Report to the visit in Budapest - Cast Short visit 6935

Reference number : 6935
Activity title : Contact and symplectic topology
Activity acronym : CAST
Units : PESC

1 Purpose of the visit

I am Phd student in Toulouse. The aim of the visit was to meet with Klaus Niederkrüger, my PhD advisor, who is lecturer in Toulouse but currently visitor at the Renyi Institute in Budapest for a year. I recently started my PhD, and I'm mostly in the learning phase, nonetheless the meeting was important to discuss the main direction of the work and do first experiments on toy models.

The meeting took place at the Renyi Institute in Budapest, Hungary during the 39th week of 2014, more precisely from 09/23/2014 to 09/30/2014.

2 Description of the work carried during the visit

We think that contact structures invariant by a 2-torus action are a rich class of examples which could illustrate some known facts in contact topology and could help to discover new one. First, we will try to classify these contact structures and then we will use this classification to deduce properties of such spaces.

Let (M, ξ) be a contact manifold invariant by a torus action. We can see the 2- torus T^2 as $S^1 \times S^1$ and consider M as the total space of a prinpal circle bundle equipped with a circle action. This action induces circle actions on each piece of the Liouville ideal domain splitting of the base. By a theorem of Ding and Geiges, we know that each principal circle bundle over a $2n$-dimensional manifold admit an S^1-invariant contact structure. For the converse, we want to know, under which conditions, we can lift a (hamiltonian) circle action on a ideal Liouville domain to another circle action on the total space of the principal circle bundle over the domain for which the contact structure would be invariant.

The meeting happened at the beginning of the project. We are still at the step of prospection. First, we tried some ideas on basic examples, e.g. $\mathbb{R}^{2n}$ equipped with the standard symplectic form and try to lift a loop from it to $\mathbb{R}^{2n} \times S^1$ with the standard contact structure as connection. But these ideas were too naive. It seems that we need more sofisticated tools to attack the problem. In particular, this requires learning more advanced notions in symplectic topology.

3 Projected publication

We are not able to publish a paper in a near future due to the beginning of the project.