MEASURING AND COMPUTING NATURAL GENERATORS FOR HOMOLOGY GROUPS

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ABSTRACT

We develop a method for measuring homology classes. This involves two problems. First, we define the size of a homology class, using ideas from relative homology. Second, we define an optimal basis of a homology group to be the basis whose elements' size have the minimal sum. We provide a greedy algorithm to compute the optimal basis and measure classes in it. The algorithm runs in $O(\beta^4 n^3 \log^2 n)$ time, where n is the size of the simplicial complex and β is the Betti number of the homology group. Finally, we prove the stability of our result.