

アドバンスマルチコアプロセッサ研究所

所長: 早稲田大学 理工学術院 情報理工学科 教授 笠原博徳
IEEE Computer Society President 2018, 早稲田大学副総長 (2018-2022)

JST博士学生支援事業SPRING/BOOST委員長/SBIRフェーズ1委員長/大学発新産業創出基金事業ガバニングボード



- 1980 早大電気工学科卒、1982 同修士課程了
- 1985 早大大学院博士課程了 工学博士,学振第一回PD
カリフォルニア大学バークレー客員研究員
- 1986 早大理工専任講師、1988年 助教授
- 1989-1990 イリノイ大学Center for
Super computing R&D客員研究員
- 1997 教授、現在 理工学術院情報理工学科
- 2004 アドバンスマルチコア研究所所長
- 2017 日本工学アカデミー会員、日本学術会議連携会員
- 2018 IEEE Computer Society会長、
早大副総長 (-2022年9月)
- 2019-2023 産業競争力懇談会(COCON) 理事
- 2020- 日本工学アカデミー理事
- 2023- ACM/IEEE ISCA2025@Tokyo 実行委員長

【受賞】

- 1987 IFAC World Congress Young Author Prize
- 1997 情報処理学会坂井記念特別賞
- 2005 半導体理工学研究センタ共同研究賞
- 2008 LSI・オブ・ザ・イヤー 2008 準グランプリ、
Intel Asia Academic Forum Best Research Award
- 2010 IEEE CS Golden Core Member Award
- 2014 文部科学大臣表彰科学技術賞研究部門
- 2015 情報処理学会フェロー
- 2017 IEEE Fellow, IEEE Eta-Kappa-Nu
- 2019 IEEE CS Spirit of Computer Society Award
- 2020 情報処理学会功績賞、SCAT表彰 会長大賞
- 2023 IEEE Life Fellow

査読付き論文234件、招待講演241、国際特許取得70件(米・英・中・日等)、
新聞・Web記事・TV等メディア掲載 704件

総合科学技術会議(平成20年4月10日)での
NEDOリアルタイム情報家電用マルチコアチップ(笠原リーダー)・デモの様子
<http://www8.cao.go.jp/cstp/gaiyo/honkaig/74index.html>
【第74回総合科学技術会議【平成20年4月10日】】

1985年よりコンパイラ(ソフト)
・アーキテクチャ(HARD) 協
設計マルチプロセッサの研究

4 core multicore RP1 (2007), 8 core multicore RP2 (2008), and 15 core Heterogeneous multicore RPX (2010) developed in NEDO projects with Hitachi and Renesas

IEEE COMPUTER SOCIETY 2020
225,000
300,000
13,000,000
•480 chapters
•168 countries
•31 technical committees & councils
84,000+ members

【政府・学会委員等】 歴任数 298件

IEEE Computer Society President 2018, Executive
Committee委員長、理事(2009-14)、戦略的計画委員会委員長、
Nomination Committee委員長、Multicore STC 委員長、
IEEE CS Japan委員長、IEEE技術委員、IEEE Medal選定委員、
ACM/IEEE SC'21基調講演選定委員等

【経済産業省・NEDO】情報家電用マルチコア・アドバンス並列化コンパイラ・グ
リーンコンピューティング・プロジェクトリーダ、NEDOコンピュータ戦略委員長等

【内閣府】スーパーコンピュータ戦略委員、政府調達苦情検討委員、総合科学
技術会議情報通信PT 研究開発基盤領域&セキュリティ・ソフト検討委員、日
本国際賞選定委員

【文部科学省】地球シミュレータ (ES) 中間評価委員、情報科学技術委員、
HPCI計画推進委員、次世代スパコン (京) 中間評価委員・概念設計評価委
員、地球シミュレータES2導入技術アドバイザー委員等、

JST: ムーンショットG3ロボット&AIアドバイザー, 博士学生支援事業SPRING/
BOOST 委員長, SBIRフェーズ1委員長, 大学発新産業創出基金事業ガバニングボード

