



McMaster University



University of Toronto



University of Waterloo

**THE FIELDS INSTITUTE
FOR RESEARCH IN MATHEMATICAL SCIENCES**

SEMINAR SERIES ON CONTROL THEORY

SPEAKER:

**MIROSLAV LOVRIC
McMaster University**

The First of Two Talks: Part 1

"Reachable Sets and Singular Riemannian Foliations"

will be held

Friday, March 27th, 1992 at 1:30 p.m.

at

**Fields Institute
3rd Floor, Uni-Park 3
185 Columbia Street West
Waterloo**

One of the problems in control theory consists of determining whether a system in a given state can be brought to some other state, and if so, by what paths. The collection of all states to which a given systems can be brought from the given state is called a reachable set (for that state).

A singular Riemannian foliation (SRF) is a collection of leaves (orbits), not necessarily of the same dimension, with the additional property that the geodesic perpendicular to one leaf remains perpendicular to the leaves for all times. For example, the orbits of the vector field $F(x,y)=(-y,x)$ in the plane or of the field $F(x,y,z,t)=(-y,x,-t,z)$ on the 3-sphere form a SRF. It is a classical result of Stefan and Sussmann that reachable sets constitute a singular foliation.

An introduction to the Riemannian foliation will be presented, together with the constructions and results relevant for the applications. We will study the geometry of the SRFs, in particular the closure of reachable sets. An application to invertible systems using feedback control will be given.