PIMS Distinguished Lecture Series

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Wednesday, April 6
3:30 - 4:30 p.m.
Classroom Building
(CL) 431

The Nash-Moser Theorem of Hamilton and Rigidity of Lie Algebras

The Nash-Moser Theorem for exact sequences of R. Hamilton roughly states the following: Let

$$U \xrightarrow{F} V \xrightarrow{G} W \qquad (1)$$

be two smooth tame functions, defined on open subsets of tame Fréchet spaces, such that $G(F(u)) = 0 \in W$ for all $u \in U$ (that is a 3-term "C^∞-chain complex"). If for a given $u_0 \in U$ the 3-term ordinary linear chain complex induced at the level of the corresponding tangent spaces is exact, then (1) is also (locally) exact. The finite dimensional version of this result is a (fine) consequence of the classical Implicit Function Theorem.

This result, among many other applications, implies the well known general principle of deformation theory that says that given an algebra structure μ (over $\mathbb{R}$), then

$$H^2(\mu,\mu) = 0 \;\Rightarrow\; \mu \text{ is rigid (but the converse is not true).} \qquad (2)$$

In this talk we will recall the precise statement of the Nash-Moser Theorem of Hamilton, showing how to obtain (2) from it, and present some of its applications to the study of finite dimensional rigid Lie algebras. This will lead us to discuss the radical of the polynomial ideal that defines the algebraic variety of k-step nilpotent Lie algebras of dimension n.

Mathematics and Statistics

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