研　究　発　表　目　録

（平成 20 年 11 月～平成 21 年 10 月）

新潟工科大学紀要以外における教職員の研究活動状況を記載する．

機械制御システム工学科

研　究　論　文

吉本康文，金子和喜，小野寺正幸：バイオディーゼル燃料の燃焼特性に及ぼす脂肪酸メチルエステル組成の影響；日本機械学会論文集 B 編，75(752)，pp. 847-854，2009,4.　概要：未使用の菜種油，大豆油，パーム油を原料としたバイオディーゼル燃料（BDF）を作製し，機関性能，燃焼特性，排ガス特性を調べた．さらに，試薬のオレイン酸メチル（OME）とパルミチン酸メチル（PME）を用い，脂肪酸メチルエステル（FAME）組成が異なる擬似 BDF を調製し，実験に供した．研究の結果，原料油種および FAME 組成の影響度合を明らかにすることができた．

吉本康文，木下英二：植物油燃料のエンジン適用技術－バイオディーゼル燃料について－；日本燃焼学会誌，51(156)，pp.121-128，2009,5.　概要： BDF のエンジン適用技術に関する内外の研究論文 44 編を調査し，この分野における研究動向について考察した．新油から製造した EU 規格適合の植物油 BDF を既存のジャーク式エンジンに適用する場合においては主たる研究は終了していること，一方，①廃食油 BDF に関する研究，②コモンレール式エンジンへの適用，③噴霧燃焼特性とモデリング，④非食用油脂の利用，などの面で検討すべき課題があることを述べた．

Yasufumi YOSHIMOTO：Performance and Emissions of a Diesel Engine Fueled by Biodiesel Derived from Different Vegetable Oils and the Characteristics of Combustion of Single Droplets；SAE Paper，2009-01-1812，pp.1-12，Jun. 2009.　概要：原料油が異なる 3 種のバイオディーゼル，および試薬のオレイン酸メチル（OME）とパルミチン酸メチル（PME）を用い，噴射特性，機関諸性能，油滴燃焼特性等について詳細に調べた．OME は軽油に比べ体積弾性率が約 7%高いこと，PME は OME に比べ着火性が良好であること，OME 油滴のスート生成率は軽油の約 13%であること，等を明らかにした．

木下英二，吉本康文：植物油燃料のエンジン適用技術－バイオディーゼル燃料以外について－；日本燃焼学会誌，51(157)，pp.209-216，2009,8.　概要：バイオディーゼル燃料以外のエンジン適用技術に関する内外の研究論文 40 編を調査した．その結果，短時間の運転であれば既存の小形高速エンジンでも植物油のニート利用に対応できるだけの多種燃料適性を有しているが，時間経過にともない深刻な問題が発生することを考察した．これに対して，植物油の水素化処理や FT 合成などの次世代バイオマス液体燃料が有望な改質技術であることを述べた．

木下英二，植田優也，吉本康文：ココナッツ油メチルエステルを着火燃料として用いた二元燃料ディーゼル機関の燃焼特性；日本機械学会論文集 B 編，75(756)，pp.1706-1711，2009,8.　概要：圧縮天然ガス（CNG）を吸気管から吸入し，BDF を着火燃料として用いる二元燃料ディーゼル機関の燃焼・排ガス特性について検討した．ココナッツ油メチルエステル（CME）着火は，軽油着火および菜種油メチルエステル（RME）着火に比べ，NOx および Smoke 濃度が顕著に低減すること，CME 着火は軽油着火および RME 着火と同程度の CNG 供給が可能であること等を明らかにした．

山崎泰広，吉田敏彦，深沼博隆，大野直行：遮熱コーティングの熱サイクル損傷と残存密着強度；材料，58(2)，pp.168-174，2009,2．概要：本研究では，大気プラズマ溶射遮熱コーティングの熱疲労特性の向上を目指し，熱サイクル疲労挙動を調査した．さらに，熱サイクル疲労後の残存密着強度を 4 点曲げ試験により評価した．実験結果より，熱疲労条件下の遮熱コーティングに生じる損傷は時間依存型と繰り返し依存型に分類できた．そして，破損モードは熱サイクル波形に依存して変化し，保持無しの熱疲労では microcrack の合体により界面近傍の top-coating 内ではく離破損が生じたが，高温保持を有する熱疲労では microcrack と top-coating/TGO 界面を連結する形ではく離破損が生じた．これらの実験結果と考察に基づき，遮熱コーティングの熱サイクル寿命の評価式として時間依存型の損傷量と繰り返し依存型の損傷量の和からなる損傷評価式を提案した．

