General primitivity in the mapping class group

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Abstract: For $g \geq 2$, let $\mathrm{Mod}(S_g)$ be the mapping class group of the closed orientable surface S_g of genus g. A nontrivial $G \in \mathrm{Mod}(S_g)$ is said to be a *root of an* $F \in \mathrm{Mod}(S_g)$ *of degree* n if there exists an integer $n > 1$ such that $G^n = F$. If F does not have any roots, then it is said to be *primitive*. A natural question is whether one can determine if an arbitrary $F \in \mathrm{Mod}(S_g)$ is primitive and compute the roots of F (up to conjugacy) when it is not primitive. We call this the *general primitivity problem* in $\mathrm{Mod}(S_g)$. To begin with, we provide a solution to this problem for some special elements in $\mathrm{Mod}(S_g)$ called *pseudo-periodic* mapping classes which play a critical role in this context. Using this solution, we will formulate an efficient algorithm for solving the general primitivity problem in $\mathrm{Mod}(S_g)$. Furthermore, we will provide realizable bounds on the degrees of pseudo-periodic mapping classes. We will conclude the talk by discussing the normal closures of pseudo-periodic mapping classes.