

New combinatorial structures with applications to group testing with inhibitors

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Group testing with inhibitors (GTI) is a variant of classical group testing where in addition to positive items and negative items, there is a third class of items called inhibitors. In this model the response to a test is YES if and only if the tested group of items contains at least one positive item and no inhibitor. This model of group testing has been introduced by Farach et al. for applications in the field of molecular biology. We have investigated the GTI problem both in the case when the exact number of positive items is given, and in the case when the number of positives is not given but we are provided with an upper bound on it. For the latter case, we present a lower bound on the number of tests required to determine the positive items in a completely nonadaptive fashion. Also under the same hypothesis, we present an improved lower bound on the number of tests required by any algorithm (using any number of stages) for the GTI problem. As far as it concerns the case when the exact number of positives is known, we give an efficient trivial two-stage algorithm. Instrumental to our results are new combinatorial structures that are generalizations of the well known superimposed codes and selectors. For these combinatorial structures, we present constructions and non-existential results that we believe to be also of independent interest.