

# A multiplicative ergodic theorem in random and simultaneous dynamics

THIRUPATHI P

**Abstract:** We consider a finite collection of measure-preserving maps defined on a compact measure space, where at least one map in the collection has degree strictly greater than 1. We study random dynamics and simultaneous dynamics generated by this collection of maps. In random dynamics, we investigate the orbits of generic points along the paths specified by the set of all infinite-lettered words drawn from a finite set of letters, whereas, in simultaneous dynamics, we consider a set-valued growth of subsets of the phase space. In particular, we examine the asymptotic behaviour of growth of operator norms that depends on the growth of typical orbits within this framework. The main objective is to derive expressions for the extremal Lyapunov exponents and provide a description of the associated multiplicative ergodic theorem.