

Report on the Outcomes of a Short-Term Scientific Mission¹

Action number: CA18232

Grantee name: Sahiba Arora

Details of the STSM

Title: Monotonicity methods for input-to-state stable systems

Start and end date: 10/3/2024 to 22/3/2024

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)

The purpose of this STSM was to study the ISS of positive systems in infinite dimensions. During my stay, I also had the opportunity to travel to Graz for a day to give a talk and interact with the functional analysis group at TU Graz, in particular, Jussi Berhndt.

During my stay, we discussed an old paper by Sontag that considers ISS with different norms (rather than just the state-space norm) in the non-linear, yet finite-dimensional setting.

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 contributions to Action objectives and deliverables, or publications resulting from the STSM. Agreed plans for future follow-up collaborations shall also be described in this section.

(max. 500 words)

After various discussions, we were able to obtain a satisfying definition for L^p - L^q -ISS in the infinite-dimensional setting and to show that it is stronger than ISS. When the control operator is bounded we were even able to show equivalence of the two conditions using converse Lyapunov techniques. The lack of availability of converse Lyapunov theorems for unbounded control operators leads us to decide that we would first like to obtain a more transparent proof of the equivalence in the bounded case, to hope for any generalization for the unbounded case.

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.

We also discussed IOS for input-output systems and the shortcomings faced when trying to generalize the usual definition to the case when the observation operator is unbounded. We pinned down several paths whose exploration could lead to a satisfactory definition. We plan to continue meeting virtually regularly to explore both L^p - L^q -ISS and IOS.

During my stay, we even had several joint (virtual) meetings with Felix Schwenninger (Twente) which, as per our initial expectations, has been a first step towards a collaboration for a joint project.