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アブストラクト集

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# Session I

## *Numerical simulation of supercritical-fluid flows based on SFS + BC*

齊士博

The supercritical-fluid simulator (SFS) has been coupled with the building-cube (BC) method. Wall boundary treatment is a critical issue for BC as a Cartesian mesh method. A hybrid scheme is proposed in the present study. In the hybrid scheme, the Cartesian mesh is used as a background grid and the meshless method is used as the wall boundary treatment. The test cases show that the simplicity of the Cartesian mesh method and the flexibility of the meshless method have been achieved in the hybrid scheme. The two-dimensional and three-dimensional scheme of the SFS + BC with the meshless method has been proved to be a promising tool in numerical simulations of practical supercritical-fluid flow applications.

## 数値流体力学と実証試験を用いた遠心圧縮機の高性能化に関する研究

八木学

シェルやエクソンモービル等の石油メジャーは、エネルギー産業用遠心圧縮機に、高効率化による省エネと運転流量範囲拡大によるライフサイクルコスト削減の両立を求めている。このニーズに応えるべく実施した本研究は、遠心圧縮機の昇圧源であるインペラと、インペラ上流の吸込流路を対象とした。数値流体力学による考察から効率と運転制限に関わるパラメータを抽出し、それらを調整することにより、高効率化と運転範囲拡大を両立できることを実証試験で確認した。

## *Comparing the News Coverage in Japanese National and Regional Newspapers*

Bohacs David

After the great east Japan earthquake and the Fukushima nuclear disaster, Miyawaki (2013) reported the appearance frequency of topics about them on TV and newspapers. However, it didn't include any local newspapers. In this study, we compared the news coverage of both disasters among two national newspapers (Yomiuri and Asahi Shimbun) and one local "block newspaper" (Kahoku Shimpō) to reveal the difference of the coverage about disasters between national and local media. As a result, though topics about earthquake and tsunami were more prevalent in the local newspaper, the news about nuclear disaster was more frequent in the national newspapers.

## *Code Refactoring for High Performance Computing Applications*

王春艷

Existing High-Performance Computing (HPC) applications are usually optimized for their target platforms to achieve high performance. Hence, such an application is often unable to run efficiently on another platform; its performance is not portable. The purpose of this work is to establish a systematic way of code refactoring, in which a HPC application is refactored to have a higher performance portability. To this end, we develop refactoring tools to facilitate the process of undoing platform-specific optimizations of an existing HPC application. After that, the refactored application is further refactored to be tunable, and thus we can use automatic performance tuning mechanisms so that the application can automatically adapt to different platforms.

## Session II

### *A Study On Fast Big Data Mining in Optical-Wireless Data Center Networks*

須藤克弥

While current big data mining architectures (BDMAs) are basically designed for data center networks, in which hundreds of thousands of servers are interconnected with optical fiber cables, prospective BDMAs would be applied in optical-wireless data center networks. To modify conventional BDMA for optical-wireless hybrid environments, we need to answer the fundamental research problem, “How does BDMA use optical and wireless resources?” To answer this question, we reveals some challenging issues and proposes a context-aware task allocation scheme that is designed by considering characteristics of both optical and wireless communications.

### *Complex hyperbolic triangle groups and volumes of hyperbolic manifolds*

孫立杰

There has been much research about the sufficient or necessary conditions for discreteness of groups of holomorphic isometries of the complex hyperbolic space. It is valuable for us to investigate the discreteness of a kind of special group, i.e., complex hyperbolic triangle group. We will pay more attention to the construction of the fundamental domain. Additionally discrete triangle groups of projective unitary group define quotients of the the complex hyperbolic space. We want to know whether the quotient space is complex hyperbolic manifolds and the covolume is finite. On this basis, we will proceed to consider how to compute the covolume or whether there exists an explicit bound.

