**British Singularity Day**

**Liverpool, 11 December 2013**

Programme

13:00-14:00 Lunch, Room 304

14:00-15:00 Room G16

Oleg Karpenkov (Liverpool)

*On finite and infinitesimal flexibility of discrete and semidiscrete surfaces*

15:00-16:00 Room G16

Kevin Houston (Leeds)  
*Shape matching between non-isometrically deformed models*

16:00-16:30 Tea, Room 304

16:30-17:30 Room G16

Barbara Fantechi (Trieste)

*Simultaneous resolution of torsion free rank r sheaves on nodal curves*

The LMS Scheme 3 grant 31230 will pay reasonable travel expenses for participants from within the UK. Graduate students are especially welcome. The meeting is also supported by the RCMM of the Department of Mathematical Sciences of the University of Liverpool.

**ABSTRACTS**

**Oleg Karpenkov**

In this talk we discuss geometric, algebraic, and computational aspects of finite and infinitesimal flexibility of Kokotsakis meshes. A Kokotsakis mesh is a mesh that consists of a face in the middle and a certain band of faces attached to the middle face by its perimeter. In particular any (3×3)-mesh made of quadrangles is a Kokotsakis mesh.

We express the infinitesimal flexibility condition in terms of Ceva and Menelaus theorems. Further we study semi-algebraic properties of the set of flexible meshes and give equations describing it. For (3×3)-meshes we show flexibility conditions in terms of face angles. In conclusion we say a few words about the semidiscrete case.

**Kevin Houston**

Finding correspondences between two shapes is an important task in geometry processing as it allows shape recognition, matching and morphing as well as allowing measurement of similarity. A key aim is to produce a bijective and continuous map between shapes where significant features are mapped to significant features, for example hands are matched to hands on human shapes.  In this talk we will use discrete differential geometry, and a discrete version of the Laplace-Beltrami operator in particular, to produce a matching between triangulated surfaces that represent shapes that are non-isometric deformations of each other, for example a body in different poses.

Joint work with Adam Smith.

**Barbara Fantechi**

This is a talk on joint work in progress with Alberto Lopez Martin.

We call a coherent sheaf F on a nodal complex curve C a singular rank r vector bundle if it is purely one-dimensional and has rank r on each irreducible component.  
A resolution of such a singular bundle is a projective morphism \eps:\tilde C\to C together with a rank r vector bundle E on \tilde C such that \eps\_\*E=F and \tilde C is minimal in an appropriate sense. In the rank one case, where the minimal resolution is unique, we prove that every flat family of nodal curves C and singular line bundles F on them admits a simultaneous resolution of singularities, i.e. the minimal resolutions also form a flat family. As an application we give a new description of Caporaso's compactification of line bundles on stable curves and find a new compactification for stable pointed curves.

We discuss partial results in the higher rank case.