Counting Potential Contacts. It is not obvious how to use CNF formulas to count the number of potential contacts in an embedding, i.e., the number of C variables set true. To implement counting we use a non-trivial method detailed in [11] and originating in [2], which, given a goal number of potential contacts, m, counts the number of C variables that are not set true and tests whether it is less than or equal to r, where equation M30 for the 2-D version and equation M31 for the 3-D version. The CNF formulas for this are shown in Eq. 5.



















The b variables exist for all internal nodes in a binary tree with equation M33 levels. Each internal node is assigned equation M34 b variables, where d is the depth of node k. The leaves are set to equation M35, and equation M36 being set true means there are at least i C variables set false in the leaves that descend from k. Using this method requires adding O(|G|) b variables to the SAT implementation, which are not present in the ILP version, however—consistent with the ILP implementation—the number of variables required for the whole CNF formula remains O(n|G|).