Call for application for a postgraduate research work "Innovative and structural restoration/repair of lightweight metallic parts using Cold Spray Additive Manufacturing"

Open position to European citizens for a 12 months (renewable once) postdoctoral industrial research project supported by the Ministry of Economy and Finance/Ministry of the Armed Forces. The research works will be performed at the laboratory Interdisciplinaire Carnot de Bourgogne (ICB), within the research team LERMPS (site of Sévenans, technological platform Titan of the Université de Technologie de Belfort-Montbéliard).

Key-words:

Structural repair, metallic restoration, cold spraying, robotic programming, artificial intelligence, online control, database.

Topic description:

Recently, cold spraying knows a huge expansion thanks to restoration and repair applications. In this field, there are tremendous benefits so that this process is now extensively used. Restoration and repair know growing interest with the development of news “green technics and methods” that can enable saving raw materials and energy consumptions due to the whole manufacturing of a product. In addition, restoration is more importantly beneficial for some aspects such as the lead-time for the replacement of a product, the stock shortage, and the budgetary limitations. Restoration and repair using cold spraying is economically convincing. Cold spraying has the particular advantage of being very flexible. The CGDS process was applied at varied different length scales, from micrometric scale (microdeposit) up to several meter sized components to coat. Blades restoration example is a typical situation showing the flexibility of the cold spray method. Large surface to repair combined with complex incurved shape requires a precise control of the deposition to produce a thin repair as well as a uniform coating. Today, the principle of cold spray additive process covers also a wide range of materials including metals for aerospace industry. This compatibility makes the cold spraying a suitable repair method for lightweight metallic structures. In addition, the repair is rapid and easily enables an in-situ rectification if necessary.

Postdoctoral research works:

This post-doctoral R&D activity will implement the cold spray technology as intelligent repair and full restoration method for aeronautical structures and parts. The research line includes the development of an iterative robotic system equipped with a contactless 3D metrology and driven by an artificial intelligence, which can adapt to all of the operating conditions in real time during the structural and morphological restoration process of each damaged area. The use of this system will guarantee a fast and efficient restoration without material surplus. The R&D work packages fall into three major categories: the development of the intelligent cold spray repair system within the technological platform Titan of the ICB-PMDM-LERMPS laboratory, the realization of on-site technological demonstrators for the partner of this project, and the implementation of the technological solution on real structures. The applicant has the capability to fulfil this research lines and to coordinate the project until the end of the postdoctoral period. He (she) should be confident in performing the following main tasks:

- Development of a 3D contactless measurement system embedded on a 6-axis industrial robot, database generation and real-time data processing.

- Development of an artificial intelligence capable of producing restoration strategies depending upon evolving knowledge base.
- Automated robotic programming capable of running (during laboratory tests as well as in a real environment) an adaptive repair generated by the AI.
- Data restitution, testing, and validation of technological demonstrators.
- Writing of technical protocols, tutorials, work reports, publications.
- Animation of project progress and participation in meetings with partners.

Expected background of the applicant:

Programming with C/C++/C#, Windows .NET/SDK, Matlab, industrial robotics, development of artificial intelligence, knowledge base, industrial communication technology, process optimization, knowledges about mechanics and materials.

Additional information:

The postdoctoral R&D activities are scheduled to begin as soon as possible, and not later by autumn 2020. Net monthly remuneration: ~2200€

Please send to (sihao.deng@utbm.fr) a CV, a cover letter, a publications list, a projects portfolio, recommendation letters, and copies of Master and PhD diplomas.

Contact:

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