FORTH
Foundation for Research & Technology - Hellas

PRESS RELEASE

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A significant success for FORTH:
The research project ADAPTIVES has recently been selected for granting by the European Research Council (ERC) Starting Fund 2009

FORTH has recently received a new distinction at European level, as the project *"ADAPTIVES/ Algorithmic Development and Analysis of Pioneer Techniques for Imaging with waVES"* submitted by Dr. Chrysoula Tsogka has been selected for granting by the European Research Council (ERC) Starting Fund 2009. The total amount of the grant will be 690.000€ and will last for 5 years.

Dr. Tsogka is Associate Professor at the department of Applied Mathematics at the University of Crete and Researcher at the Institute of Applied and Computational Mathematics-FORTH. The project "ADAPTIVES" concerns the theoretical and numerical development of robust and adaptive methodologies for imaging with waves. As she explains, "Waves are been used for the detection and imaging of objects for many years. We all know the radar, which uses electromagnetic waves, the sonar that is based on acoustic waves, and medical ultrasound where usually acoustic and elastic waves coexist. Other applications less known to the public concern seismic imaging, i.e., imaging of the subsurface geological formations, and non-destructive testing of materials using ultrasound. In most of these applications the materials encountered in practice are often complex and their properties are not known - and cannot be estimated - in every detail".

Following, Dr. Tsogka adds, "We model the propagation medium as a random process for which we know some statistical properties, for example, the mean of the propagation speed and the size of the heterogeneities. Our goal is to solve the imaging problem in a regime where multipathing due to the heterogeneities is important. The world multipathing means that in such random media, the waves, to go from one point to another, they can follow multiple paths and not just a single one. Imaging in such regimes is quite challenging and requires very different methods from the usual ones in homogeneous or known deterministic environments. The challenge is to produce reliable, i.e., statistically stable results, especially when there is no a priori knowledge about the propagation medium".

A coherent interferometric imaging methodology (CINT) has recently been developed that produces statistically stable results in noisy environments. CINT is designed for imaging with partially coherent array data recorded in richly scattering

media. It uses statistical smoothing techniques to obtain results that are independent of the random medium realization. According to Dr. Tsogka, “The project ADAPTIVES aims to extend this methodology along two complementary directions: novel types of applications (such as underwater acoustic and seismic imaging), and further mathematical and numerical development so as to assess and extend its range of applicability ".

Dr. Tsogka feels very lucky and happy that her proposal was selected for funding, as it gives her the opportunity to create a research team (the project allows for supporting both doctoral and postdoctoral students). In her own words, “One thing is certain, a lot of work lies ahead of us and we will keep up the good work with enthusiasm.”

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