

Introduction of Research Field: Information Architecture

Bio-Robotics and Human-Mechatronics Laboratory

Graduate School of Information, Production and Systems, Waseda University

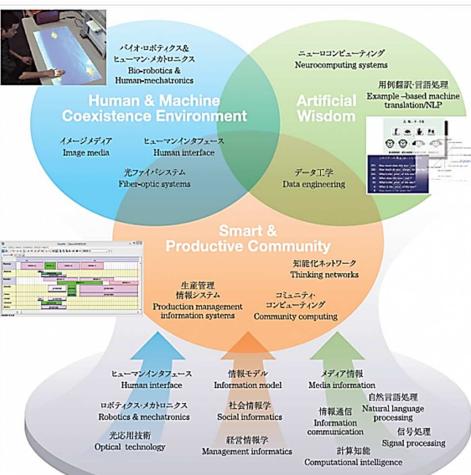
<http://www.waseda.jp/sem-matsumaru/>**Takafumi MATSUMARU**<http://www.f.waseda.jp/matsumaru/>
matsumaru@waseda.jp

2019.08. Grad School of IPS, Waseda University, Kitakyushu, Japan

Laboratory

□ Human & Machine Coexistence Environment

- Interactive Programming
- Image Media
- Fiber-optic Systems
- Bio-Robotics & Human-Mechatronics



□ Artificial Wisdom

- Neurocomputing Systems
- Data Engineering
- Example-based machine translation/NLP



□ Smart & Productive Community

- Smart Industry
- Thinking Networks
- Community Computing



Information Architecture

□ Designing new uses of information, from media to management engineering.

- Covering entire field of information and telecommunications, with specially emphasizing on educational research and application.
- Developing applications and networks, with requiring state-of-the-art theory and academia-industry collaboration.
- Educating with accommodation of various fields of science and technology, supporting wide range of career development.

□ Information and technologies encircling smart society.

- Safe and secure society and comfortable environment comprised of human, information, and things.
- Tackling researches on information and technologies, with wide spectrum of abilities and applications, which support upcoming smart society.

Human & Machine Coexistence Environment

□ Interactive Programming

- Prof. Jiro TANAKA



Human Interface
Ubiquitous Computing
Programming Languages
Software Engineering

Image Media Laboratory
Character Recognition Image Compression



Mobile Interface
Large Display Interface
Gestures
Augmented Reality

Deep Learning
Medical Imaging
Lifelog Fusion of Real and Virtual CSCW
Recent Research topics
1) Optical Network
Multicore/multimode fiber transmission,
Robust network structure,
Optical path setup algorithm, etc.
2) Optical Waveguide Device
Nanosize optical splitter/combi
Nanosize optical fiber,
Light concentrator, etc.
3) Fiber-Optic Sensor
Bending sensor,
Distribution sensor, etc.

□ Image Media

- Prof. Sei-ichiro KAMATA



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□ Fiber-optic Systems

- Prof. Makoto TSUBOKAWA



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□ Bio-Robotics & Human-Mechatronics

- Prof. Takafumi MATSUMARU



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Bio-robotics & Human-mechatronics laboratory
• Various themes between human and robot
• To make mechanical systems more friendly for users
• To develop new functions and to produce real-world systems
• Applying various knowledge and technologies, as a system Integrator

Robotics & Mechatronics
Mechatronics, 3D
Electrical, 3D
Control, 3D
Bio-Ergonomics
Ergonomics design, 3D
Bio-robotics
Robotics design, 3D

Better relationship between human and robot

?

Human & Machine Coexistence Environment

□Interactive Programming

■ Prof. Jiro TANAKA



Human Interface
Ubiquitous Computing
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Software Engineering

Mobile Interface
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Gestures
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Lifelog
Fusion of Real
and Virtual
CSCW

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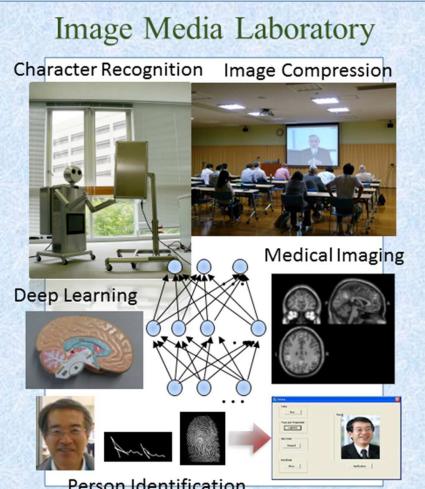
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Human & Machine Coexistence Environment

□Image Media

■ Prof. Sei-ichiro KAMATA



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Human & Machine Coexistence Environment

□Interactive Programming

1. Go together: providing nonverbal awareness cues to enhance co-located sensation in remote communication (一緒に行く: 遠隔コミュニケーションで同じ場所にいる感覚を高めるための非言語的認識キューを提供する)

Cai, M., Tanaka, J. (2019)

Human-centric Computing & Information Sciences, 9(1), 19, 25 pages.

