

The Development of Optimized SKA Algorithm Library

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Introduction

The algorithm reference library (ARL), a next generation of crocodile, is a SDP task under rapid development lately, which aims to produce basis algorithms implementation for SKA production system. Furthermore, the effort of optimizing imaging pipeline running on Spark has been carried out, which results in promising performance. However, the SDP production system demands highly optimized implementation of imaging algorithms, which necessitates the work to optimize ARL on targeted platform specifically to ensure high performance. This work is to undertake such task and keep the interface consistent with ARL.

Functionality and performance analysis

Algorithms, especially those functions consuming substantial computing resource are the main focus of the work. Nested loops and NumPy functions naturally are the candidates for functionality and performance analysis. Profiling tools will be utilized for such purpose. Functions will be classified by performance characteristics, and specific optimization strategies will be chosen for different class.

Autotuning and code generation

In ARL, NumPy library is extensively used for numerical operations, which might not achieve optimal performance. Recently, Tensorflow is popular computational tool for deep learning. Especially, Tensorflow provides numerical kernels, which are portable across different architectures including accelerators. To port ARL running with Tensorflow will automatically equip ARL ability to run on accelerators like GPGPU. Technology like autotuning and automatic code generation will also be employed in this work.

Summary

In summary, we propose to create an optimized version of ARL, which can achieve high performance across different architectures including emerging computing platforms. Also, autotuning techniques will make such optimization process adaptive in the future.