**Abstract**

We present an algorithm for the following problem. Given a triangulated 3-manifold $M$ and a (possibly non-simple) closed curve on the boundary of $M$, decide whether this curve is contractible in $M$. Our algorithm is combinatorial and runs in exponential time. This is the first algorithm that is specifically designed for this problem; its running time considerably improves upon the existing bounds implicit in the literature for the more general problem of contractibility of closed curves in a 3-manifold. The proof of the correctness of the algorithm relies on methods of 3-manifold topology and in particular on those used in the proof of the Loop Theorem.