Damage Imaging in Guided Wave-based Inspection of Adhesive Joints

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Scientific context. Bonding of aluminium or carbon reinforced fibre (CFRP) plates is now commonly used to avoid the mechanical rivets or any other type of fasteners that introduce weaknesses in the structures. In order to inspect these assembling, looking for possible disbonding, a method based on the propagation of ultrasonic guided waves is very promising especially in the framework of structural health monitoring. However, a lot of research is still to be done to provide the community with the theoretical tools that can reduce the experimental work and help in to develop a reliable inspection method. Another important issue is the applicability: Is the developed method applicable to the assessment of different bonded joints, e.g. Aluminium-Aluminium, Aluminium-CFRP, CFRP-CFRP? This question must be answered since the wave propagation will vary depending on the assembly and it is a challenging task to develop a method covering all possible assemblies.

To inspect structures like lap joints deep knowledge of the wave propagation in each of two plates to be joined as well as the physical phenomena at the transition zone (adhesive region) of the overlapped plates is necessary. In the transition zone we must be able to answer the following questions: How a wave mode excited in one plate couples to the other plate after passing the transition zone (adhesive region)? How is the wave propagation affected depending on the adhesion quality? Is it possible to consider the methods developed for other assemblies to study the wave mode behaviour of other structures? Which are the modes most sensitive to the adhesion properties?

Working Context. The work will be carried out at Instituto de Telecomunicações (IT) (https://www.it.pt/), a research institute in Instituto Superior Técnico (IST) (https://tecnico.ulisboa.pt/en/), Universidade de Lisboa. The future student will be enrolled as a PhD student at IST but the research work will be carried out in the IT instrumentation laboratory. The instrumentation and measurement group from IT is a highly motivated research group, with a very good scientific and technical infrastructure. The student will be part of a group where everybody helps each other in performing their duties. Strong support and mentoring will be provided to help the PhD student to accomplish his/her work in a close contact with the supervisors. In addition to the daily contact, there will be weekly meetings to review the progress of the PhD student and to resolve the issues which may arose during the project.

Required Skills. We are looking for applicants with a strong academic background who have completed a five-year master’s degree (3+2) in Electrical and Computer Engineering, Mechanical Engineering, Engineering Physics, Aerospace Engineering, Materials Engineering or related fields and do not have more than four years full time research experience. Previous programming experience in Matlab and in simulation programs like Ansys or Comsol is beneficial. It is required to master at least one of the computer languages, e.g. Python, C++ or Matlab. Knowledge of Artificial Intelligence (AI) is desirable. Experience with non-destructive testing such as ultrasounds or Lamb/guided waves is beneficial.
Emphasis is also placed on:

- motivation and potential for research within the field
- motivation to embrace rigorous experimental work
- ability to work independently and in a team, being innovative and creative
- ability to manage work and projects in a planned and structured way
- mastering both oral and written English

**Your application.** Please note that only applications with a CV, a motivation letter and the certificates / diplomas will be considered. Please combine all necessary documents in one PDF file and send your application with the subject “ESR15” to recruitment@gw4shm.eu. Please note that you can apply for more than one position, in this case please indicate your order of preference. In case of any technical questions concerning this position please contact Prof. Dr. Helena Geirinhas Ramos at hgramos@ist.utl.pt or Dr. Artur Lopes Ribeiro at arturlr@ist.utl.pt.