Research Statement

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I am a master math student at IME (Instituto de Matemática e Estatística) of University of São Paulo under supervision of Professor Artur Hideyuki Tomita. My interest lies in general and set-theoretic topology, particularly the unexpected behavior of topological spaces enriched with an algebraic structure when we consider ZFC with additional assumptions, v.g. CH or $\neg\mathsf{CH}$, different forms of MA (Martin Axiom), like $\mathsf{MA}_{\mathtt{countable}}$, $\mathsf{MA}_{\sigma-\text{centered}}$ or even the total failure of MA. Moreover, I am interested to study topological objects whose existence is independent from ZFC, results that are frequently proved using forcing and techniques which involve elementary substructures.

Currently, I am writing my master dissertation on existence of countably compact topological groups without non trivial convergent sequences using CH [Tka90], MA [vD80], selective ultrafilters [GFTW04, GT07] and forcing [KTW00, Tom03]; the construction of those groups allows to solve problems that apparently are not connected to their existence, such as the Wallace problem [RS96, Tom96], the non productivity of countably compactness in topological groups [vD80, Tom05a, Tom05b] and some questions related to independent group topologies [TY02].

References

[GFTW04] Salvador Garcia-Ferreira, Artur H. Tomita, and S. Watson. Countably compact groups from a selective ultrafilter. *Proc. Amer. Math. Soc.*, 133(3), 2004.

[GT07] Roberto E. Madariaga Garcia and Artur H. Tomita. Countably compact topological group topologies on a free Abelian groups from selective ultrafilters. *Topology Appl.*, 154(7):1470–1480, 2007.

[KTW00] Piotr B. Koszmider, Artur H. Tomita, and S. Watson. Forcing countably compact groups topologies on a larger free Abelian group. *Topology Proc.*, 25:563–574, 2000.

[RS96] Desmond Robbie and Sergey Svetlichny. An answer to A. D. Wallace's question about countably compact cancellative semigroups. *Proc. Amer. Math. Soc.*, 124(1), 1996.

[Tka90] M. G. Tkačenko. Countably compact and pseudocompact topologies on free Abelian groups. *Iz. VUZ.*, 34(5):68–75, 1990.

[Tom96] Artur H. Tomita. The Wallace problem: a counterexample from $\mathrm{MA}_{\mathrm{countable}}$ and $\mathfrak{p}$-compactness. *Canad. Math. Bull.*, 39(4):486–498, 1996.

[Tom98] Artur H. Tomita. The existence of initially ω_1 compact group topologies on free Abelian groups is independent of ZFC. *Comment. Math. Univ. Carolin.*, 39(2):401–413, 1998.

[Tom03] Artur H. Tomita. Two countably compact topological groups: One of size $\aleph_\omega$ and the other of weight $\aleph_\omega$ without non-trivial convergent sequences. *Proc. Amer. Math. Soc.*, 131(8):2617–2622, 2003.

[Tom05a] Artur H. Tomita. A solution to Comfort's question on the countable compactness of powers of a topological groups. *Fund. Math.*, 186:1–24, 2005.

[Tom05b] Artur H. Tomita. Square of countable compact groups without non-trivial convergents sequences. *Topology Appl.*, 153(1):107–122, 2005.

[TY02] M. G. Tkačenko and Ivan Yasčenko. Independent group topologies on Abelian groups. *Topology Appl.*, 122(1-2):425–451, 2002.

[vD80] Erick K. van Douwen. The product of two countably compact topological groups. *Trans. Amer. Math. Soc.*, 262:199–205, 1980.