VECTOR FIELDS AS MAGNETIC MAPS

MARIAN IOAN MUNTEANU

Abstract.

This talk is based on some joint papers with J. Inoguchi, Institute of Mathematics, University of Hokkaido, Japan.

In our paper [IM14] we define the notion of magnetic map as a generalization of both magnetic curves and harmonic maps.

A magnetic map is obtained as critical points of the LH functional, that is the energy functional together with a potential part.

As a vector field can be thought of as a map from the manifold to its tangent bundle and since the tangent bundle carries a natural magnetic field obtained from its almost Kählerian structure, we may ask when a vector field is a magnetic map?

Furthermore, we show that a unit vector field on an oriented Riemannian manifold is a critical point of the Landau Hall functional if and only if it is a critical point of the Dirichlet energy functional. Therefore, we provide a characterization for a unit vector field to be a magnetic map into its unit tangent sphere bundle.

References

IM14 J. Inoguchi and M.I. Munteanu, Magnetic maps, Internat. J. Geom. Methods Mod. Phys. 11 (2014) 6, art. n.1450058.

IM15 J. Inoguchi and M.I. Munteanu, New examples of magnetic maps involving tangent bundles, Rend. Semin.Mat. Univ. Politec. Torino 73/1 (2015) 3-4, 101–116.

IM18 J. Inoguchi and M.I. Munteanu, Magnetic vector fields: New examples, Publ. Inst. Math. Beograd 103 (117) (2018), 91–102.

IM23 J. Inoguchi and M.I. Munteanu, Magnetic unit vector fields, Revista de la Real Academia de Ciencias Exactas, Fisicas y Naturales. Serie A. Matematicas, 117 (2023) 2, art. 71.

Key words and phrases. magnetic fields, trajectories, magnetic maps, harmonic vector fields.