経済産業省グリーン・コンピューティング・センター設置事業PL: 笠原博徳



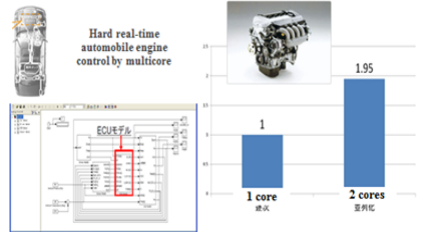
笠原博徳

交通シミュレーション・信号制御
制御 NTTデータ・日立



車載(グリーンエンジン制御・自動運転Deep Learning・ADAS・MATLAB/Simulink自動並列化) デンソー、ルネサス.NEC

Engine Control by multicore with Denso
 Though so far parallel processing of the engine control on multicore has been very difficult, Denso and Waseda succeeded 1.95 times speedup on 2core V850 multicore processor.



高信頼・低コスト・ソフト開発

FA 三菱

カメラ



環境への貢献
 カーボンニュートラル

データセンター: 100MW(火力発電所必要)
 → 100MW=1GW (原子力発電所必要)

HPC, AI, BigData 高速化・低消費電力化

OSCARマルチコア/サーバ & コンパイラ OSCAR

Many-core Accelerator Software API

産業
 ホーム・産業系
 モバイル系
 メモリーコア

生活
 パーソナル
 スパコン

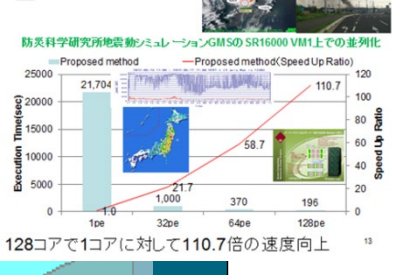
生命・SDGs
 への貢献



木村啓二

グリーンスパコン
 グリーンデータ・クラウドサーバ

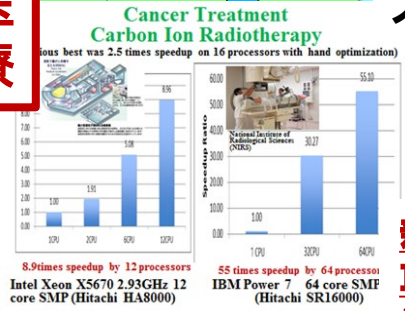
災害から命を守る



カプセル内視鏡
 オリンパス



医療



スマホ

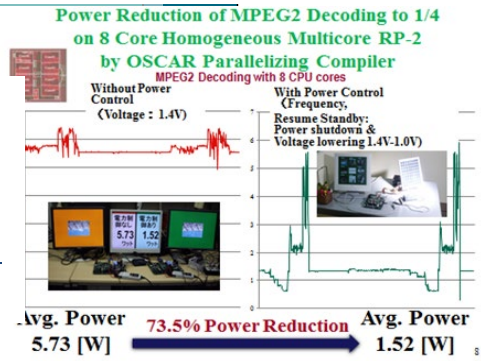


太陽光駆動

重粒子ガン治療 日立

新幹線
 車体設計・
 ディープ
 ラーニング・
 日立

首都圏直下型地震火災延焼、
 住民避難指示



世界の人々の生活への貢献
 安全安心便利な製品・サービス
 (産官学連携・ベンチャー)



