Report on the outcomes of a Short-Term Scientific Mission[1]

Action number: CA18232 (Mathematical models for interacting dynamics on networks)

Grantee name: Matko Ljulj

Details of the STSM

Title: Homogenization of periodic networks of elastic rods

Start and end date: 17/09/2023 to 22/09/2023

Description of the work carried out during the STSM

Description of the activities carried out during the STSM. Any deviations from the initial working plan shall also be described in this section.

(max. 500 words)

The primary objective of this STSM was to develop a faster and simpler method for solving one-dimensional elastic models by homogenizing them as 2D limit models, focusing on two distinct regimes: flexural and membrane. In the flexural case, we made significant progress and were on the verge of finalizing the project. However, some details in the proofs regarding properties of the space of limit functions and correctors in unusual setting of 1D cell require more attention before the paper could be submitted for publication. These remaining details are currently being addressed, and we anticipate submitting the paper in the near future. In the membrane case, we successfully initiated the project by obtaining crucial results related to the limit equations within asymptotic equations. Although substantial progress was made, there is still some additional work to be done to bring the overall project to completion.

Description of the STSM main achievements and planned follow-up activities

Description and assessment of whether the STSM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the STSM. Agreed plans for future follow-up collaborations shall also be described in this section.

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

(max. 500 words)

This STSM was pivotal in achieving several key milestones and has set the stage for future collaborative efforts. In the flexural case, the main achievement of this STSM was the almost-finalization of the project. We successfully addressed numerous aspects of the problem, and the paper is nearly ready for submission. This accomplishment aligns with the primary objective of the STSM, which was to continue the work on the flexural case and contribute to the development of appropriate 2D limit models for elastic networks when bending force is applied. In the membrane case, significant progress was made during this STSM. However, it became evident that the visit was too short to complete everything and that additional work is necessary to complete this project fully. Looking ahead, we have agreed upon plans for future follow-up collaborations. These plans involve further visits, either my visit to Germany to collaborate with Priv.-Doz. Dr. Kersten Schmidt or his visit to Zagreb, to address the remaining tasks in the membrane case. These visits were not part of the initial working plan but have become highly needed to ensure the successful completion of our research in this regime.

The main achievements of this STSM include progress in both the flexural and membrane cases, bringing us closer to achieving appropriate 2D limit models and developing numerical methods for handling elastic networks. These accomplishments directly contribute to the objectives of Action CA18232 by advancing the study of equations on multi-structure spaces and enhancing our understanding of numerical methods for elastic networks.