### 産業の ICT 化がもたらす経済構造の変化に関する研究

杉本理

特に対面販売による物販では ICT の導入によって作業効率が上がり生産性が向上することで企業の利益が上がり雇用を生むと考えられる。その一方で産業全体に ICT 化が進むことで ICT に取って代わられるポジションが増えその業界では雇用が減る。この研究では書店における ICT の導入例や在庫と配送センターの最適化による物流・生産性の向上について研究し、雇用の業界間移動についてモデルを考える。ICT の普及による平均所得, メディアン所得, 雇用の途上国との競争についても議論する。

### データ圧縮技術を用いた高性能専用計算機アーキテクチャ

上野知洋

計算機性能は、プロセッサの性能、データ移動コスト、用いるアプリケーションなどにより決定されるが、データ移動部分の性能向上はプロセッサに比べて速度が緩やかである。特に高性能計算 (HPC) が必要となる科学技術計算において、データの移動が計算全体の性能のボトルネックとなりつつある。本研究は FPGA 上に実装した専用計算機のデータ移動コストを、データ圧縮技術を用いて下げることにより計算性能を向上させることを目的としており、幅広い分野に適用可能な高性能計算アーキテクチャの提案を行う。

*A Centralized Multiple Access Scheme for Data Gathering  
in Satellite-Routed Sensor System (SRSS)*

川本雄一

Satellite-Routed Sensor System (SRSS) has attracted attentions as a next generation sensor network system to realize data gathering from a large scale sensors deployment. In this system, a large number of sensor terminals send sensed data to the monitoring stations which are located in the different area via a satellite. With the help of satellite, it is possible to collect data from sensor terminals that are located in an area that has no physical infrastructure. Thus, SRSS is expected to provide many services such as real-time traffic control system and disaster detection systems by utilizing gathered data from large area. However, an efficient access control method is required to accommodate a large number of sensor terminals trying to transmit their sensed data to the satellite. Therefore, this paper proposes a novel data gathering method that can efficiently allocate bandwidth to the sensor terminals in need to transmit their sensed data. Additionally, an optimization to improve the efficiency of our proposed method is provided with mathematical expressions. The effectiveness of our proposal is evaluated through numerical results.

### **Session III**

*Joint Design of Density of Access Points  
and Partially Overlapped Channel Assignment  
for Capacity Maximization in Wireless Networks*

Wei Zhao

The design of a wireless network is often critically affected by issues such as determining the optimal density of Access Points (APs) and optimal channel assignment by exploiting partially overlapped channels (POCs) for significantly improving the network performance in terms of maximizing the overall network capacity. A more fundamental insight into the joint issue and its affect on capacity, in signal to interference plus noise ratio (SINR) is required. Our proposal derives the existence of the upper bound of the density of APs with POCs, and models the POC assignment to the deployed APs from a novel perspective. Computer-based simulations are conducted to demonstrate the effectiveness of our proposal.

*Priority-Based Hierarchical Management  
for Multiagent-Based Microgrids*

加藤匠

Electricity consumption in the world is constantly increasing, making our lives become highly dependent on electricity. The new power grid paradigms are expected to be more resilient to survive several difficulties, e.g. power shortage situation during disasters like Great East Japan Earthquake in 2011. We focus on multiagent-based microgrids and propose priority-based hierarchical operational management. The proposed management is a new multiagent-based load shedding scheme and multiagent-based hierarchical architecture to realize such resilient microgrids. We performed evaluations of our proposals, and confirmed the effectiveness in power shortage situations of microgrids.

## 超音波灯台による耐環境型自己位置推定システムに関する研究

小野幸彦

自律移動車両の活躍の場は、工場や病院などの外界認識が比較的容易な場所から、災害現場や鉱山など、外界認識が困難な場所へと広がっている。そのような場所でも車両が自律的に目的地へと移動するには、煙や水蒸気、砂埃が舞う過酷な環境下でも信頼して利用できる自己位置推定システムが重要となる。そこで本研究では、超音波灯台による耐環境型自己位置推定システムの構築を目指しており、本発表会ではその概要について発表する。

## 物性物理学と神経科学の融合による 確率的神経回路網モデルの再構築と画像認識への応用

齋藤真樹

近年、ディープラーニングと呼ばれる多層の人口ニューラルネットワーク (以下 NN) を用いた機械学習の方法論が注目されている。人工 NN の研究は古くその歴史は 50 年ほどになるが、このような性能向上を達成した最大の理由に、プーリング等の生体 NN からの知見を取り入れたことがある。しかし、これらは生体 NN がもつ性質の一部にすぎない。本研究では生体 NN がもつ時間方向のニューロンのふるまいを取り入れ、効率的に学習するための方法論を確立する。