高速化

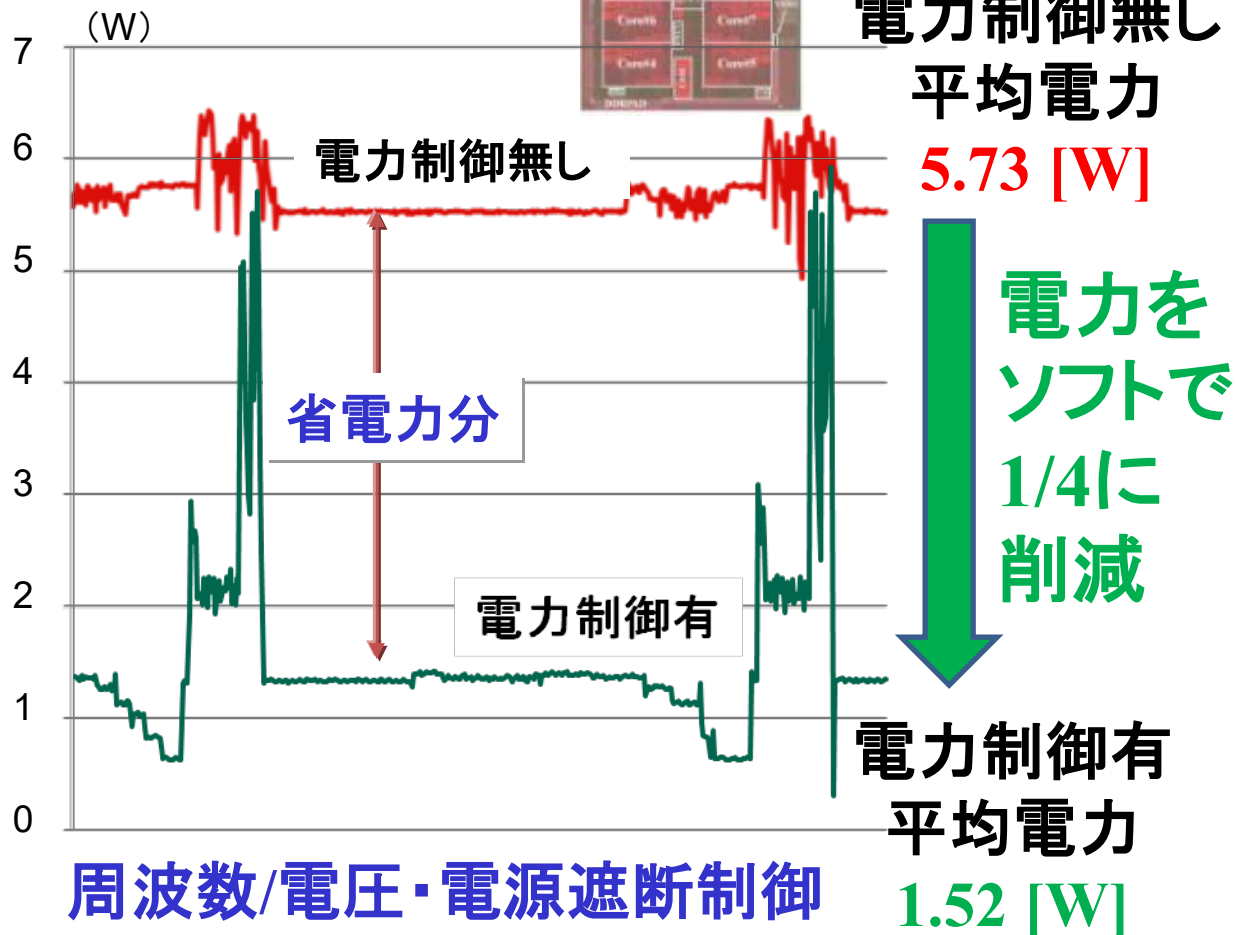
低消費電力化

太陽光電力で動作する情報機器

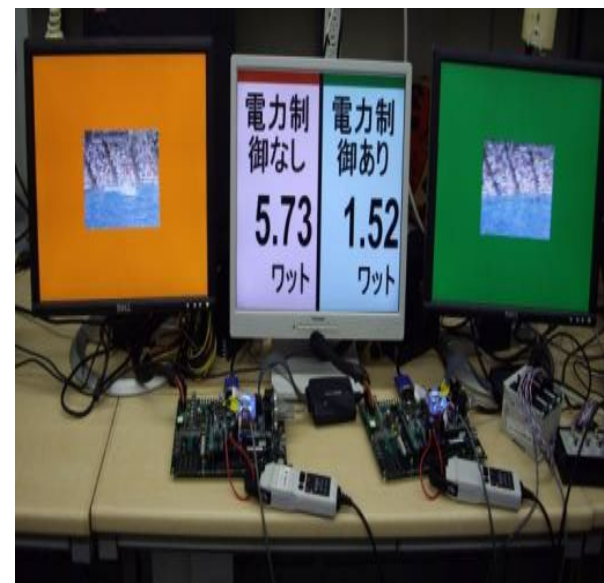
コンピュータの消費電力をHW&SW協調で低減。電源喪失時でも動作することが可能。

