Andrea Fraser

Analysis

Andrea Fraser's areas of research include multiplier operators and analysis on the Heisenberg group.

Multiplier Operators modify a function by multiplying its Fourier transform by a fixed function m. In simplified terms, when we apply a multiplier operator to a sound or signal which has been decomposed into constituent frequencies at various amplitudes, we are damping certain of those frequencies and magnifying others: we do this, for example, when adjusting the equalizer on a stereo set. Multiplier theory has important applications in many areas of mathematics, such as partial differential equations, analytic number theory, differential geometry (where for example one uses multiplier operators to split a vector field into divergence-free and curl-free pieces), and fluid mechanics (where multiplier operators play a role in the incompressible Navier-Stokes equations).

The Heisenberg group is the simplest example after R^n of a homogeneous group: a group which admits a natural one-parameter family of dilations. It is an important conceptual tool useful in understanding aspects of mathematical physics, time-frequency analysis, several complex variables, and partial differential equations. This is because of its beautiful fundamental connections to both quantum mechanics, from which it derives its name, and to the theory of several complex variables, with respect to which it plays the same distinguished role as the real line does to the theory of one complex variable. Group-theoretically, the Heisenberg group is the embodiment of Heisenberg's relations governing the interplay between the position and momentum operators. It also provides the underlying structure for the fundamental operators of time-frequency analysis. In several complex variables, the Heisenberg group can be realized as the boundary of the unit ball. The extension to the Heisenberg group of concepts and methods of real-variable harmonic analysis is thus of much interest, and has important applications via each of these fields.

For more information, contact:

Dr. Andrea Fraser
Department of Mathematics and Statistics
Dalhousie University
(902) 494-3062, afraser@mathstat.dal.ca

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