Separating invariants for real representations of abelian groups

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The orbit recovery problem for the cyclic group acting on the real n-space via cyclic shifts of the coordinates has relevance for the multireference alignment model, appearing in connection with signal processing, computer vision, or structural biology. This motivates the study of degree bounds for polynomial invariants separating the orbits under a linear action of a finite abelian group on a finite dimensional real vector space. In the talk we present a result showing how a known bound valid for complex representations improves when we work over the real (or other algebraically non-closed) base field. Moreover, this theorem places into context the perhaps surprising fact that for any representation over the field of rational numbers of the cyclic group of prime order, polynomial invariants of degree at most three are sufficient to separate all the orbits.