リアルタイムMPEG2デコードを、8コアホモジニアスマルチコアRP2上で、消費電力1/4に削減

世界唯一の差別化技術



太陽電池で駆動可



総合科学技術会議(平成20年4月10日)での

NEDOリアルタイム情報家電用マルチコアチップ(笠原リーダー)・デモの様子

<http://www8.cao.go.jp/cstp/gaiyo/honkaigi/74index.html>

第74回総合科学技術会議【平成20年4月10日】 2008年



第74回総合科学技術会議の様子(1)



第74回総合科学技術会議の様子(2)



第74回総合科学技術会議の様子(3)



第74回総合科学技術会議の様子(4)

1985年よりコンパイラ (ソフト)

・アーキテクチャ (ハード) 協調
設計マルチプロセッサの研究

4 core multicore RP1 (2007), 8 core multicore RP2 (2008)
and 15 core Heterogeneous multicore RPX (2010)
developed in NEDO Projects with Hitachi and Renesas

RP-1 (ISSCC2007 #5.3)	RP-2(ISSCC2008 #4.5)	RP-X(ISSCC2010 #5.3)
90nm, 8-layer, triple-Vth, CMOS	90nm, 8-layer, triple-Vth, CMOS	45nm, 8-layer, triple-Vth, CMOS
97.6 mm ² (9.88 x 9.88 mm)	104.8 mm ² (10.61 x 9.88 mm)	153.8 mm ² (12.4 x 12.4 mm)
1.0V (internal), 1.8/3.3V (I/O)	1.0-1.4V (internal), 1.8/3.3V (I/O)	1.0-1.2V (internal), 1.2-3.3V (I/O)
600MHz, 4.32 GIPS, 16.8 GFLOPS	600MHz, 8.64 GIPS, 33.6 GFLOPS	648MHz, 13.7GIPS, 115GOPS, 36.2GFLOPS
11.4 GOPSW(32b換算)	18.3 GOPSW(32b換算)	37.3 GOPSW(32b換算)

215

International Conferences

12 Magazines

35 Journals

47 Total Publications

847,000+
Articles in CSDL

Bjarne Stroustrup: Morgan Stanley & Columbia Univ.
2018 IEEE Computer Society Computer Pioneer Award
IEEE COMPSAC2018 Keynote & Award Ceremony



July 26, 2018, Keynote,
Hitotsubashi Hall



July 25, 2018 Award Ceremony
Rihga Royal Hotel Tokyo



CHERRI M. PANCAKE

2018 ACM President



HIRONORI KASAHARA

2018 IEEE Computer Society President



6
New Standards

230
Active Standards

373,100+
Community Members

12,000+
Volunteers

615
Committees/
Boards

2,352+
Meetings/
Teleconferences

168
Countries with CS Members

634
Chapters

IEEE 754,
802

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- Events
- Education
- Publications
- Podcasts
- Standards
- Working Groups

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About

IEEE Quantum Technical Community (QTC) was an IEEE Future Directions initiative launched in 2019 that serves as IEEE's leading community for all quantum technologies. IEEE Quantum is supported by leadership and representation across IEEE Societies and OUs. The initiative has developed a project landscape of quantum technologies, identify challenges and opportunities, leverage and coordinate Quantum Initiative in the long-term.

