Towards contact semitoric systems

Senne Ignoul

(Antwerpen)

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Integrable Hamiltonian Systems are usually studied within the symplectic framework. This implies we can only consider even dimensional spaces. If one wants to study odd dimensional spaces instead, one needs a different kind of geometry: contact geometry. Many results of symplectic integrable systems have already been translated to the contact setting. In contact geometry, one has a notion of Hamiltonian vector fields, brackets, integrable systems, an Arnold-Liouvile like theorem, a local normal form of singular points, … Furthermore, Lerman classified compact connected contact toric manifolds in a Delzant-like fashion. The natural next step is to introduce contact semitoric systems. However, these systems have not been studied before.

In my PhD-project, I use an inductive approach to find a natural definition of contact semitoric systems. In particular, we try to construct non-toric contact systems out of symplectic semitoric system. This can be done in two ways: either the dimension will decrease by one (contactisation down) or it will increase by one (contactisation up). For contactisation down, we study the regular level sets of the S^1-integral of the semitoric system, both on a topological, geometrical and dynamical level. For contactisation up, we consider $M \times N$ with N either $\mathbb{R}$ or S^1 and (M, ω, F) an exact semitoric system. After studying these constructions, we were able to conclude that both methods yield some interesting results in general, but in the context of contact semitoric systems, they don't provide intuition for a new definition. Consequently, either a deductive approach or an ad hoc inductive approach are more suitable for this end.

In this seminar, we will cover the main results of my PhD-research. I will mostly follow the format of the pre-defence structure of the Universiteit Antwerpen (consider this as a pre-pre-defence): the core of the presentation will be maximally 30 minutes. I will extend this 30 minutes with an additional short (+- 15 minutes) introduction towards contact integrable systems. Finally, I explicitly invite all attendees to ask many questions during the remainder of the time.