2. GesID: 3D gesture authentication based on depth camera and one-class classification (GesID: 深度カメラと1クラス分類に基づく3Dジェスチャ認証)

Wang, X., Tanaka, J. (2018)

Sensors (Switzerland), 18(10), 3265, 23 pages.

3. An interaction technique for smartwatches based on estimating the moving amount of the thumb (親指の移動量推定に基づくスマートウォッチの片手操作手法)

Aoyama, S., Abe, T., Shizuki, B., Tanaka, J. (2017)

Computer Software, 34(2), pp.102-113

4. Block system based on capacitance (静電容量に基づくブロックシステム)

Yoshida, A., Tsuruta, M., Ikegawa, K., Abe, T., Shizuki, B., Tanaka, J. (2017)

Computer Software, 34(2), pp.93-101

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Human & Machine Coexistence Environment

□Image Media

1. Sparse graph based deep learning networks for face recognition (顔認識のためのスパースグラフベースの深層学習ネットワーク)

Wu, R., Kamata, S.-I. (2018)

IEICE Transactions on Information and Systems, E101D(9), pp.2209-2219.

2. Copy move image forgery detection based on Polar Fourier representation (極座標フーリエ表現に基づいたコピー画像偽造検出)

Wang, Y., Kamata, S.-I. (2018)

International Journal of Machine Learning and Computing, 8(2), pp.158-163.

3. Nuclei detection based on secant normal voting with skipping ranges in stained histopathological images (染色された組織病理学的)

画像における範囲をスキップする割線通常投票に基づく核検出)

Lim, X., Sugimoto, K., Kamata, S.-I. (2018)

IEICE Transactions on Information and Systems, E101D(2), pp.523-530.

4. Discriminative Histogram Intersection Metric Learning and Its

Applications (識別ヒストグラム交差メトリック学習とその応用)

Hao, P.-Y., Xia, Y., Li, X.-X., Kamata, S.-I., Chen, S.-Y. (2017)

Journal of Computer Science and Technology, 32(3), pp.507-519.

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Human & Machine Coexistence Environment

□Fiber-optic Systems

■ Prof. Makoto
TSUBOKAWA



Recent Research topics

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Multicore/multimode fiber transmission,
Robust network structure,
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Bending sensor,
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Human & Machine Coexistence Environment

□Fiber-optic Systems

1. **Ultrasmall light-spot transmission in a silicon-core fiber with a bowtie slot structure** (ボウタイスロット構造のシリコンコアファイバでの超小型光スポット伝送)
Sheng, A., Tsubokawa, M. (2018)
Optics Express, 26(17), pp.21797-21802.
2. **Intercore crosstalk mitigation in multicore fiber transmission with optical space coding** (光空間符号化によるマルチコアファイバ伝送におけるコア間干渉緩和)
Tsubokawa, M., Wang, Y. (2017)
IEICE Transactions on Communications, E100B(12), pp.2104-2109.
3. **A controllable nanosize combiner in T-shaped metal-insulator-metal waveguides** (T字型金属-絶縁体-金属導波路における制御可能なナノサイズのコンバイン)
Kong, D., Tsubokawa, M., Chen, L. (2016)
IEICE Electronics Express, 31(6), pp.1-5.
4. **Evaluation of slot-to-slot coupling between dielectric slot waveguides and metal-insulator-metal slot waveguides** (誘電体スロット導波路と金属絶縁体金属スロット導波路間のスロット間結合の評価)
Kong, D., Tsubokawa, M. (2015)

Human & Machine Coexistence Environment

□Bio-Robotics & Human-Mechatronics

■ Prof. Takafumi
MATSUMARU



Bio-robotics & Human-mechatronics laboratory

- Various themes between **human** and **robot**
 - To make mechanical systems more **friendly** for users
 - To develop new functions and to produce **real-world systems**
 - Applying various knowledge and technologies, as a **system integrator**
-
- The diagram illustrates the interdisciplinary nature of the lab. It shows a central oval labeled "Robot" connected to two boxes: "Robotics & Mechatronics" (Mechanics (ynamics, ...), Electronics (ignals, ...), Control (systems, ...)) and "Bio-Engineering" (Ergonomics (rformance, ...), Medicine (edicine, ...), Psychology (cognition, ...)). Above the oval is a box labeled "Human". Arrows indicate interactions between the robot and both the robotics/mechatronics and bio-engineering domains.