IEEE Quantum Steering Committee

Initiative Co-Chairs	Candace Culhane, Los Alamos National Laboratory
	Travis Humble, Oak Ridge National Laboratories
	Hausi Müller, University of Victoria
	Luu Nguyen, PsiQuantum
Steering Committee	Greg Byrd, NC State University
	Tom Conte, Georgia Tech
	Reena Dayal
	Kaveh Delfanazari, University of Glasgow
	Lajos Hanzo, University of Southampton
	Amr Helmy, University of Toronto
	Scott Koziol, Baylor University
	Bruce Kraemer, IEEE Standards Association
	Catherine McGeoch, D-Wave
	Oleg Mukhanov, Seeqc
	Elie Track, IEEE Council on Superconductivity
	Lia Yeh, University of Oxford
Program Manager	Kathy Grise, IEEE Future Directions

Participating OUs



Conferences

IEEE Quantum Week 2023
 17-22 September 2023 in Bellevue, WA, USA
 The 4th International Conference on Quantum Computing and Engineering (QCCE) is the leading multidisciplinary venue featuring quantum research, practice, applications, education, and training.
 Visit the IEEE Quantum Week website to learn more.



Current Events

Event	Dates	Location
100th European Conference on Applied Superconductivity (EMCAS2023)	3-7 September 2023	Bologna, Italy
IEEE Quantum Science and Engineering Education Conference	17-18 September 2023	Bellevue, WA, USA
IEEE Quantum Week 2023	17-22 September 2023	Bellevue, WA, USA
Big Q Hackathon - Quantum Computing Hackathon	20 September - 2 October 2023	Chicago, IL, USA
Super Computing (SC23)	12-17 November 2023	Denver, CO, USA

For previous conferences & workshops, please see Past Events.

Quantum Science and Technology Hackathon

IEEE Quantum Sponsorship Highlight: 2022 Quantum Science and Technology Hackathon
 IEEE Quantum is proud to have been a sponsor for the Quantum Science and Technology Hackathon 2022 (QSTH), running from August through the end of November 2022. The hackathon was based in India, but attracted participants from around the globe, making the event an international success. Read more about the goals, participants and winners of the event on IEEE Quantum's QSTH highlight page.
[Learn more](#)

IEEE WIE ILC 2022 Spotlight Session: Quantum Revolution Led by Women in Tech

IEEE Women in Engineering International Leadership Conference
Spotlight Session: Quantum Revolution Led by Women in Tech
 01 June 2022 | Recorded Event
 Take a journey into the technological revolution centered around quantum. Learn how quantum computing has the potential to exceed classical computing capabilities. The panel of experts from academia, government, and industry share their perspectives and experiences on quantum computing and its impact and real world applications.

The panelists represent academia via Pranita Narsing, Harvard University, government via Candace Culhane, Los Alamos National Laboratory, and industry via Patsy Lee, Honeywell Quantum Solutions, and Anne Matsuura, Intel Labs where their roles and organizations all contribute and play differently in their Research and Development environments. The quantum field is developing and expanding rapidly and thus needs engagement from a broader and more diverse community, with specific technical contributions, science education, and workforce development. The panelists provide a wide breadth and depth of insights from their experiences in this new field.
 Watch on IEEE.tv

2021 IEEE Quantum Week

17-22 October 2021 | Virtual Event
 IEEE Quantum Week 2021 received outstanding contributions from the international quantum community forming an exceptional program with exciting exhibits featuring technologies from quantum companies, startups and research labs. QCCE21, the second IEEE International Conference on Quantum Computing and Engineering, provided over 300 hours of quantum and engineering programming featuring 10 world class keynote speakers, 17 workshops building futures, 29 community-building futures, 48 technical papers, 20 executive posters, 18 stimulating panels, and 80+ of a Feather sessions.

Quantum Talks
 27 August 2021 | Virtual Event
 Quantum Talks is an online event that opens the latest in quantum computing research right part of QuantumWeek activities and is brought to you in collaboration with IEEE Computer Society and IEEE Signal Processing Society.

2020 IEEE Quantum Week
 12-16 October 2020 | Virtual Event
 The inaugural IEEE Quantum Week Conference on Quantum Engineering (QCCE) was IEEE's first international conference on quantum computing and engineering. The event was a landmark in quantum computing and engineering, providing a platform for researchers and practitioners to share their latest work in quantum computing and engineering.

