Algebraic methods applied to mappings under relative symmetries

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June 20, 2013

Symmetries of a mapping form a group with a linear real action on the space of variables that commutes with the mapping. Relative symmetries extend this notion, forming a larger group Γ whose subset of symmetries is a normal subgroup H of finite index. The actions of Γ on source and target are now distinct. More precisely, consider the cyclic group $\mathbf{Z}_m$, where m is the index of H, and an epimorphism $\sigma : \Gamma \to \mathbf{Z}_m$; for $\gamma \in \Gamma$, if $x \mapsto \gamma x$ denotes the action on the source, then $x \mapsto \sigma(\gamma)\gamma x$ is the action on the target. In this talk, we discuss the power of algebraic tools from invariant theory to obtain the general form of mappings with relative symmetries, as well as for the systematic study of the singularities and bifurcations of vector fields under relative symmetries. In particular, we shall address more attention to $m = 2$, which is the case of equivariant and reversible vector fields. The results presented here are part of a series of joint works with P.H. Baptistelli.