Figure 5: Performance of GBP run on the partial TR construction, the FCB construction and IJGP with \(i\text{Bound} = 3\) as a function of connectivity (see text for discussion).

Figure 6: Performance of the SRG constructions as a function of \(i\text{Bound}\) with fixed connectivity of 0.7.

8.2.2 Grids with long range interactions

In addition to the partial \(K\)-tree instances, we also considered grid instances with an increasing number of long range interactions. The additional interactions were added via the following procedure. We begin with a \(10 \times 10\) grid. Let \(G_0\) denote this initial graph. Two vertices \(u\) and \(v\) are randomly chosen from the grid. If edge \((u, v)\) exists in graph \(G_{i-1}\), new vertices \(u\) and \(v\) are chosen randomly; if edge \((u, v)\) is not in \(G_{i-1}\), then graph \(G_i\) is created by adding edge \((u, v)\) to \(G_{i-1}\). This process is repeated until a specified number of edges have been added to \(G_0\).

Figure 7 compares the \(Error_{L_1}\) and \(Error_Z\) of GBP run on different loop SRG constructions. \(M = 25\) instances were generated with 5, 10, ..., and 50 additional edges. In all 250 of these MN instances the unary and pairwise terms were drawn with \(\sigma_{h_i} = 1\) and \(\sigma_{w_{ij}} = 0.5\). For the partially TR SRG construction, we take the TR core \(H\) to be \(G_0\) and fill out the cycle basis using algorithm \text{Construct Basis} (as illustrated in Figure 3). As in the partial \(K\)-tree experiments, for the FCB construction we choose a fundamental basis that does not build upon the TR core by using algorithm \text{Construct Basis} with \(H = \emptyset\). In Figure 7, we see that both the partially TR and FCB construction outperform IJGP with an equivalent \(i\text{Bound}\). Interestingly, when adding 50 additional edges we do not see the \(Error_{L_1}\) of the partially TR and the FCB constructions coalesce. This may be explained by the fact that even with 50 additional edges more than 60% of the loops in the SRG are TR (131...