科研工作总结 (2005-2025)

一．研究方向：

群作用拓扑动力系统。

二．研究目标：

理解作用群的代数结构、相空间的拓扑、和作用的动力学性质三者之间的关系。

三．研究问题：

给定拓扑空间 X，作用群 G，和动力性质 P，研究三类问题:

（1） 实现问题：G 能否以性质 P 作用在 X 上;

（2） 结构问题：描述 G 在 X 上以动力性质 P 作用的系统的结构;

（3） 分类问题：拓扑共轭意义下分类所有 G 在 X 上具有性质 P 的作用。

四．研究成果：

(1) 可扩作用的实现和结构

[a] B .Liang, E. Shi, Z. Xie, H. Xu, The nonexistence of expansive actions of groups with subexponential growth on Suslinian continua, Top. Appl. (2024).

[b] E. Shi, S. Wang, Z. Xie, H. Xu, The nonexistence of expansive polycyclic group actions on the circle, PAMS (2023).

[c] J. Mai, E. Shi, A class of spaces that admitting no sensitive commutative group actions, Fund.Math. (2012).

[d] E. Shi, S. Wang, The Ping pong game, geometric entropy and expansiveness for group actions on Peano continua having free dendrites, Fund.Math. (2009).

[e] J. Mai, E. Shi, The nonexistence of sensitive commutative group actions on graphs, Sci.China.Ser A (2007).

[f] E. Shi, L. Zhou, The nonexistence of expansive Z^d actions on graphs, Acta Mathematica Sinica, English Series (2005).

[g] E. Shi, H. Xu, Z.Yu, The structure of pointwise recurrent expansive homeomorphisms, ETDS (2023).

(2) Distal 作用的实现和结构

[a] E. Shi, H. Xu, Z. Yu, The strucutre of periodic point free distal homeomorphisms on the annulus. Math.Z. (2026).

[b] E. Shi, H. Xu, L. Zhou, Obstructions for minimal distal actions. Acta Mathematica Sinica, English Series (accept).

(3) 不可约作用的实现和分类

[a] H. Xu, E. Shi, Topological conjugation classes of tightly transitive subgroups of Homeo(S^1), JDDE (2022).

[b] E. Shi, L. Zhou, Topological transitivity and wandering intervals for group actions on the line R, GGD (2019).

[c] E. Shi, L. Zhou, Topological conjugation classes of tightly transitive subgroups of Homeo(R), Colloq. Math. (2016).

(4) 曲线同胚群的二择性

[a] E. Shi, H. Xu, X. Ye, An alternative for minimal group actions on totally regular curves, JDE (2022).

[b] E. Shi, Free subgroups of dendrite homeomorphism groups, Top. Appl. (2012).

[c] E. Shi, S. Wang, L. Zhou, Minimal group actions on dendrites, PAMS (2010).

(5) 群作用的刚性现象

[a] E. Shi, H. Xu, Rigidity for non-left-orderable group actions on dendrites. (submit)

[b] H. Huang, H. Li, E. Shi, H. Xu, Stronly independent matrices and rigidity of A-invariant measures on n-torus, Front. Math. 18 (2023).

[c] H. Hu, E. Shi, Z. Wang, Some ergodic and rigidity properties of Heisenberg group actions, Israel J.Math. (2018).

(6) 极小集的结构

[a] E. Shi, X. Ye, Equicontinuity of minimal sets for amenable group actions on dendrites, Contemp. Math. (2020).

[b] H. Xu, E. Shi, Y. Wang, Invariant Radon measures and minimal sets for subgroups of Homeo(R), Top. Appl. (2020).

(7) 周期轨的存在性

[a] E. Shi, X. Ye, Periodic points for amenable group actions on uniquely arcwise connected continua, ETDS (2021).

[b] E. Shi, X. Ye, Periodic points for amenable group actions on dendrites, PAMS(2017).

[c] E. Shi, L. Zhou, Periodic points of solvable group actions on uniquely arcwsie connected continua, Top.Appl. (2010).

[d] E. Shi, B. Sun, Fixed point properties of nilpotent group actions on 1-arcwise connected continua,PAMS (2009).

[e] J. Mai, E. Shi, K. Yan, F. Zeng, A new construction of counterexamples to the bounded orbit conjecture, TMNA (to appear).

[f] E. Shi, Z. Yu, A note on the bounded orbit conjecture (arXiv:2504.09539).

(8) 组合中的应用

[a] E. Shi, H. Xu, Erdos' problem and (n, 1/3)-separated set (arXiv:2405.12782).

[b] E. Shi, H. Xu, A dynamical argument for a Ramsey property (arXiv:2104.02358).

五．待解决的问题：

(1) 是否每个曲线（1 维连续统）上的 distal 群作用都是等度连续的?

(2) Kazhdan Property(T) 群在圆周上的连续作用是否必为有限作用?

(3) 若 2-球面上的一个 distal 同胚 f 的每个轨道闭包都是 0-维的，f 是否必为有限阶的?
(4) 高秩格群在 2-球面上的 distal 作用一定是有限作用吗?
(5) 2-球面上存在可扩 Z^2 作用吗?
(6) 刻画无穷维环面上可扩 Z^2 作用的结构。
(7) 平环上具有丢番图旋转数的光滑 distal 伪旋转是否一定可以光滑线性化?