Better relationship between human and robot

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Human & Machine Coexistence Environment

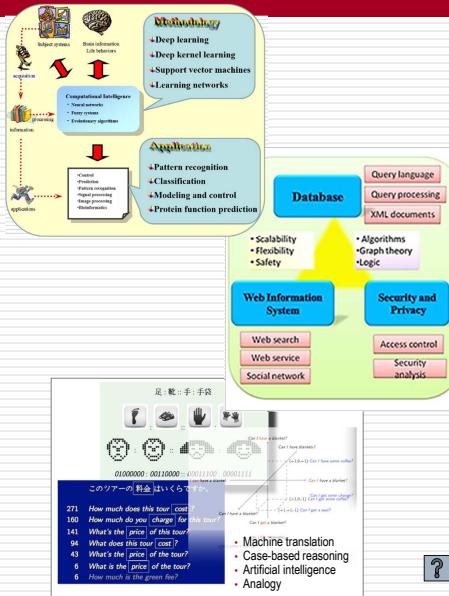
□Bio-Robotics & Human-Mechatronics

1. **Three-dimensional aerial image interface, 3DAII** (3次元空中画像インターフェース)
Matsumaru, T., Septiana, A.I., Kazuki, H. (2019)
Journal of Robotics and Mechatronics, 31(5), pp.657-670.
2. **Path planning in outdoor pedestrian settings using 2d digital maps** (2Dデジタルマップを使用した屋外歩行者設定での経路計画)
Farid, A., Matsumaru, T. (2019)
Journal of Robotics and Mechatronics, 31(3), pp.464-473.
3. **ORB-SHOT SLAM: Trajectory correction by 3D loop closing based on bag-of-visual-words (BoVM) model for RGB-D visual SLAM** (ORB-SHOT SLAM: RGB-D視覚SLAMのbag-of-visual-words (BoVM) モデルに基づいた3Dループクローズによる軌跡補正)
Chai, Z., Matsumaru, T. (2017)
Journal of Robotics and Mechatronics, 29(2), pp.365-380.
4. **Calibration and statistical techniques for building an interactive screen for learning of alphabets by children** (子供たちがアルファベットを学習するためのインタラクティブなスクリーンを構築するためのキャリブレーションと統計的手法)
Boby, R.A., Prakash, R., Saha, S.K., Matsumaru, T., Sharma, P., Jaity, S. (2017)
International Journal of Advanced Robotic Systems, 14(3), pp.1-17.

Artificial Wisdom

□ Neurocomputing System

■ Prof. Takayuki FURUZUKI



□ Data Engineering

■ Prof. Mizuho IWAIHA



□ Example-based machine translation/NLP

■ Prof. Yves LEPAGE



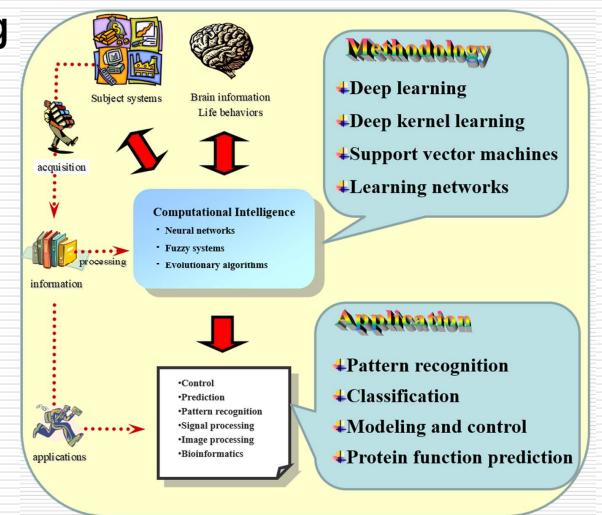
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Artificial Wisdom

□ Neurocomputing System

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Artificial Wisdom

□ Neurocomputing System

1. Fast SVM training using data reconstruction for classification of very large datasets (非常に大きなデータセットを分類するためのデータ再構成を使用した高速SVMトレーニング)
Liang, P., Li, W., Hu, J. (2020)

IEEJ Transactions on Electrical and Electronic Engineering, 15(3), pp.372-381.
2. An autoencoder-based piecewise linear model for nonlinear classification using quasilinear support vector machines (準線形サポートベクタマシンを使用した非線形分類のためのオートエンコーダベースの区分線形モデル)
Li, W., Liang, P., Hu, J. (2019)

IEEJ Transactions on Electrical and Electronic Engineering, 14(8), pp.1236-1243.

