Bachelor thesis

Title of Thesis

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Abstract

In this thesis we augment the existing Hypergraph Partitioner KaHyPar with an evolutionary framework with the goal to improve the solution quality.

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Ort, den Datum

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1 Introduction

1.1 Motivation

Hypergraph Partitioning is a highly complex field of study. The Motivation behind this work is to add an evolutionary framework to the existing Hypergraph partitioner KaHyPar in order to improve the cuts of the Hypergraph.

1.2 Contribution

1.3 Structure of Thesis

2 Fundamentals

2.1 General Definitions

Hypergraph := (H;V;E;C) Node contraction := Node uncontraction := Net := cut := connectivity := quality := population := individual :=

3 Related Work

The Hypergraph Partitioner KaHyPar uses a multilevel approach for partition. The original Hypergraph H is coarsened by contracting two nodes u, v using a selection strategy until a certain limit is passed. On the coarsened Hypergraph a simpler partitioning algorithm is chosen to generate an initial partitioning. Afterwards to contraction operations will be reverted and during each step of the uncoarsening phase local search algorithms are used to improve the current connectivity of H. The local search is based on the principle of Fiduccia-Mattheysis algorithm where operations of decreasing quality are considered, but only executed if the sum of operations results in a net gain.
The memetic Graph Partitioner KaHiP uses evolutionary actions to increase solution quality and is the main inspiration for the operations implemented in KaHyParE.

4 KaHyParE

4.1 Overview

4.2 Population

We manage a Population P which is the resource for the partitions. An individual I is a member of the population, if it is a valid solution for the given Hypergraph H

4.3 Diversity

We define diversity as

4.4 Selection Strategies

4.5 Combine operations

4.5.1 Basic Combine

The basic combine uses two parent partitions P_1 P_2 in order to create a child individual C

4.5.2 Cross Combine

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4.5.4 Basic Combine + Edge Frequency Information

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