

# Tangential Transversality and Strong Tangential Transversality

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We propose the concepts of tangential transversality and strong tangential transversality in Banach spaces.

We show that tangential transversality is weaker than transversality (see [2]) and (may be) stronger than subtransversality (see [2]). Sufficient conditions for tangential transversality are discussed. New abstract Lagrange multiplier rule is proven and applied to an infinite-dimensional optimal control problem.

The definition of strong tangential transversality involves uniform tangent sets (introduced in [3] and discussed in [1]) and generalises the classical definitions of transversality of manifolds and transversality of cones. It is shown that strong tangential transversality is a sufficient condition for tangential transversality and subtransversality (see [2]), which in turn imply intersection property for the Clarke tangent cones. Moreover, strong tangential transversality implies an intersection property for the Clarke normal cones and a rather general sum rule for the Clarke subdifferential.

## References

- [1] M. Bivas, N. Ribarska, M. Valkov, Properties of uniform tangent sets and Lagrange multiplier rule, <https://arxiv.org/abs/1712.01540>
- [2] A. Ioffe, Transversality in Variational Analysis, *J Optim Theory Appl* (2017), 174(2), 343-366.
- [3] M. Krastanov and N. Ribarska, Nonseparation of Sets and Optimality Conditions, *SIAM J. Control Optim.* (2017), 55(3), 1598-1618