IEEE Quantum Initiative Sessions at IEEE Rebooting Computing Week 2019
 2019 IEEE Workshop on Benchmarking Quantum Computational Devices and Systems
 A summary and spin-off from QCCE on the topic of quantum computing and quantum computing hardware workshops on benchmarking quantum computational devices and systems. The workshop is a key component of the IEEE Quantum Initiative.

2019 IEEE Quantum Education Summit
 1-2 May 2019 | Gaithersburg, Maryland, USA
 The IEEE Quantum Initiative organized an educational summit on 6 November 2019 in San Mateo, California, and an Education Summit in Gaithersburg, Maryland, in conjunction with the 2019 IEEE International Conference on Quantum Computing and Engineering (QCCE2019).

2019 IEEE Quantum Meeting
 1-2 May 2019 | Gaithersburg, Maryland, USA
 We explored the latest advancements in quantum technologies at the 2019 IEEE Quantum Meeting.

2018 IEEE Quantum Computing Summit
 30-31 August 2018 | Atlanta, GA, USA
 Recent technical advances are driving rapid growth of interest and attention to quantum computing and education that include quantum computing, the goal of this summit was to start discussions.

世界をリードするマルチコア用コンパイラ技術

OSCARコンパイラの世界唯一技術

1. マルチグ레인並列化(全ての並列性を利用)

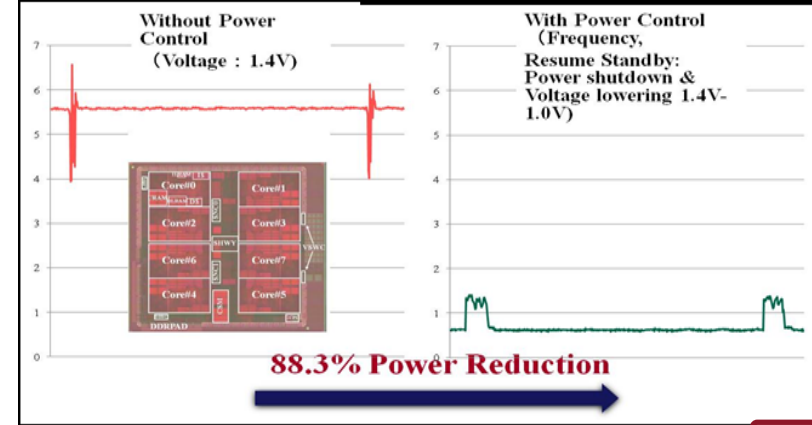
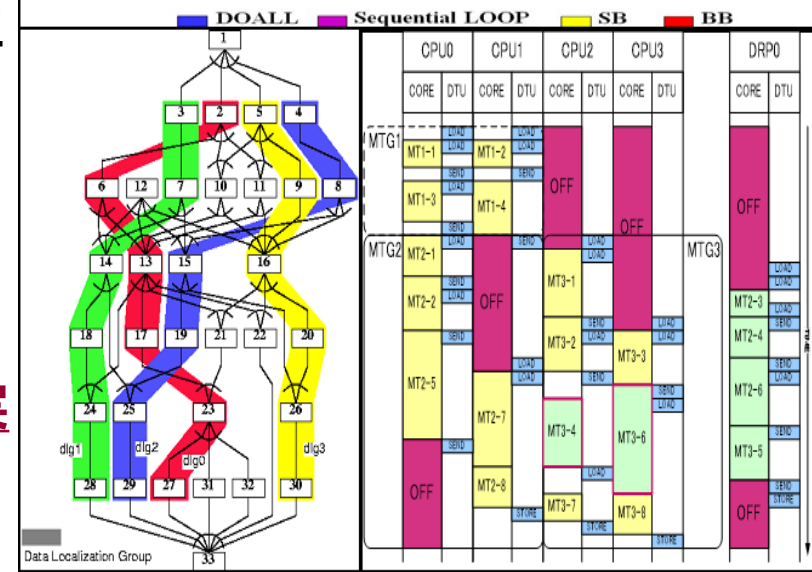
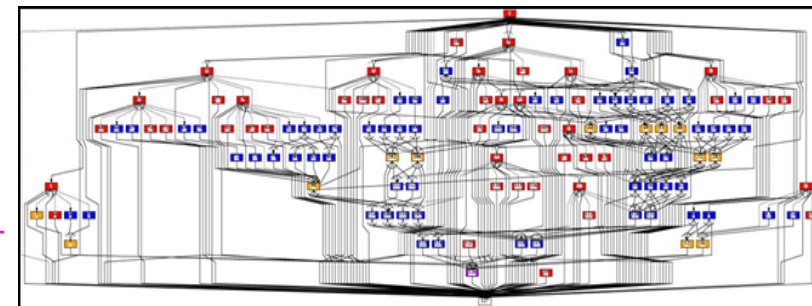
- 粗粒度タスク並列化、ループ並列化、近細粒度並列化によりプログラム全域の並列性を利用する マルチグ레인並列化機能により、従来の命令レベル並列性より大きな 並列性を抽出し、複数マルチコアで速度向上

