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The first eigenvalue of the Laplacian on orientable surfaces

The famous Yang-Yau inequality provides an upper bound for the first eigenvalue of the Laplacian on an orientable Riemannian surface solely in terms of its genus γ and the area. Its proof relies on the existence of holomorphic maps to $\mathbb{C}\mathbb{P}^1$ of low degree. Very recently, Ros was able to use certain holomorphic maps to $\mathbb{C}\mathbb{P}^2$ in order to give a quantitative improvement of the Yang-Yau inequality for $\gamma = 3$. In the present paper, we generalize Ros' argument to make use of holomorphic maps to $\mathbb{C}\mathbb{P}^n$ for any $n > 0$. As an application, we obtain a quantitative improvement of the Yang-Yau inequality for all genera except for $\gamma = 4, 6, 8, 10, 14$. Later, Ros adjusted some parts of the prove that has lead to even better asymptotic estimates.