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Shuofeng Xu. *Characteristic 0 Automorphism loci of the moduli spaces of dynamical systems \mathcal{M}_3
and \mathcal{M}_4 and Applications.*

Let $f : \mathbb{P}^1 \rightarrow \mathbb{P}^1$ be a rational function, where \mathbb{P}^1 is the projective line. We know that conjugating f by an element of PGL_2 will produce another rational function with similar dynamical behavior. Define Rat_d as the set of degree d rational maps on \mathbb{P}^1 and the moduli space of degree d rational maps, \mathcal{M}_d , as the quotient space $Rat_d/PGL_2(\bar{\mathbb{Q}})$.

The automorphism loci of the moduli space corresponds to the set of rational functions with non-trivial automorphism groups and can be further broken down into loci where the automorphism group contains a particular finite subgroup of PGL_2 . We are able to describe the automorphism loci in \mathcal{M}_3 and \mathcal{M}_4 in terms of some normal forms, i.e., n -parameter families in Rat_3 and Rat_4 such that n equals to the dimension of the appropriate automorphism loci in the moduli space. Using these normal forms, we are also able to obtain some uniform boundedness results on the rational preperiodic structures of several one-parameter families with non-trivial automorphism groups. Additionally, we look at applications of the automorphisms to statistics over finite fields. (Received September 16, 2019)