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Randomly Removing *g* Handles at Once

It was shown in [Indyk and Sidiropoulos 07] that any orientable graph of genus *g* can be probabilistically embedded into a graph of genus *g* - 1 with constant distortion. In particular, such graphs embed into a distribution over planar graphs with distortion exp(*O*(*g*)). By removing all *g* handles at once, we present a probabilistic embedding with distortion *poly*(*g*), which also works in the non-orientable case. Our result is obtained by showing that the minimum-cut graph [Erickson and Har-Peled 2004] has low dilation, and then randomly cutting this graph out of the surface using the Peeling Lemma of [Lee and Sidiropoulos 08].