国 際 会 議 論 文

Yonosuke MURAYAMA, Syuichi SASAKI, Srinivasan RAJAGOPALAN, D.HUBER, Hisamichi KIMURA, Akihiko CHIBA and Hamish L. FRASER：Mechanical Properties and Phase Stability of Ti-Cr System Alloys；Proceedings of TMS 138th Annual Meeting & Exhibition, 3, General Paper Selections, p.263-270, Feb. 2009. 概要：Ti-Cr-Sn 系合金のヤング率の組成依存性を調査し、Cr および Sn 添加量によってヤング率の極小値が存在し、50GPa 以下の低弾性合金が存在することを見いだした。また、加工性と組成依存性に関しても調査し、組成によって、第二相の析出による冷間加工性の劣化がみられることを報告した。

Shojiro George TERASHIMA, Takuya Kitazawa and Eiichi SATHO：Development of Mouthpiece Type Remote Controller for Disability Persons - 3rd-；Proceedings of 4th Asian Pacific Conference on Biomechanics, in CD, Christchurch, New Zealand, 2009. 概要：頚椎損傷など上下肢共に自由が利かなくない重度障害者は日常生活の些細な動作においても困難が伴う．そこで，重度障害者の残存機能のひとつである舌動作を利用したマウスピース型リモートコントローラーの開発を行なっている．開発した 1 号機の特性と問題点を明らかにし，2 号機の開発を行った．また，試作 2 号機の特性を評価すると共に，有用性を明らかにした．

Yasuhiro YAMAZAKI：Thermal Cycle Damage Evaluation and Life Assessment in Plasma Sprayed Thermal Barrier Coatings；Proc. of 2nd German-Japanese Workshop on Thermal Barrier Coating Systems for Gas Turbines, B2-5 (CD-ROM), May 2009. Abstract：In this work, the thermal fatigue test of thermal cycle wave with the hold at maximum temperature and the isothermal oxidation test have been carried out. The degradation mechanism by thermal fatigue was discussed. In addition, a simple life assessment method for the thermal fatigue of TBC was proposed.

Kouichi NAMBA, Masakazu OKAZAKI and Yasuhiro YAMAZAKI：Collaborative Research on Adhesion Strength of Thermal Barrier Coatings after thermal cyclings in JSMS；Proc. of 2nd German-Japanese Workshop on Thermal Barrier Coating Systems for Gas Turbines, C2-4 (CD-ROM), May 2009. Abstract：The industry-university joint research on TBCs for land-based gas turbines started under JSMS Subcommittee on superalloys and coatings since 2001. The objectives of this working are to help for studying the failure mechanisms and remaining life prediction methodology of TBCs, to suggest for standardizing an evaluation method of TBC adhesion strength and to develop a fundamental concept for designing new TBC systems.

Yasuhiro YAMAZAKI and Toshihiko YOSHIDA：Thermal Fatigue Damage Behavior of Plasma Sprayed Thermal Barrier Coatings；Advances in Fracture and Damage Mechanics VIII (Proc.

of 8th International Conference on Fracture and Damage Mechanics), 417-418, pp.85-88, Oct. 2009. Abstract：Thermal fatigue and isothermal oxidation tests of a plasma sprayed thermal barrier coatings have been carried out. The experimental results indicated that micro-cracking as the fatigue damage occurred in each cooling stage of thermal cycles. And the spallation fracture morphology was changed by the cycle wave form; the spallation failure occurred in the ceramic top-coating under the triangle cycle wave condition, on the other hand, it occurred near the top-coating/TGO interface under the trapezoidal wave condition. The finite element analysis indicated that the local residual stress, which is the driving force of interfacial damage, increases with the thickness of the thermal grown oxide.

解　説・総　説

寺島正二郎：話題の追跡，RF タグを組み込んだ口腔内リモートコントローラーの開発―内蔵電源を必要としないリモートコントローラー―；月刊 自動認識，22(1)，pp.35-39，2009,1. 概要：RFID は製品管理やトレーサビリティーなどの分野で多用されている．ここでは、新たな利用方法として“内蔵電源を不要としたリモートコントローラー”としての活用について提案すると共に，福祉分野への応用の可能性について検討した．

そ　の　他（概要は記載しない）

井上誠：工作機械産業特集「高加工精度の実現へ期待高まる　研削加工」；日刊工業新聞 2009.3.19，第 2 部 10-11 面．

中嶋新一，丸山洋平，渡辺健太：刃物研ぎ作業における作業性能の測定，日本機械学会北陸信越支部第 46 期総会・講演会講演論文集，pp.227-228，2009,3.

