$$t_i = \boldsymbol{\tau}_{i-1}^{N-i+1}(t_{i-1}, x_{i-1}(t_{i-1})), \tag{13}$$

$$x_{i-1}(t_i) = \mathbf{x}_{i-1}^{N-i+1}(t_{i-1}, x_{i-1}(t_{i-1})), \tag{14}$$

where $i = 1, \ldots, N$. *If* $N = 0$, *then equations* (12)–(14) *are absent.*

The application of the optimality conditions is demonstrated by model examples of group performance. The plain motion of a "quick" controlled object ("carrier") is considered. "Slow" objects directed to preset goals separate from it in the process of motion. It is required to hit all the goals in the shortest possible time. In these examples, switching is considered to be the separation of the controlled objects. At the moment of switching, the control model changes because of the increase in the number of controlled objects.

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Geodesics and Laplacians in sub-Riemannian geometry

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Sub-Riemannian problems are a particular class of optimal control problems that are linear in the control and have quadratic costs. They can be seen as Riemannian problems in which some directions are forbidden. Geodesics are computed via the Pontryagin Maximum Principle.

In this talk I will discuss how to define an intrinsic Laplacian in sub-Riemannian geometry and I will discuss the relation between its self-adjointness and the properties of the geodesics. Surprising results for the heat and the Schroedinger equation appear already in simple examples as the Grushin plane and the Heisenberg group deprived of a point.