INSTITUTUL DE MATEMATICA “SIMION STOILOW” AL ACADEMIEI ROMANE

Conferința lunară

The Nash embedding in conformal geometry and the Hill equation

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Abstract: According to the Nash embedding Theorem, any Riemannian manifold can be realized as a submanifold in an Euclidean space, with the induced metric. In particular, the arc length induced by the submanifold on each curve coincides with the one induced by the ambient space. In conformal geometry, the role of arc length is played by the class of projective parametrizations, induced on each curve by a Hill equation, explicitly determined by the conformal structure, and the global invariant corresponding to the length of a closed curve is its projective class. We show that, while for each projective class there exist compact conformal manifolds inducing it on a closed curve, on an Euclidean space there is an inequality that the projective class of a curve in R^n satisfies, the equality case characterizing the circles in R^n. This excludes therefore a Nash-like embedding (in the above terms) for a large class of conformal manifolds.

Rezumat. *Conform teoremei lui Nash, orice varietate Riemanniana poate fi realizata ca o subvarietate a unui spatiu euclidian, cu metrica indusa. In particular, lungimea de arc indusa de subvarietate pe orice curba a ei este aceeasi cu cea indusa de spatiul euclidian ambiental. In geometrie conforma, rolul lungimii de arc este jucat de clasa parametrizarilor proiective induse printr-o ecuatie Hill determinata explicit de structura conforma, iar invariantul global corespunzator lungimii unei curbe este clasa sa proiectiva. Aratam ca, in timp ce pentru orice astfel de clasa proiectiva exista varietati conforme compacte ce o induc pe o curba inchisa, pe un spatiu euclidian exista o inegalitate pe care clasa proiectiva a unei curbe in* R^n *o satisface, cazul egalitatii caracterizand cercurile in* R^n*. Aceasta exclude deci o scufundare de tip Nash (in termenii de mai sus) pentru o clasa larga de varietati conforme.*