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Title : Dynamic Programming Bounds from Decision Diagrams

Abstract: Decision diagrams were originally developed to encode Boolean functions but can also represent relaxations of optimization problems. We investigate the potential of relaxed decision diagrams to provide bounds on the optimal value of dynamic programming formulations. We prove general conditions under which a node merger operation in the diagram yields a valid relaxation. We then focus on job sequencing problems with state-dependent processing times, because no useful bounding mechanism currently exists for these problems. Computational experiments show that, surprisingly, relaxed diagrams prove the optimal value when their size is only a small fraction of the size of an exact diagram.