

A fundamental problem that the bearing rigidity theory studies is to determine when a framework can be uniquely determined up to a translation and a scaling factor by its inter-neighbor bearings. While many previous works focused on the bearing rigidity of two-dimensional frameworks, a first contribution of this paper is to extend these results to arbitrary dimensions. It is shown that a framework in an arbitrary dimension can be uniquely determined up to a translation and a scaling factor by the bearings if and only if the framework is infinitesimally bearing rigid. In this paper, the proposed bearing rigidity theory is further applied to the bearing-only formation stabilization problem where the target formation is defined by inter-neighbor bearings and the feedback control uses only bearing measurements. Nonlinear distributed bearing-only formation control laws are proposed for the cases with and without a global orientation. It is proved that the control laws can almost globally stabilize infinitesimally bearing rigid formations. Numerical simulations are provided to support the analysis.