中嶋新一，内山勇紀，宮下亮太，ロボットによる溶接ビード研削のための能動工具ホルダー，日本機械学会北陸信越支部第 46 期総会・講演会講演論文集，pp.417-418，2009,3.

川田充洋，山岸直也，林豊彦，中村康雄，中嶋新一，井上誠：自律顎運動シミュレータ JSN/3A の咀嚼様運動における食片性状の検出，日本顎口腔機能学会第 42 回学術大会事前抄録集，pp.23-24，2009,4.

中嶋新一：溶接ビード研削をロボット化するための能動工具ホルダーの開発；ロボティクス・メカトロニクス講演会 ’09 講演論文集，CD-ROM Paper 2A1-A17(1)-(3)，2009,5.

村山洋之介，佐々木秀一，木村久道，千葉晶彦，Srinivasan Rajagopolan and Hamish L. Fraser：Ti-Cr-Sn-Zr 系合金の機械的性質；日本金属学会講演概要集 2009 年春期（第 144 大会），p.481，2009,3.

村山洋之介，佐々木秀一，木村久道，千葉晶彦，Srinivasan Rajagopolan and Hamish L. Fraser：Ti-Cr-Sn-Zr 合金の相安定性と機械的性質;日本金属学会講演概要集 2009 年秋期(第 145 大会)，p.154，2009,9.

佐々木秀一，村山洋之介，木村久道，千葉晶彦，Srinivasan Rajagopolan and Hamish L. Fraser：Ti-Cr-Al 系合金の機械的性質；日本金属学会講演概要集 2009 年秋期（第 145 大会），p.555，2009,9.

金子和喜，吉本康文，木下英二：オレイン酸メチルを着火燃料とする二元燃料ディーゼル機関の燃焼特性；日本機械学会北陸信越支部第 46 期総会・講演会講演論文集，097-1，pp.133-134，2009, 3.

原利昭，寺島正二郎，三宅仁：医療関連施設の被害と復興状況；能登半島および中越沖地震による地場産業等の被害とその復興に関する臨時調査分科会（2007 年 4 月～2009 年 3 月）成果報告書，pp.167-213，2009.3.

寺島正二郎，荻原憲，中村一夫，佐藤栄一，小竹和夫：RFID を用いた重度障害者用リモートコントローラーの開発―試作機の性能評価と有効性の検討－；日本機械学会北陸信越支部第 46 回総会・講演会講演論文集，097-1，pp.483-484，2009,3.

寺島正二郎，荻原憲，中村一夫，佐藤栄一，小竹和夫，植木一範，佐々木栄一：重度障害者のための口腔内コントローラーの開発；第 21 回バイオメカニズム・シンポジウム前刷 2009，pp.381-391，2009,7.

寺島正二郎，佐藤栄一，小竹和夫：口腔内コントローラーを用いた電動車椅子の操作；第 24 回リハ工学カンファレンス講演論文集，24thJCAART，pp.283-284，2009,8.

山崎泰広：溶射材料の密着性評価；日刊工業新聞 2008.10.2，22-23 面.

山崎泰広，吉田敏彦，深沼博隆，大野直行：遮熱コーティングの熱サイクル損傷とその評価；日本学術会議材料工学連合講演会講演論文集，52，p.163-164，2008,10.

山崎泰広，吉田敏彦，深沼博隆，大野直行：遮熱コーティングの熱サイクル損傷および寿命に及ぼす熱サイクル波形の影響；高温強度シンポジウム前刷集，46，p.48-52，2008,12.

山崎泰広，吉田敏彦：遮熱コーティングの熱サイクル損傷と簡易寿命推定；日本機械学会北陸信越支部第 46 回総会・講演会講演論文集，097-1，p.37，2009,3.

山崎泰広，北東直樹：計装化圧子圧入試験機による界面破壊靱性評価と遮熱コーティングへの適用；日本材料学会学術講演会講演論文集，58，p.117，2009,5.

山崎泰広，他：超合金とそのコーティング材の高温強度評価技術ワーキンググループ第Ⅲ期活動成果報告書－高温曝露と熱サイクルを受けた遮熱コーティングの密着強度を中心に－，日本材料学会高温強度部門委員会，2009,5（分担執筆）.

