Application for an ESF short visit grant

"Discretization of curvature line parametrized surfaces and orthogonal coordinate systems in terms of Clifford algebras"

Emanuel Huhnen-Venedey

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Aim of the visit and research project

I plan to visit the Isaac Newton Institute for Mathematical Sciences at Cambridge, UK, from Sunday 22nd to Saturday 28th of March 2009. At these days there happens the conference "Quantum Discrete Integrable Systems" in which most of the specialists in discrete integrable systems will participate. This is an excellent occasion to meet people working in this subject and to broaden my respective knowledge. In particular I plan to collaborate with Professor Alexander Veselov from Loughborough University, UK, and Professor Rinat Kashaev from University of Geneva, Switzerland.

My field of research is discrete differential geometry. Discrete differential geometry is an active mathematical terrain where differential geometry and discrete geometry meet and interact. It aims at the development and application of discrete equivalents of the geometric notions and methods of differential geometry. The latter appears then as a limit of refinements of the discretization. Current progress in this field is to a large extent stimulated by its relevance for computer graphics and mathematical physics, thus discrete differential geometry is an essential ingredient of quantum discrete integrable systems.

Currently I'm dealing with the discretization of curvature line parametrized surfaces and orthogonal coordinate systems, which are described by integrable systems. My work on that started with my Diploma thesis (finished in 2008), in which I introduced cyclidic nets as a discretization of the mentioned systems based on Lie geometry of spheres. The idea was, to use surface patches of so-called Dupin cyclides in order to obtain piecewise smooth discretizations of curvature line parametrized surfaces and orthogo-

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nal coordinate systems. This worked out very well, because there is a simple description of Dupin cyclides in the projective model of Lie geometry. Nevertheless one ends up with quadratic expressions, and our goal now is to linearize the theory by switching to a Clifford algebraic description of Lie geometry. Something similar was already done in the context of circular nets, where a Clifford algebraic description of Möbius geometry enabled Bobenko, Matthes and Suris in 2003 to prove important facts about the convergence of circular nets to orthogonal coordinate system. My current work can be seen as a continuation of this.

Organizational details

Duration of the visit: 22nd to 28th of March 2009.

Host: Prof. Alexander Veselov

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	Loughborough University, Loughborough,
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Travel costs: approximately €400.

Curriculum Vitae

Personal data

Address	Emanuel Huhnen-Venedey Gneisenaustraße 87 10961 Berlin, Germany
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Phone number	+49-30-314-79253
Homepage	www.math.tu-berlin.de/∼huhnen
Date of birth	14.07.1981 in Bensberg, Germany
Citisenship	German
Family status	unmarried

Education

08/1987–05/2000	School, North Rhine-Westphalia, Germany
10/2001–09/2002	Mathematics (Diploma) at Bonn University, Germany
10/2002–02/2008	Mathematics (Diploma) at Technical University Berlin Topic: *Curvature line parametrized surfaces and orthogonal coordinate systems. Discretization with Dupin cyclides.* Advisor: Prof. A.I. Bobenko Obtained award for the 2nd best degree in Mathematics at TU Berlin in 2008
04/2008–ongoing	Mathematics (Ph.D.) at Technical University Berlin

Employment

09/2000–08/2001	Civilian service at "Johannes-Schule" for handicapped children in Bonn
03/2004–03/2005	Tutor for mathematics and physics at "Schülerhilfe" institute, Berlin

04/2005–02/2008	Student Assistant at TU Berlin, Research Unit "Polyhedral Surfaces"
04/2008–ongoing	Research Assistant at TU Berlin

Teaching

Summer 08	Discrete Differential Geometry (Exercises) Linear Algebra for engineers (Exercises)
Winter 08	Berlin Mathematical School basic course "Geometry" (Analytic and projective Geometry) (Exercises)

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Emanuel Huhnen-Venedey is a research assistant at the institute of mathematics at TU Berlin, and a participant in the DFG Research Unit "Polyhedral Surfaces". He is working on discretization of curvature line parametrized surfaces and orthogonal coordinate systems, and has written an excellent Diploma thesis in this topic. The proposed visit would aid the current and future research of him.

Prof. Dr. A.I. Bobenko