3. A coarse-to-fine two-step method for semisupervised classification using quasi-linear Laplacian SVM (準線形ラプラシアンSVMを使用した半教師付き分類のための粗密2段階法)
Zhou, B., Li, W., Hu, J. (2019)

IEEJ Transactions on Electrical and Electronic Engineering, 14(3), pp.441-448.

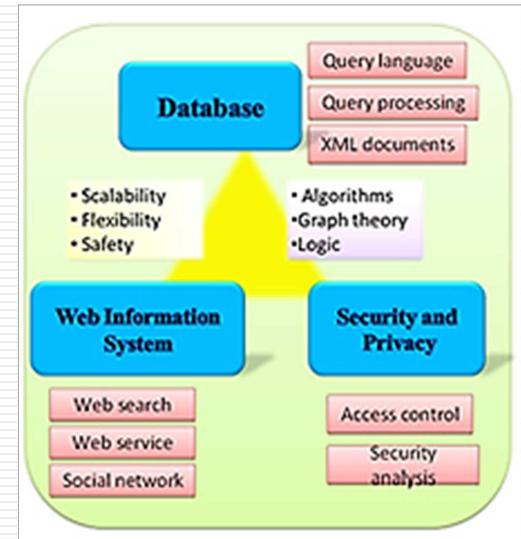
4. One-class classification using a support vector machine with a quasi-linear kernel (準線形カーネルを備えたサポートベクタマシンを使ったクラス分類)
Liang, P., Zheng, F., Li, W., Hu, J. (2019)

IEEJ Transactions on Electrical and Electronic Engineering, 14(9), pp.280-296

Artificial Wisdom

□ Data Engineering

■ Prof. Mizuho IWAIHA



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Artificial Wisdom

□Data Engineering

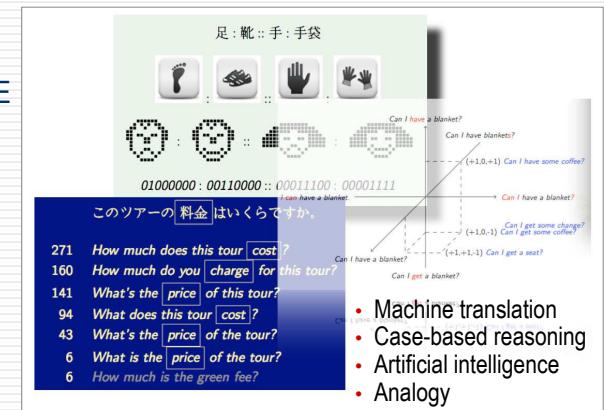
1. Detection of mergeable wikipedia articles utilizing multiple similarity measures (複数の類似性測定を利用したマージ可能な Wikipedia 記事の検出)
Wang, R., Iwaihara, M. (2020)
Journal of Information Processing, 28, pp.178-191.
2. Estimating reference scopes of wikipedia article inner-links (Wikipedia の記事の内部リンクの参照範囲の推定)
Wang, R., Iwaihara, M. (2018)
Journal of Information Processing, 26, pp.562-570.
3. Associations between privacy, risk awareness, and interactive motivations of social networking service users, and motivation prediction from observable features (プライバシー、リスク認識、ソーシャルネットワーキングサービスユーザーのイタラケティブな動機付け、および観察可能な機能からの動機付ける予測間の関連付け)
Mvungi, B., Iwaihara, M. (2015)
Computers in Human Behavior, 44, pp.20-34.
4. Revision graph extraction in Wikipedia based on supergram decomposition and sliding update (スーパーグラム分解とスライディング更新に基づく Wikipedia の改訂グラフ抽出)

