TOPICS AND REFERENCES

Here are some suggestions as topics for speakers.

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1. Introduction to boundary rigidity, outline of Pestov-Uhlmann result
2. Manifolds and geodesics I: basic properties, distance minimizing curves are geodesics
3. Manifolds and geodesics II: covariant derivative, geodesic flow
4. Manifolds and geodesics III: Jacobi fields, conjugate points of geodesics
5. Boundary distance function determines a simple metric and its derivatives at the boundary [LSU, Theorem 2.1]
6. Boundary distance function determines a simple metric in its conformal class [Mu]
7. Scattering relation, geodesic X-ray transform I, solvability of $I^*w = h$ [PU, p. 1095, 1097–1099]
8. Laplace-Beltrami operator, Dirichlet-to-Neumann map, determination of metric from DN map [LU]
9. Hilbert transform [PU, p. 1099–1101]
10. Preliminaries and notation [PU, Section 2]
11. Pseudodifferential operators, I^*I is a pseudodifferential operator [PU, Lemma 3.1]
12. Surjectivity of I^*I [PU, Lemma 3.2]
13. Scattering relation and folds [PU, Section 4]
14. Hilbert transform and geodesic flow [PU, Section 5]

The following references may be useful. The newer papers are also available electronically.

[PU] L. Pestov and G. Uhlmann, *Two dimensional compact simple Riemannian manifolds are boundary distance rigid.* Ann. of Math. **161** (2005), 1093–1110.

• The main paper for the seminar.

[PU2] L. Pestov and G. Uhlmann, *The boundary distance function and the Dirichlet-to-Neumann map.* Math. Res. Lett. **11** (2004), 285–297.

• Outline of the Annals paper, plus a procedure for reconstructing a sound speed from boundary distance function.

[Cr] C. B. Croke, *Rigidity theorems in Riemannian geometry.* Geometric methods in inverse problems and PDE control, 47–72, IMA Vol. Math. Appl., 137, Springer, New York, 2004.

• Survey of results on boundary rigidity (written May 2002).

[LSU] M. Lassas, V. Sharafutdinov, and G. Uhlmann, *Semiglobal boundary rigidity for Riemannian metrics*, Math. Ann. **325** (2003), 767-793.

• Proves a semiglobal result, and shows that the boundary distance function determines the metric and its derivatives at the boundary.

[LU] M. Lassas and G. Uhlmann, *On determining a Riemannian manifold from the Dirichlet-to-Neumann map.* Ann. Sci. École Norm. Sup. **34** (2001), no. 5, 771–787.

• Shows, for $n = 2$, that the Dirichlet-to-Neumann map determines a metric up to isometry and conformal factor.

[Mi] R. Michel, *Sur la rigidité imposée par la longuer des géodésiques* (in French). Invent. Math. **65** (1981), 71–83.

• Considers boundary rigidity for simple metrics mostly with constant curvature.

[Mu] R. G. Mukhometov, *A problem of reconstructing a Riemannian metric* (translated from Russian). Siberian Math. J. **22** (1982), 420–433.

• Proves that the boundary distance function determines a simple metric uniquely in its conformal class.