

# Approximation Algorithms, exercise sheet 6

November 22, 2013

## 1. Extending the neighbourhood

In the lecture a local search algorithm was treated for the problem MAX-CUT. It was proved that this algorithm has approximation factor 2. Suppose we modify the algorithm a bit by extending the neighbourhood in which we search for the local maximum. The new neighbourhood function  $U'$  we define as  $U'(V_1, V_2) := \bigcup_{(V'_1, V'_2) \in U(V_1, V_2)} U(V'_1, V'_2)$ , where  $U$  is defined as in the lecture. What happens to the approximation factor if we modify the algorithm in this way?

## 2. Finding the local optimum

The MAX-CUT algorithm from the lecture just looks for any solution in the neighbourhood that is better than the present one. If instead it would search for the best one, would that improve the performance ratio?