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Artificial Wisdom

□Example-based machine translation/NLP

■ Prof. Yves LEPAGE



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Artificial Wisdom

□Example-based machine translation/NLP

1. Improving automatic Chinese–Japanese patent translation using bilingual term extraction (バイリンガル用語抽出を使用した自動中国語-日本語特許翻訳の改善)
Yang, W., Lepage, Y. (2018)
IEEJ Transactions on Electrical and Electronic Engineering, 13(1), pp.117-125.
2. Inflating a small parallel corpus into a large quasi-parallel corpus using monolingual data for Chinese–Japanese machine translation (中国語から日本語への機械翻訳のための単一言語データを使用して、小さな並列コーパスを大きな準並列コーパスに膨張させる)
Yang, W., Shen, H., Lepage, Y. (2017)
Journal of Information Processing, 25, pp.88-99.
3. A method of generating translations of unseen n-grams by using proportional analogy (比例アノダジーを使用して、見えないn-gramの翻訳を生成する方法)
Luo, J., Lepage, Y. (2016)
IEEJ Transactions on Electrical and Electronic Engineering, 11(3), pp.325-330.
4. Extraction of Potentially Useful Phrase Pairs for Statistical Machine Translation (統計的機械翻訳のための潜在的に有用な句ペアの抽出)

?

Smart & Productive Community

□Smart Industry

■ Prof. Shigeru FUJIMURA



The information system for production management handles various types and categories of information. However, due to the difficulty of collecting useful information and their costs, it remains to be a challenge. In addition, such information systems' abilities are still rather limited, and therefore, we still need more research for the following subjects.

Topics for additional research

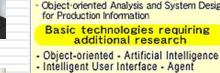
- Intelligent Network for Production Information Integration Architecture
- Self-organized Production Scheduling
- Object-oriented Analysis and System Design for Production Information

□Thinking Networks

■ Prof. Keiichi KOYANAGI



Study of Thinking Networks for building bottom-up intelligent networks



□Community Computing

■ Prof. Osamu YOSHIE



• High-quality expertise for diagnosis by expert systems

• Accurate diagnosis referring to distributed information sources, such as facility management database and sensor data, which are collected by agents

• Cooperative work of mobile agents, which are prepared in agent stations and downloaded to the plant, if necessary

• Specialized work for signal processing and diagnostic reasoning at the plant and E-maintenance center, respectively

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Smart & Productive Community

□ Smart Industry

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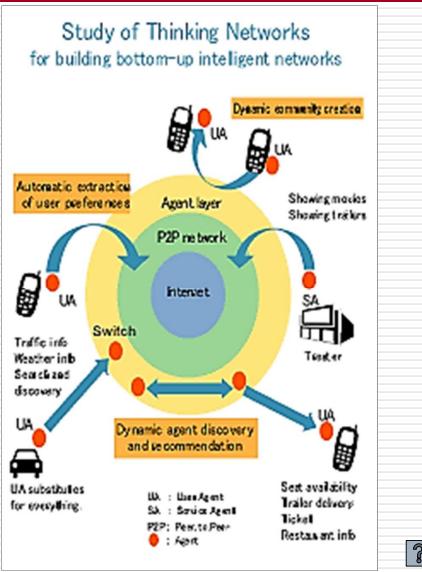


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Smart & Productive Community

□ Thinking Networks

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Smart & Productive Community

□ Smart Industry

1. Solving university course timetabling problem using localized island model genetic algorithm with dual dynamic migration policy

(デュアルダイナミックマイグレーションポリシーを備えたローカライズされたアイランドモデルの遺伝的アルゴリズムを使用して大学のコースの時間割問題を解決する)

Gozali, A.A., Kurniawan, B., Weng, W., Fujimura, S. (2020)

IEEJ Transactions on Electrical and Electronic Engineering, 15(3), pp.389-400.

2. Triple-chromosome genetic algorithm for unrelated parallel

machine scheduling under time-of-use tariffs

(使用時間料金の下での無関係な並列機械スケジューリングのための三重染色体遺伝的アルゴリズム)

Kurniawan, B., Chandramitasari, W., Gozali, A.A., Weng, W., Fujimura, S. (2020)

IEEJ Transactions on Electrical and Electronic Engineering, 15(2), pp.208-217.

3. A genetic algorithm with local search using activity list

characteristics for solving resource-constrained multiproject scheduling problem

(リソースに制約のあるマルチプロジェクトスケジューリング問題を解決するための活動リスト特性を使用した局所探索による遺伝的アルゴリズム)

Okada, I., Weng, W., Yang, W., Fujimura, S. (2016)

IEEJ Transactions on Electrical and Electronic Engineering, 11, pp.S34-S43.