2. プログラム全域にわたるメモリ利用最適化

- コンパイラによる ローカルメモリへのデータ分割配置、DMAコントローラによるタスク実行とオーバーラップしたデータ転送によりメモリアクセス・データ転送オーバーヘッド最小化

3. プロセッサ・メモリ・ネットワーク等の停止・動作速度制御による自動省エネ

- コンパイラによる低消費電力制御機能を用いたアプリケーション内でのきめ細かい周波数・電圧制御・電源遮断により消費電力低減



Practical Multiprocessor Scheduling Algorithms for Efficient Parallel Processing

HIRONORI KASAHARA, MEMBER, IEEE, AND SEINOSUKE NARITA, SENIOR MEMBER, IEEE

Parallel Processing of Robot-Arm Control Computation on a Multimicroprocessor System

HIRONORI KASAHARA MEMBER, IEEE, AND SEINOSUKE NARITA, SENIOR MEMBER, IEEE

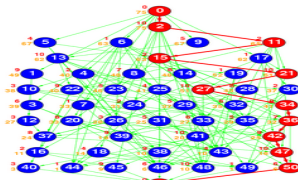


Standard Task Graph Set

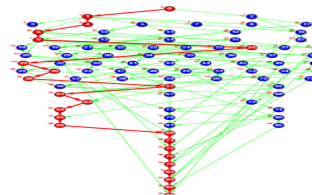
Contents

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- [Introduction](#)
- [How to make STG](#)
- [STG format](#)
- [Download STG](#)
- [Optimal schedules](#)
- [Links](#)

Standard Task Graph Set (STG) is a kind of benchmark for evaluation of multiprocessor scheduling algorithms. STG is proposed for every researchers to evaluate their algorithms under the same conditions covering various task-graph (TG) generation methods including task graphs generated from actual application programs.



Random TGs



Actual Application TGs

Obtained schedule length of several heuristic and optimizing algorithms are also available. You can compare the performance of the other scheduling algorithms with these information.



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Kasahara Laboratory
Dept. of Electrical, Electronics
and Computer Engineering,
Waseda University

E-Mail : STG@oscar.elec.waseda.ac.jp

Table 1 : Optimal schedules for prototype Standard Task Graph Set

Task Graph File Name	Number of Tasks	Number of Processors	Optimal Schedule Length [u.t.]
proto000.stg	452	20	537
proto001.stg	473	4	1178
proto002.stg	499	14	341
proto003.stg	164	13	556
proto004.stg	457	20	Time Over
proto005.stg	404	7	742

ISCA2025, June 21-25, 2025, Waseda University, Tokyo, Japan



General Co-Chairs: Jean-Luc Gaudiot (Prof. UCI)
Hironori Kasahara (Prof. Waseda)



Technical Committee on Computer Architecture

