© 2013 FIZ Karlsruhe

io-port 05949362

Bonfietti, Alessio; Lombardi, Michele; Benini, Luca; Milano, Michela

A constraint based approach to cyclic RCPSP.

Lee, Jimmy (ed.), Principles and practice of constraint programming – CP 2011. 17th international conference, CP 2011, Perugia, Italy, September 12–16, 2011. Proceedings. Berlin: Springer (ISBN 978-3-642-23785-0/pbk). Lecture Notes in Computer Science 6876, 130-144 (2011).

Summary: A cyclic scheduling problem is specified by a set of activities that are executed an infinite number of times subject to precedence and resource constraints. The cyclic scheduling problem has many applications in manufacturing, production systems, embedded systems, compiler design and chemical systems. This paper proposes a Constraint Programming approach based on Modular Arithmetic, taking into account temporal resource constraints. In particular, we propose an original modular precedence constraint along with its filtering algorithm. Classical "modular" approaches fix the modulus and solve an integer linear sub-problem in a generate-and-test fashion. Conversely, our technique is based on a non-linear model that faces the problem as a whole: the modulus domain bounds are inferred from the activity-related and iteration-related variables. The method has been extensively tested on a number of non-trivial synthetic instances and on a set of realistic industrial instances. Both the time to compute a solution and its quality have been assessed. The method is extremely fast to find close to optimal solutions in a very short time also for large instances. In addition, we have found a solution for one instance that was previously unsolved and improved the bound of another of a factor of 11.5%.

Keywords: Constraint; Resource Constrained; Cyclic Scheduling
doi:10.1007/978-3-642-23786-7_12