СИИТ

СИСТЕМНАЯ ИНЖЕНЕРИЯ И ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ

OPTIMIZATION MODELS AND ALGORITHMS FOR DISCRETE RECEIVE BEAMFORMING

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Abstract. Large computer systems consist of several boards with a number of chip stacks on each board. Due to an increasing density of compute and memory chips, the communication needs between chip stacks in future computer systems will grow extremely. Today's copper-based connections will not be able to satisfy these needs with respect to several aspects like data rates and link flexibility.

Key words: high energy, receive data, systems.

INTRODUCTION

Therefore, optical connections between chip stacks on the same board and wireless links between chip stacks of neighboring boards are investigated within projects of the Collaborative Research Center (CRC) "Highly Adaptive Energy-Efficient Computing" at TU Dresden. This center, funded by the German Research Foundation (DFG), started its work in 2011 and aims at researching technologies that enable future computing systems with high energy efficiency and without compromising on high performance. It is driven by the interaction of 20 projects connecting researchers working in hardware, architecture, and software.

Wireless links between chip stacks of neighboring boards shall enable high data rates, energy efficiency, and flexibility, i.e., that each chip stack on a board can communicate with any chip stack on the other board. To achieve these goals each chip stack is equipped with one or more antenna arrays that can transmit or receive data. The antenna arrays enable to direct transmit and receive beams. Controlling the phase and amplitude of all elements of an array spatially directs and forms its beam to guarantee a high throughput for a link and low interferences with other beams. Depending on the way an antenna array is controlled we obtain difficult discrete optimization models. In addition to those models, techniques for its solution, numerical results, and further challenges are presented. The references [1–3] provide details on the research on beamforming, whereas [4] gives a broader view on related hardware concepts developed in the CRC.

KNOWLEDGMENTS

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METADATA

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