Description of the funded research project 822 (NAVMAT)
1st Call for H.F.R.I. Research Projects to Support Faculty Members & Researchers and Procure High-Value Research Equipment

Title of the research project: Knowledge based System for naval materials failures

Principal Investigator: Prof. Nikolaos E. Melanitis

Reader-friendly title: NAVMAT

Scientific Area: Innovation: Knowledge management in Failure of Materials

Institution and Country: Hellenic Naval Academy, Greece

Host Institution: Hellenic Naval Academy

Collaborating Institution(s): NCSR DEMOKRITOS-IIT, Hellenic Army Academy, Hellenic Air-force Academy

Budget: 180.000 €

Duration: 36 months

Project webpage: www.navmat.gr

NAVMAT Project Description

NAVMAT project aims at the development of a knowledge based system dedicated to effective recording, efficient indexing, easy and accurate retrieval of information, history of maintenance and secure operation concerning every failure incident of marine materials, components and systems in a Naval environment. Based on materials failure ontology, utilising artificial intelligence algorithms and modern approaches in data handling, NAVMAT aims at the optimisation of naval materials failure management and the support of decision making in Maintenance and Repair Operations (MRO), materials supplies and staff training.

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NAVMAT Project originality

The proposed work attempts an interdisciplinary approach by integrating Materials Engineering and Informatics under a platform of Knowledge Management. Failure analysis expands into forensics engineering for it aims not only to identify individual and symptomatic reasons of failure but to assess and understand repetitive failure patterns, which could be related to underlying material faults, design mistakes or maintenance omissions. The vast technical information on materials failure frequently remains in the logbooks of industry. The broad scientific information related to materials failure formulates a "market" in which all major publishing houses have invested. NAVMAT approach, although humbler in ambition, differentiates from the logbook / handbook / journal approach and utilizes a focused common-cause failure methodology for the naval and marine environment, to begin with. It will support decision making through appropriate Artificial Intelligence and Natural Language Processing methods.

Expected results & Research Project Impact

To design, develop and operate a **nav**al **mat**erials failure management platform,
To erase disruptions in the flow of knowledge in naval maintenance operations
To support the decision making in maintenance and supply
To train and further educate the technical and scientific personnel
To adopt and explore the potential of semantic web for enriching information and knowledge in technical environment

thus

Strengthening Research and Innovation capabilities
Building and upgrading infrastructure
Contributing to research and Innovation integration and networking

The importance of this funding

Hellenic Foundation for Research and Innovation (HFRI) funding allows the implementation of an idea dating back 20 years to when the Principal Investigator (PI) joined Hellenic Naval Academy. Since then, when assessing user needs he has realised the significance of materials failure analysis for the fleet and identified the importance of traceability and evaluation of distributed knowledge and information. NAVMAT is a multidisciplinary concept that requires a combination of skills and data: deep knowledge of failure analysis and organisation of unstructured and distributed data. When combined with the recent development of suitable Artificial Intelligence technologies, it allows the formation of a multi-layered tool to learn from previous failures and the building of a dynamic problem-solving platform. The HFRI call addressed the absence of funding schemes to cover interdisciplinary research in traditional thematically-restricted programmes and the PI now faces the challenge of making his ideas work!

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