山崎泰広：溶射コーティングの界面強度評価法の検討；日本溶射協会第 89 回（2009 年度春季）全国公演大会論文集，p.43，2009,6（依頼講演）.

山崎泰広，吉田敏彦，深沼博隆，大野直行：遮熱コーティングの熱サイクル損傷挙動に及ぼすボンドコートの影響；M&M2009 材料力学カンファレンス CD-ROM 論文集，OS0808，2009,7.

情報電子工学科

著　　書

角山正博，中島繁雄：ディジタル回路の基礎 ；森北出版，2009,10. 概要：ディジタルの基礎から論理回路の設計までを着実に理解できるように，具体例を用いて解り易く解説した．また多くの例題や演習問題を示して，実際に問題を解きながら学習を進めることが出来るようにすると共に，論理回路シミュレータを用いて論理回路設計を直観的に理解出来るように配慮した.

伊藤建一，佐藤拓朗：これだけは知っておきたい 最新 移動体通信のキーテクノロジー；リックテレコム，2009,2. 概要：本書では，世界の情報通信産業の進展と移動体通信産業の果たすべき役割や将来予測,そしてこれから 5 年以内で運用される各種の移動体通信システムについて述べている．担当部分：第 4 章 次世代 PHS，第 5 章 移動体通信と最新のネットワーク， 6.1 節 ソフトウェア無線，6.2 節 コグニティブ無線，pp.68-120.

研 究 論 文

Simon J. GREAVES, Yasushi KANAI and Hiroaki MURAOKA: Magnetic Recording in Patterned

Media at 5-10 Tbit/in^2; IEEE Transactions on Magnetics, **44**(11) Part2, pp.3430-3433, Nov. 2008. Abstract: The feasibility of patterned media systems able to support areal densities of 5-10 Tbit/in^2 is examined. The systems considered used only a conventional write head, without additional electromagnetic devices. Despite the use of a shielded head and contact recording it was impossible to discriminate reliably between bits at 10 Tbit/in^2. Areal densities of around 5 Tbit/in^2 appear feasible, but only if geometrical and material parameter dispersions are minimised. Including such dispersions reduced the maximum areal density to around 4 Tbit/in^2.

Naomichi DEGAWA, Simon J. GREAVES, Hiroaki MURAOKA and Yasushi KANAI: Characterization of a 2 Tbit/in^2 Patterned Media Recording System; IEEE Transactions on Magnetics, **44**(11) Part2, pp.3434-3437, Nov. 2008. Abstract: The characteristics of bit patterned media with an areal density of 2 Tbit/in^2 were investigated using micromagnetic simulations. The influence of dot size and position dispersions on the signal to noise ratio (SNR) was clarified. The head medium synchronization tolerance (write margin) for error-free writing was calculated, and the feasibility of achieving 2 Tbit/in^2 recording with bit patterned media was demonstrated.

Kazuetsu YOSHIDA, Eisei UDA, Natsuumi UDAGAWA and Yasushi KANAI: Investigation on Magnetic Fields from Field Generating Layer in MAMR; IEEE Transactions on Magnetics, **44**(11) Part2, pp.3408-3411, Nov. 2008. Abstract: Microwave-assisted magnetic recording (MAMR) has recently emerged as a candidate to solve the trilemma in magnetic recording. In this study, the actfundamental chareristics of the magnetic fields generated by a field-generating layer (FGL) are investigated using micromagnetic simulations. The relationships between the fields generated by the FGL and magnetic parameters, such as interlayer exchange coupling strength ($A_\perp$) and the anisotropy constant (K), are investigated. In addition, oscillation behaviors are investigated by examining the magnetization configurations of the FGL. A Bloch-line-like magnetic structure is observed in the FGL in the stable oscillation mode. The Bloch-line-like structure functions as a rotation axis. However, it disappears in the unstable oscillation mode.

Hiroaki MURAOKA, Simon J. GREAVES and Yasushi KANAI: Modeling and Simulation of the Writing Process on Bit-Patterned Perpendicular Media; IEEE Transactions on Magnetics, **44**(11) Part2, pp.3423-3429, Nov. 2008. Abstract: The recording physics of bit patterned media is studied for areal densities of around 2 Tbits/inch^2. A model of the writing process, based on the head field gradient and switching field distribution, including various interference fields, is presented to extract the write-head and media parameters which are necessary to attain a wider write margin. Write head field distributions, calculated by the finite-element method, are presented for various head pole structures with side- and trailing- shields to improve head field gradient. Optimization of the pole configuration increased the gradient to over 500 Oe/nm for a head-to-SUL spacing of 14 nm. Using the head field distribution, a recording performance analysis by micromagnetic simulation indicated that the write margin was improved. Position and size dispersions of the dots deteriorated the SNR and increased adjacent track erasure (ATE).

