact, but their results are not really socially applicable. Just the ROVs are helpful performing useful tasks. Humanoid robot and drones are mostly used for amusement. This reality should be considered as a positive situation because it is a great opportunity to set up successful companies.

Rafael Aracil, professor of Systems Engineering and Automation in UPM ETSI Industriales

Recognized UPM technologies at 11th actúaupm

The Best Business Ideas Award Ceremony of the 11th actúaupm competition was held on March 25. Over 1,000 people from diverse areas of expertise and belonging to the UPM community , presented a total of 350 business ideas. This competition has been promoting entrepreneurship and technological innovation of UPM for a decade. A selection of 10 proposals was awarded for their best business ideas and other 15 proposals received a certificate for their potential development. The ideas based on technologies developed by research teams of UPM were positively assessed, such as:

Urban gardens for a better environment @ UPM ETSI Agrónomos

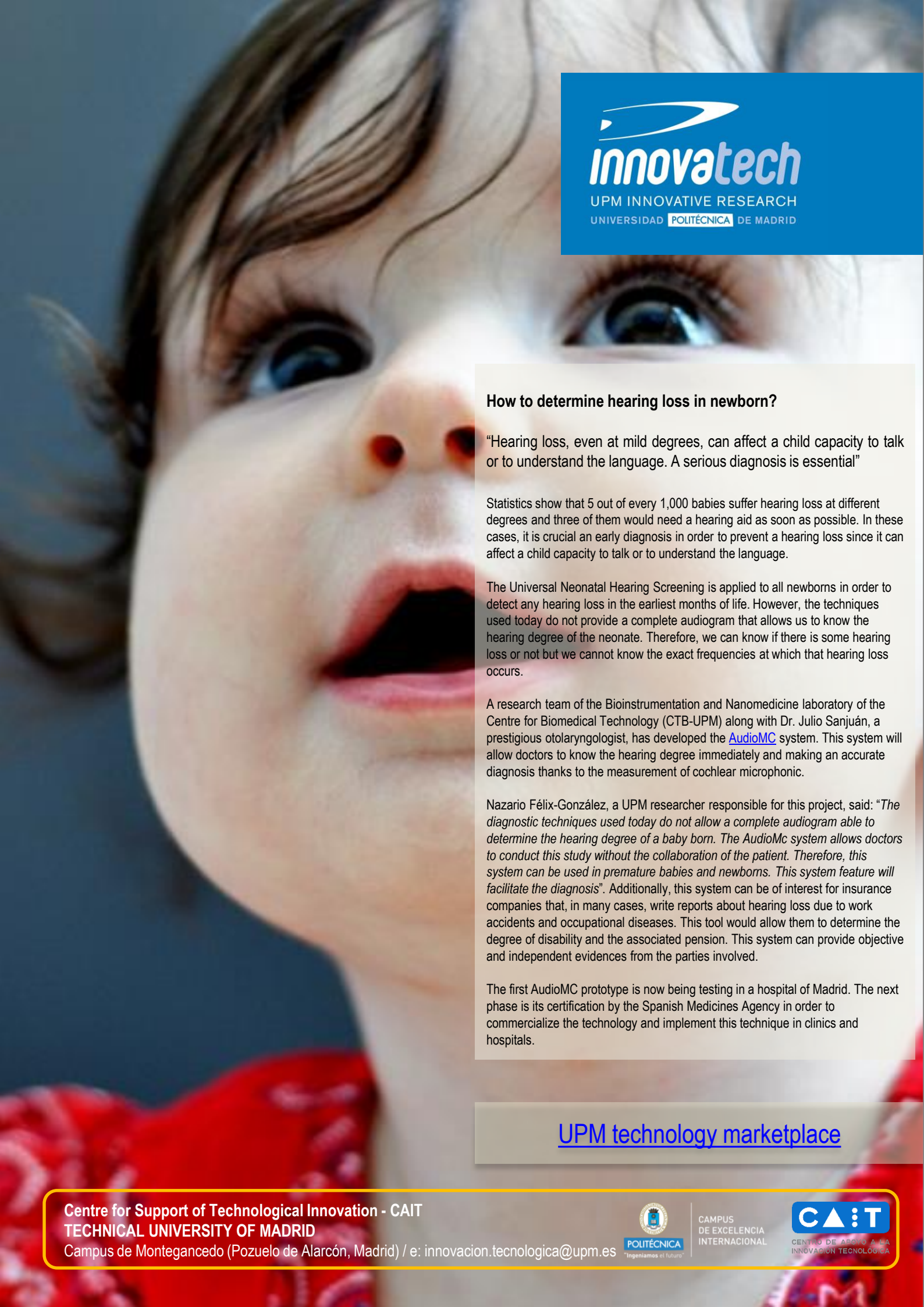
Near of 90% of the Europeans that live in cities are exposed to air pollutants concentrations which are considered harmful according to WHO. Therefore, many researchers are studying a new model of city that is focused on new places for a better environment instead of private landscapes in the cities. According to this model and based on an UPM patent, it is suggested to create a company for the design and development of urban gardens in terraces and roofs that can use the CO2 emissions of boilers in buildings during combustion of diesel, natural gas or biomass in winter. All this gives as a result a decrease of environmental pollution in our cities.

