Nobuhiro INNAMI, Dr.Sci.

Professor

Program: Fundamental Sciences

Area: Mathematical Science

Undergraduate: Dept. of Science

Professional Expertise

His research expertise is geometry of geodesics. Roughly speaking, a geodesic is a curve whose length is equal to the distance between its endpoints. The distance plays very important roles in variety of researches. Thus the geometry of geodesics can be useful and have many applications. He gave some results in studying convexity in Riemannian manifolds, manifolds without conjugate points, geodesic flows of Riemannian manifolds, matrix valued differential equation of Jacobi type, convex billiards, geodesics in gluing manifolds, Steiner ratio for surfaces. His studies are based on the methods developed in the study of Riemannian manifolds.

Research Fields of Interest

Minimum network problems

- Study on Steiner ratios for surfaces and Alexandrov surfaces as an application of geometry of geodesics. In particular, he has recently given the Steiner ratios for Poincare disks and surfaces having ends.

Convex billiards

- Study on convex billiards as an application of geometry geodesics. In particular, he has studied them by using the method developed in the study of manifolds without conjugate points, geodesics on 2-tori. His main interest directs to the characterization of circles and ellipses by behavior of billiards trajectories.

Differential equation of Jacobi type

- To study geodesics in Riemannian manifolds we often use variation vector fields through geodesics which satisfy a differential equation of Jacobi type. He has given some examples of vector fields and families of curves in the study of which a differential equation of the same type as that in geodesic variation.

Riemannian manifolds without conjugate points

- Study on complete Riemannian manifolds without conjugate points, without focal points and with non-positive curvature. Those manifolds are a natural generalization of Euclidean geometry in the sense that all geodesics are minimizing if they are simply connected. He developed Busemann's method to study geometry in those spaces. Those subjects are concerned with the study of dynamical systems.

Theory of parallels

- Is a straight space satisfying the parallel axiom Euclidean? This is one of the oldest problems. In the wide class of spaces the answer is negative, however it is positive if the spaces are the universal covering spaces of tori without conjugate points. What is the final answer?

Classical differential geometry

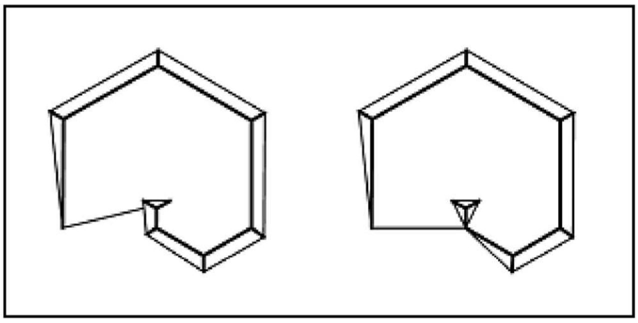
- Study on characterization of Riemannian manifolds with constant sectional curvature, relation between volume, surface area and injectivity radius, geodesic hyperspheres in Riemannian manifolds, etc.

Educational Background

1983: Doctor of Sci.degree, Grad.School (Math.), University of Tsukuba, Japan (1978-1983)
1982: Master of Sci.degree, Grad.School (Math.), University of Tsukuba, Japan
1973: Bachelor of Sci.degree, Dept.of Mathematics, Tokyo Univ. Edu, Japan (1973-1977)

Professional Societies and Activities

1. Mathematical Society of Japan
2. MAA



Major Publications

Papers

[1] The Steiner ratio conjecture of Gilbert-Pollak may still be open, Algorithmica, 57 (2010) 869--872 (with B.H. Kim, Y. Mashiko and K. Shiohama).

[2] Compression theorems for surfaces and their applications, J. Math. Soc. Japan, 59,3 (2007) 825--835.

[3] Steiner ratio for hyperbolic surfaces, Proc. Japan Acad., Ser A, 82,6 (2006) 77--79 (with B.H. Kim).

[4] Gradient vector fields which characterize warped products. Math. Scand, 88,2 (2001) 182--192 (with Kim, Byung Hak).

[5] Volume, surface area and inward injectivity radius, Proc. Amer. Math. Soc., 127, 10 (1999) 3049-3055.

[6] Integral formulas for polyhedral and spherical billiards, J. Math. Soc. Japan, 50,2 (1998) 339-357.

[7] Isoperimetric inequalities depending on injectivity radius from boundary, "Complex structures and vector fields" (editors S. Dimiev and K. Sekigawa), (1995) 36-45, World Scientific, Singapore.

[8] Natural Lagrangian systems without conjugate points, Ergod. Th. & Dynam. Sys., 14 (1994) 169-180.

[9] Applications of Jacobi and Riccati equations along flows to Riemannian geometry, in Advanced Studies in Pure Mathematics, 22, Progress in Differential Geometry, (1993) 31-52, Kinokuniya, Tokyo.

[10] The class of second order equations which Riemannian geometry can be applied to, J. Math. Soc. Japan., 45-1 (1993) 89-103.

[11] Jacobi vector fields along geodesic flows, Dynamical System and Related Topics (editor, K. Shiraiwa), World Scientific Adv. Ser. in Dynam. Sys., 9 (1991) 166-174, World Scientific, Singapore.

[12] Euclidean metric and flat metric outside a compact set, Proc. Amer. Math. Soc., 105 (1989) 701-705.

[13] Manifolds without conjugate points and with integral curvature zero, J. Math. Soc. Japan, 41 (1989) 251-261.

[14] Convex curves whose points are vertices of billiard triangles, Kodai Math. J., 11 (1988) 17-24.

[15] A characterization of flat metrics on tori by ergodicity, Ergod Th. Dynam. Sys., 7 (1987) 197-201.

[16] A note on nonfocality properties in compact manifolds, Archiv der Math., 48 (1987) 277-280.

[17] Families of geodesics which distinguish flat tori, Math. J. Okayama Univ. 28 (1986) 207-217.

[18] The n-plane with integral curvature zero and without conjugate points, Proc. Japan Acad., 62, A (1986) 282-284.

[19] On tori having poles, Invent. math. 84 (1986) 437-443.

[20] On the terminal points of co-rays and rays, Archiv der Math. 45 (1985) 468-470.

[21] The axiom of generalized hyperspheres in Riemannian geometry, Kodai Math. J. 8 (1985) 259-263 (with Koichi Shiga).

[22] Totally flat foliations and peakless functions, Archiv der Math. 41 (1983) 464-471.

[23] The axiom of n-planes and convexity in Riemannian manifolds, J. Math. Soc. Japan 180 (1983) 85-91.

[24] Differentiability of Busemann functions and total excess, Math. Z. 180 (1982) 235-247.

[25] Splitting theorems of Riemannian manifolds, Compositio Math. 47 (1982) 237-247.

[26] A classification of Busemann G-surfaces which possess convex functions, Acta Math. 148 (1982) 15-29.