Yasushi KANAI, Kazunori HIRASAWA, Toshio TSUKAMOTO, Kazuetsu YOSHIDA, Simon J. GREAVES and Hiroaki MURAOKA: Micromagnetic Recording Field Analysis of a Single-Pole-Type Head for 1-2 Terabit/inch^2; IEEE Transactions on Magnetics, **44**(11) Part2,

pp.3609-3612, Nov. 2008. Abstract: Dynamic recording fields of single-pole-type (SPT) heads, having main pole tip dimensions of 25 nm × 25 nm at the air bearing surface (ABS), were investigated using a Landau-Lifshitz-Gilbert (LLG) micromagnetic analysis. The recording performance in combination with continuous media and bit-patterned media (BPM) was discussed for areal densities of 1 – 2 Terabit/inch^2 using the results of LLG micromagnetic media recording simulations. Trailing and side shields were indispensable and the switching speed of the SPT head did not deteriorate on reducing the area of the main pole tip. The advantage of BPM over continuous media was clear with regard to obtaining a higher areal density.

Naomichi DEGAWA, Simon J. GREAVES, Hiroaki MURAOKA and Yasushi KANAI: Optimisation of Bit Patterned Media for 1 Tb/in^2; Journal of Magnetism and Magnetic Materials, **320**(22), pp.3092-3095, Nov. 2008. Abstract: Micromagnetic simulations were used to investigate the influence of patterned media geometry on the signal to noise ratio (SNR), adjacent track erasure and write margin for a target recording density of 1 Tb/in^2. For an ideal patterned medium the readback noise was a maximum when the read head was directly over the dots and a minimum at the transitions. The SNR improved for smaller dots due to the larger dot separation. However, the ideal media with the highest SNR were also the most susceptible to dispersions of dot size and position. Low temperature simulations suggest that large write margins are available, however, at room temperature the write margin can be much reduced. Increasing the rise time of the write head had a deleterious effect on the write margin and the write margin was zero for rise times of more than 0.45 ns. Nevertheless, error-free writing at 1 Tb/in^2 could be achieved using appropriate head geometries and material parameters.

Yasushi KANAI, Kazunori HIRASAWA, Toshio TSUKAMOTO, Kazuetsu YOSHIDA, Simon J. GREAVES and Hiroaki MURAOKA: Micromagnetic Recording Field Analysis of a Fast-Switching Single-Pole-Type Head; Journal of Magnetism and Magnetic Materials, **320**(22), pp.2971-2974, Nov. 2008. Abstract: Single-pole-type (SPT) heads for perpendicular magnetic recording were investigated using a Landau-Lifshitz-Gilbert (LLG) micromagnetic analysis program running on a PC cluster system. Dynamic recording fields were calculated for various driving currents, head structures and head materials. The dynamic head field response is discussed with regard to the write timing window for bit-patterned media, as described in previous papers.

Simon J. GREAVES, Hiroaki MURAOKA and Yasushi KANAI: Simulations of Recording Media for 1 Tb/in^2; Journal of Magnetism and Magnetic Materials, **320**(22), pp.2889-2893, Nov. 2008. Abstract: Simulations of magnetic recording onto perpendicular media were carried out to determine parameters suitable for supporting an areal density of 1 Tb/in^2. Composite media showed sufficient thermal stability and SNR to meet this goal, provided that dispersions of magnetic and microstructural parameters are sufficiently well controlled.

Tadao OHTANI, Kenji TAGUCHI, Tatsuya KASHIWA, Yasushi KANAI and James B. COLE: Scattering Analysis of Large-Scale Coated Cavity Using the Complex Nonstandard FDTD Method with Surface Impedance Boundary Condition; IEEE Transactions on Magnetics, **45**(3), pp.1296-1299, Mar. 2009. Abstract: Recently, we reported on the basic advantages of the complex-type surface impedance boundary condition (CSIBC), however, its validity has not been confirmed for practical problems. In this paper, we show the formulation of CSIBC,

which includes corners, and the complex nonstandard finite-difference time-domain (CNS-FDTD) method with the CSIBC is applied to the scattering analysis of a large cavity coated with radar absorbing materials. As a result, it is shown that the CSIBC formulation is highly efficient at reducing the computer load. For our 3-D model, the CSIBC reduced the computer load to roughly $1/6^4$ that of the FDTD method.

