The notion of unique ergodicity relating to a group was introduced by Angel, Kechris and Lyons. They also ask the following question which is the main focus of the thesis: Let G be an amenable Polish group with metrizable universal minimal flow, is G uniquely ergodic?

Note that unique ergodicity is an interesting notion only for relatively large groups, as it is proved in the last chapter of this thesis that locally compact non compact Polish groups are never uniquely ergodic. This result is joint work with Andy Zucker.

The thesis includes proofs of unique ergodicity of groups with interesting universal minimal flows, namely the automorphism group of the semigeneric directed graph and the automorphism group of the 2-graph.

It also includes a theorem stating that under some hypothesis on a ω-categorical structure M, the logic action of $\mathrm{Aut}(M)$ on $\mathrm{LO}(M)$, the compact space of linear orders on M, is uniquely ergodic. This implies unique ergodicity for the group if its universal minimal flow happens to be the space of linear orderings. It can also be used to prove non-amenability of some groups for which the action of $\mathrm{Aut}(M)$ on $\mathrm{LO}(M)$ is not minimal. This result is joint work with Todor Tsankov.

Finally, the thesis also presents a proof that under the assumption that the universal minimal flows involved are metrizable, unique ergodicity is stable under group extensions. This result is joint work with Andy Zucker.

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Liling Ko. ***Towards Finding a Lattice that Characterizes the $> \omega^2$-Fickle Recursively Enumerable Turing Degrees.*** University of Notre Dame, USA. 2021. Supervised by Peter Cholak. MSC: 03D25, 03D55. Keywords: Fickle, Turing degrees, recursively enumerable, lattices, computable approximation, embedding.

Abstract

Given a finite lattice L that can be embedded in the recursively enumerable (r.e.) Turing degrees $\langle \mathcal{R}_{\mathrm{T}}, \leq_{\mathrm{T}} \rangle$, we do not in general know how to characterize the degrees $\mathbf{d} \in \mathcal{R}_{\mathrm{T}}$ below which L can be bounded. The important characterizations known are of the L_7 and M_3 lattices, where the lattices are bounded below $\mathbf{d}$ if and only if $\mathbf{d}$ contains sets of "*fickleness*" $> \omega$ and $\geq \omega^{\omega}$ respectively. We work towards finding a lattice that characterizes the levels above ω^2, the first non-trivial level after ω. We introduced a lattice-theoretic property called " 3-*directness*" to describe lattices that are no "*wider*" or "*taller*" than L_7 and M_3. We exhaust the 3-direct lattices L, but they turn out to also characterize the $> \omega$ or $\geq \omega^{\omega}$ levels, if L is not already embeddable below all non-zero r.e. degrees. We also considered upper semilattices (USLs) by removing the bottom meet(s) of some 3-direct lattices, but the removals did not change the levels characterized. This leads us to conjecture that a USL characterizes the same r.e. degrees as the lattice on which the USL is based. We discovered three 3-direct lattices besides M_3 that also characterize the $\geq \omega^{\omega}$-levels. Our search for a $> \omega^2$-candidate therefore involves the lattice-theoretic problem of finding lattices that do not contain any of the four $\geq \omega^{\omega}$-lattices as sublattices.

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