4. Integrating genetic algorithm with time control for just-in-time

Smart & Productive Community

□ Thinking Networks

1. Research on improvement of information platform for local tourism by paragraph vector

(パラグラフベクタによるローカルツーリズムのための情報プラットフォームの改善に関する研究)

Tsuchiya, T., Hirose, H., Miyosawa, T., (...), Sawano, H., Koyanagi, K. (2020)

Studies in Computational Intelligence, 819, pp.115-121.

2. 画像処理技術を用いた模擬授業の振り返り支援システムの提案 (A study of a supporting system for reviewing trial lessons using image processing technologies)

小西拓也, 澤野弘明, 坂本将暢, 中條直也, 鈴木裕利, 土屋健, 小柳恵一 (2015)

電気学会論文誌C(電子・情報・システム部門誌), 135(12), pp. 1509-1516.

3. A distributed information retrieval manner based on the statistic information for ubiquitous services

(ユビキタスサービスの統計情報に基づく分散情報検索方法)

Tsuchiya, T., Sawano, H., Lihan, M., Yoshinaga, H., Koyanagi, K. (2009)

Progress in Informatics, (6), pp.63-77

4. 広域ネットワークに対応したマルチエージェント組織化支援システム (Agent organization system for multi-agent based network management)

寺内敦, 明石修, 丸山充, 菅原俊治, 福田健介, 廣津登志夫, 栗原聰, 小柳

Smart & Productive Community

□Community Computing

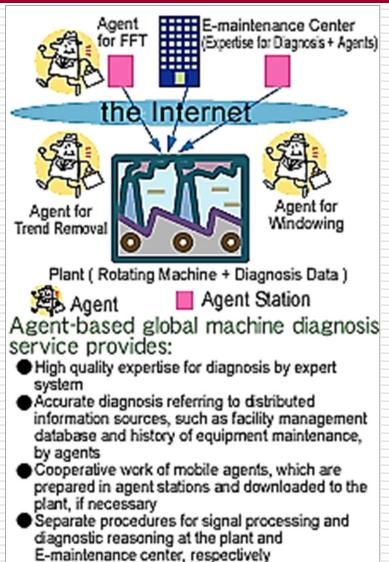
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Smart & Productive Community

□Community Computing

1. Learning-based power prediction for geo-distributed Data

□ Centers: weather parameter analysis(地理的に分散したデータセンターの学習ベースの電力予測:気象パラメータ分析)
Taheri, S., Goudarzi, M., Yoshie, O. (2020)
Journal of Big Data, 7(1)8, 16pages.

2. Strong optical absorption of a metallic film to induce a lensing effect in the visible region(可視領域でレンズ効果を誘発するための金属フィルムの強い光吸収)

Jiang, A.-Q., Zang, K.-Y., Hu, E.-T., Tu, H.-T., Xu, L., Ren, W.-S., Yoshie, O., Lee, Y.-P., Zheng, Y.-X., Wang, S.-Y., Zhao, H.-B., Guo, J.-P., Wang, C.Z., Ho, K.M., Lynch, D.W., Chen, L.-Y. (2019)
Scientific Reports, 9(1)12434, 6pages.

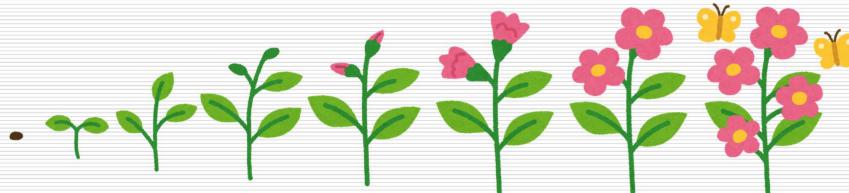
3. Ultrahigh-resolution spectrometer based on 19 integrated gratings(19の統合された回折格子に基づく超高解像度分光計)

Jiang, A.-Q., Zang, K.-Y., Tu, H.-T., Chen, J.-K., Lu, W.-J., Yoshie, O., Wang, X.-P., Xiang, X.-D., Lee, Y.-P., Chen, B., Zheng, Y.-X., Wang, S.-Y., Zhao, H.-B., Yang, Y.-M., Chen, L.-Y. (2019)
Scientific Reports, 9(1)10211, 7pages.

4. Dual supervised learning for non-native speech recognition(非ネイ

Message

□Let's grow up together
developing a new field at the
meeting ground for people
who have a new way of
thinking and extraordinary
abilities regardless of areas
or aspects.



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Graduate School of Information, Production and Systems (IPS), Waseda University



Introduction of Research Field: Information Architecture

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Graduate School of Information, Production and Systems, Waseda University

<http://www.waseda.jp/sem-matsumaru/>



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