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A family of curves in the Severi variety with special moduli

Let C be a smooth complex algebraic curve of genus $g \geq 8$. Denote by K_C the canonical line bundle on C . Let $|L| = g_{g-2}^1$ a pencil on C free of base points such that the residual g_g^2 of the g_{g-2}^1 determines a birational map onto a plane curve of degree g and geometric genus g with $\delta = \frac{(g-1)(g-2)}{2}$ nodes as singularities. Consider the Petri map $\mu_L: H^0(C, L) \otimes H^0(C, K_C \otimes L^{-1}) \rightarrow H^0(C, K_C)$. We show that μ_L is not injective if and only there exists a curve F of degree $g - 5$ containing $\delta - 1$ nodes of Γ .

Now consider the Severi Variety $\mathcal{V}^{g,g,\delta}$ of reduced and irreducible plane curves of degree g and genus g having δ nodes as singularities. Let $\mathcal{V}_g := \{\Gamma \in \mathcal{V}^{g,g,\delta} : \delta - 1 \text{ nodes lie on a curve of degree } g - 5\}$. Let $\phi: \mathcal{V}_{g,g}^\delta \rightarrow \mathcal{M}_g$ the natural morphism to the moduli space of curves \mathcal{M}_g . We show that the image $\phi(\mathcal{V}_g)$ is a divisor in \mathcal{M}_g . We discuss the irreducibility of $\phi(\mathcal{V}_g)$ in some cases.