Scientific report

In the framework of the RDSES programme I have been awarded a grant to visit Prof. Wolfgang Woess in Graz.

Visitor:
Nina Gantert
Institut für Mathematische Statistik
Universität Münster
Einsteinstr. 62
48149 Münster

Germany

email: gantert@math.uni-muenster.de
Phone:+49 521 83 32671

Host:
Wolfgang Woess
Institut für Mathematik C
Technische Universität Graz
Steyrergasse 30

8010 Graz

Österreich

Phone: +43 316 873 7130
Email: woess@wey.math.tu-graz.at

Date and duration:
5 June 2006 - 10 June 2006

Scientific Report:

We discussed several questions concerning Branching Markov Chains and related spectral quantities. Branching Markov Chains are clouds of particles which move (according to an irreducible underlying Markov Chain) and produce offspring independently. The offspring distribution can in general depend on the location of the particle; we assumed that its mean m is constant In order to understand the recurrence/transience of the Branching Markov Chain, we considered the embedded Galton Watson process of all particles ever reaching the origin. It was shown in [1] that this branching process dies out if and only if the mean of the offspring distribution is less or equal to $\rho(P)^{-1}$, where $\rho(P)$ denotes the spectral radius of the underlying Markov chain. The critical case $m = \rho(P)^{-1}$ is of particular interest: a naive guess would be that the embedded Galton Watson process is critical, too. However, it turned out that this is in general not true: the embedded Galton-Watson process is critical if and only if the underlying Markov chain is ρ-recurrent (see [3] for the definition of ρ-recurrence). This yields a probabilistic definition of ρ-recurrence as well as,

with the results in [3], several interesting examples for critical Branching Markov Chains where the embedded Galton-Watson process can be subcritical.
We also discussed the subdivision of the recurrent phase but did not succeed in characterizing the second critical value.

On wednesday 7 June I gave a talk on the results in [1] and [2].

During my visit, I also took the opportunity for scientific exchange with Lorenz Gilch, a Ph. D. student of my host, and Post-Docs Adam Timar and Florian Sobieczky.

We plan to continue our discussions, together with my Ph. D. student Sebastian Müller, and hope to write a joint paper.

References

[1] N. Gantert and S. Müller, *The critical Branching Markov Chain is transient*, to appear in: Markov Processes and Related Fields.

[2] S. Müller, *Recurrence and Transience for Branching Random Walks in an iid Environment*, to appear in: Markov Processes and Related Fields.

[3] W. Woess, *Random walks on infinite graphs and groups,* Cambridge University Press, (2000)