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

Action number: CA18232

Grantee name: Patrizio Bifulco

Details of the STSM

Title: Evolutionary equations with white-noise boundary conditions on networks

Start and end date: 14/03/2024 to 22/03/2024

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)

During my research visit to Salerno, the primary objective was to collaborate with Professor Rhandi on exploring white-noise type boundary problems on networks and achieving well-posedness. The visit was structured into several key phases to maximize productivity and facilitate fruitful discussions.

The visit commenced with a short presentation of my significant results to Professor Rhandi. This session served as an opportunity to share insights and discuss potential avenues for extending my work to address white-noise conditions in boundary problems.

Following the initial discussion, the next step involved a detailed review of Professor Rhandi's previous paper on white-noise problems, co-authored with Fkirine and Sadd. This paper served as a foundational reference for formulating white-noise boundary conditions on networks, laying the groundwork for addressing the problem of well-posedness.

Building upon the insights gleaned from this previous paper, our collaborative efforts focused on formulating white-noise boundary conditions tailored to networks. This phase involved theoretical exploration and mathematical modeling to devise effective strategies for incorporating white-noise conditions into boundary problems on networks.

In the final phase of the visit, we dedicated the remaining time to formulate a rigouruos proof of well-posedness of white-noise type boundary problems on networks. Leveraging our formulated white-noise boundary conditions and drawing upon our collective expertise, we successfully derived the claimed well-posedness of these boundary problems.

Overall, the research visit to Salerno was highly productive, culminating in the successful formulation

1This 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.

and demonstration of well-posedness for white-noise type boundary problems on networks. The collaborative effort between myself and Professor Rhandi exemplifies the value of interdisciplinary collaboration in advancing our understanding of complex mathematical phenomena. This visit not only contributed to the advancement of knowledge in boundary value problems but also laid the foundation for future research endeavors in this exciting area of study.

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.

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In collaboration with Professor Rhandi at the University of Salerno, we successfully proved the well-posedness of white-noise boundary conditions for networks that was described in my application letter. Our research endeavor aimed at addressing the intricacies of boundary problems on metric graphs, specifically focusing on spectral comparison results and their implications for formulating and solving white-noise type boundary problems.

Our collaborative effort commenced with a comprehensive review and discussion of spectral comparison results on graphs. Indeed, to leverage this foundation, I initiated my STSM in Salerno by giving a talk on spectral comparison results for more common vertex conditions, which provided the conceptual framework necessary for formulating and addressing the targeted (spectral comparison) for white-noise boundary problems on networks.

Building upon Professor Rhandi's previous work together with Fkirine and Hadd, we successfully were able to show the well-posedness of white-noise type boundary problems on networks, generalizing these initial results. This accomplishment represents a significant advancement in our understanding of boundary value problems on complex graph structures.

Moving forward, our research will focus on elucidating explicit examples including standard or delta-type vertex conditions for the Laplacian (Schrödinger operator) on networks having an additional “white-noise” perturbation. These examples will not only serve to validate our theoretical findings but also contribute to the practical applicability of our research in various domains, including mathematical physics and engineering. Moreover, we are currently trying to generalize the spectral comparison results known for more common conditions on networks onto the framework of white-noise perturbed conditions.

In conclusion, our collaborative efforts with Professor Rhandi have yielded promising results in proving the well-posedness of white-noise type boundary problems on metric graphs. This accomplishment underscores the importance of interdisciplinary collaboration and may lay the groundwork for further explorations (in particular including the above described upcoming goals) into the intricate dynamics of boundary value problems perturbed by a white-noise of stochastic type (in form of a Wiener process).

This report encapsulates our successful endeavor in advancing the understanding of boundary problems on graphs and networks and may set a promising stage for future investigations into this intriguing area of mathematical research.

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Grantee enters max 500 word summary here.