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Convexity For Momentum Maps Constructed by Thimm's Trick

In 1983, Guillemin and Sternberg introduced the Gelfand-Zeitlin system on coadjoint orbits and proved that the image of a Gelfand-Zeitlin system on a unitary coadjoint orbit is a convex polytope. It is interesting to note that although unitary coadjoint orbits are compact, the Gelfand-Zeitlin system only generates a Hamiltonian torus action on an open dense submanifold of the coadjoint orbit. For this reason, Guillemin and Sternberg were unable to deduce convexity and fibre connectedness for Gelfand-Zeitlin systems from their famous Abelian convexity theorem* (instead they computed the image explicitly).

The Gelfand-Zeitlin system can be viewed as an example of a more general construction, which one may refer to as 'Thimm's trick' (owing to a 1981 paper by Thimm). In this talk I will present a convexity and fibre connectedness theorem for all proper momentum maps that are constructed by Thimm's trick. It may be interesting for session participants to note that the proof does not contain Morse theory.

The corresponding pre-print is arXiv:1509.07356.

* Of course, the Abelian convexity theorem was proven by Atiyah and separately Guillemin and Sternberg in 1982.