

GIT for polarized curves

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Abstract. We study the GIT quotients of the Hilbert and Chow schemes of curves of degree d and genus g in a projective space of dimension $d - g$, as the degree d decreases with respect to the genus g . We prove that the first three values of d at which the GIT quotients change are given by $d = 4(2g - 2)$, $d = 3.5(2g - 2)$ and $d = 2(2g - 2)$. In the range $d > 4(2g - 2)$, we show that the previous results of L. Caporaso hold true both for the Hilbert and Chow semistability. In the range $4(2g - 2) < d < 3.5(2g - 2)$, the Hilbert semistable locus coincides with the Chow semistable locus and it maps to the moduli stack of weakly-pseudo-stable curves. In the range $2(2g - 2) < d < 3.5(2g - 2)$, the Hilbert and Chow semistable loci coincide and they map to the moduli stack of pseudo-stable curves. We also analyze in detail the first two critical values $d = 4(2g - 2)$ and $d = 3.5(2g - 2)$, where the Hilbert semistable locus is strictly smaller than the Chow semistable locus. As an application of our results, we get two new compactifications of the universal Jacobian, one over the moduli stack of weakly-pseudo-stable and the other over the stack of pseudo-stable curves, which are different from the well-known Caporaso's compactification over the moduli stack of stable curves. This is a joint work with G. Bini, F. Felici, M. Melo.