Scientific Report to
RGLIS Short Visit Grant 4720

Purpose of visit

The purpose of my visit at Université de Provence at Marseille/Aix-en-Provence was the scientific collaboration with Sebastian Müller. Our aim was to study large deviation principles (via a link to Martin boundary) for random walks on groups.

Description of the work carried out during my visit

The grant is devoted to the studies of large deviation principles for random walks on groups. In particular, we focused on linking large deviation principles with the Martin boundary. To this end, we investigated the associated space-time Markov chain of the original random walk, and described its bounded harmonic functions. Since the space-time chain is in some sense easier to analyze, this was the starting point for further discussions about rate functions, which describe large deviation principles, followed by discussions on examples.
Furthermore, we were able to discuss on related problems as, e.g., the question for analyticity of entropy of random walks on groups and regular languages.
Finally, I was able to discuss on many related topics with James Parkinson, another guest in Marseille from University of Sydney.

Main results

We described the harmonic functions of the space-time Markov chain in terms of the harmonic functions of the original random walk. Furthermore, we established a link between these harmonic functions and rate functions, which describe a large deviation principle for the original random walk. We worked out the idea of the proof with some minor things left to be solved. In particular, our result may be applied to the special case, where one investigates the deviation distance of the random walker from his expected distance at time n. We considered also the special case of symmetric random walks on free groups.

Future collaboration with host institute

The fruitful collaboration will certainly go on. Sebastian Müller will visit me in summer 2012 for further collaboration (in particular, within the scope of our current project).

Projected publications to result from grant

Large Deviation Principles for Random Walks on Groups via Martin Boundary (in preparation)

Other comments

The project was granted for 11 days. Since my plans, however, have changed after application for the grant, I stayed only 8 days in Marseille/Aix-en-Provence (17.02.2012 – 24.02.2012).