Dedicated short-range communications (DSRC) @ UPM INSIA

Vehicular communications will be an essential part of the vehicle equipment in a few years. This connectivity will facilitate next generation applications for support driving such as lane change warning, red lights warning, collision warning and even the autonomous driving in the future.
UPM has proposed the commercialization of a short-range communications module for road vehicles which is inexpensive, modular, of low consumption and able to meet all the standards and laws for any road vehicle. Also, this module aims to support communications amongst vehicles.

Structural Fiber Sensing (SFS) @ UPM ETSI Aeronáuticos

The preventive structural maintenance based on regular inspections is expensive and inefficient since this type of maintenance is made even in undamaged structures. The preventive structural maintenance represents the 3% of the total cost of a wind turbine. Another example is that the maintenance strategy of bridges in Europe costs 5 billion Euros a year.
The Structural Fiber Sensing (SFS) has proposed an effective solution for damage detection in structures through a network based on fiber optic sensors. It is an integrated system which is less intrusive and very light. The treatment of the received signals allows us to estimate position and degree of severity. This treatment also allows the maintenance based on the current state of the structure and to saving repair costs.



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How to determine hearing loss in newborn?

"Hearing loss, even at mild degrees, can affect a child capacity to talk or to understand the language. A serious diagnosis is essential"

Statistics show that 5 out of every 1,000 babies suffer hearing loss at different degrees and three of them would need a hearing aid as soon as possible. In these cases, it is crucial an early diagnosis in order to prevent a hearing loss since it can affect a child capacity to talk or to understand the language.

The Universal Neonatal Hearing Screening is applied to all newborns in order to detect any hearing loss in the earliest months of life. However, the techniques used today do not provide a complete audiogram that allows us to know the hearing degree of the neonate. Therefore, we can know if there is some hearing loss or not but we cannot know the exact frequencies at which that hearing loss occurs.

A research team of the Bioinstrumentation and Nanomedicine laboratory of the Centre for Biomedical Technology (CTB-UPM) along with Dr. Julio Sanjuán, a prestigious otolaryngologist, has developed the AudioMC system. This system will allow doctors to know the hearing degree immediately and making an accurate diagnosis thanks to the measurement of cochlear microphonic.

Nazario Félix-González, a UPM researcher responsible for this project, said: "*The diagnostic techniques used today do not allow a complete audiogram able to determine the hearing degree of a baby born. The AudioMc system allows doctors to conduct this study without the collaboration of the patient. Therefore, this system can be used in premature babies and newborns. This system feature will facilitate the diagnosis*". Additionally, this system can be of interest for insurance companies that, in many cases, write reports about hearing loss due to work accidents and occupational diseases. This tool would allow them to determine the degree of disability and the associated pension. This system can provide objective and independent evidences from the parties involved.

The first AudioMC prototype is now being testing in a hospital of Madrid. The next phase is its certification by the Spanish Medicines Agency in order to commercialize the technology and implement this technique in clinics and hospitals.

UPM technology marketplace

Centre for Support of Technological Innovation - CAIT
TECHNICAL UNIVERSITY OF MADRID
Campus de Montegancedo (Pozuelo de Alarcón, Madrid) / e: innovacion.tecnologica@upm.es

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