

Abstract

Abstraction of Space Partitioning for Spatial Computation

SHIGEYUKI SATO^{1,a)} KENJIRO TAURA^{1,b)}

Presented: August 6, 2015

Space-partitioning trees, each of which holds particles in some space, are extensively used in various applications. Parallel programming with space-partitioning trees is an important issue because they are often used for spatial computation on large-scale data that motivates parallel computing. High-level computational patterns that abstract spatial computation on space-partitioning trees will make parallel programming easy, simple, and productive. Although they have tree structures, spatial computation on them is inherently interaction/correlation computation on two sets rather than tree computation. Existing patterns based only on tree structures are therefore insufficient to abstract it. In this study, we present a pattern based on cross edges between two space-partitioning trees. It abstracts computations between subspaces/particles as cross edges. We have implemented our pattern as a C++ template library at the proof-of-concept level. We present our library API, describe its affinity with parallel implementation, and also report the experimental overhead of sequential execution.

¹ Department of Information and Communication Engineering, Graduate School of Information Science and Technology, The University of Tokyo

a) sato@idos.ic.i.u-tokyo.ac.jp

b) tau@idos.ic.i.u-tokyo.ac.jp