藤澤明信，若林伴典，藤井昭宏，金井靖，吉田和悦：マイクロマグネティックシミュレータの OpenMP による高速化；Journal of the Magnetics Society of Japan, **33**(3), pp.189-192, May 2009. Abstract: We have developed a micromagnetic simulator for magnetic recording. Since the simulator precisely calculates the magnetic interactions between the magnetic head and the recording medium using a difference method, it expends a great deal of computing time. We thus tried to speed it up using a computer with built-in multi-cores that function as a shared memory system. We compared the effects of parallel processing of OpenMP with those of MPI. The OpenMP system more effectively increases speed than an MPI system, which is a distributed-memory system, because it decreases the communication time. As a result, we succeeded in increasing the speed by about three times.

宇田川夏海，金井靖，吉田和悦：軟磁性キャップ層付き CGC 媒体の R/W 特性と熱安定性; Journal of the Magnetics Society of Japan, **33**(3), pp.193-198, May 2009. Abstract: Recently, magnetic recording has faced a trilemma, the signal-to-noise ratio (SNR), thermal stability, and writability in order to achieve recording densities of over 1 Tbit/in2. To solve this problem, we propose a coupled granular/continuous medium with a soft capping layer (C-CGC medium). We investigated the read/write characteristics and thermal stability of the C-CGC medium using a micromagnetic simulator. The coercivity of the C-CGC medium can be reduced by over 40% in comparison with those of conventional granular and CGC media. The reduced coercivity of C-CGC media results in excellent read/write characteristics, despite its large anisotropy constant. Further, it is confirmed that the thermal stability of the C-CGC medium is superior to that of granular and conventional CGC media. These results show that the C-CGC medium can be considered a candidate for attaining recording densities of over 1 Tbit/in^2.

Tadao OHTANI, Kenji TAGUCHI, Tatsuya KASHIWA, Yasushi KANAI and James B. COLE: Nonstandard FDTD Method for Wideband Analysis; IEEE Transactions on Antennas and Propagation, **57**(8), pp.2386-2396, Aug. 2009. Abstract: The nonstandard (NS) FDTD algorithm can compute electromagnetic propagation with very high accuracy on a coarse grid, but only for monochromatic or narrow-band signals. We have developed a wideband (W) NS-FDTD algorithm that overcomes this limitation. In NS-FDTD special finite difference operators are used to make the numerical dispersion isotropic, which is then corrected by a frequency-dependent factor. In WNS-FDTD the numerical dispersion is modeled as frequency-dependent electrical permittivity and magnetic permeability, and the Yee algorithm is augmented by correction terms in the time domain. We demonstrate the high accuracy of WNS-FDTD in example problems, and show that it gives better results than both the standard (S) FDTD and the FDTD(2,4) algorithms.

宇田英世，横江真人，吉田和悦，金井靖：マイクロ波アシスト磁気記録用発振素子の発振特性と渦電流の影響; Journal of the Magnetics Society of Japan, **33**(4), pp.357-361, Sep. 2009. Abstract: Microwave-assisted magnetic recording (MAMR) has been proposed as one of the candidates to achieve a higher areal recording density over 1.0 Tbit/inch2. MAMR needs a device to

generate strong oscillating magnetic field to induce magnetic resonance in a recording medium. Its oscillating frequency is needed over 20 GHz, implying that eddy current might influence the dynamic magnetization behaviors of the field generating layer (FGL). In this paper, the influences of eddy current on the dynamic behaviors of the oscillator proposed by J.-G. Zhu are discussed. The eddy current field in the FGL acts on the magnetizations to inhibit the rotation of precession, resulting in a slight increase in the oscillating frequency. However, the strength of the eddy current filed is very small less than 20 A/m. Thus, it is concluded that eddy current field little influences the dynamic behaviors of the FGL.

平澤和則，金井靖，吉田和悦，Simon J. GREAVES，**村岡裕明：シールドを有する単磁極ヘッドのマイクロマグネティック解析**; Journal of the Magnetics Society of Japan, **33**(5), pp.403-413, Sep. 2009. Abstract: A micromagnetic analysis was carried out for single-pole-type (SPT) heads with side and trailing shields, which are indispensable in obtaining higher values for both track and linear densities, and dynamic recording field and magnetization processes were investigated. First, quasi-static recording field distributions were obtained for various SPT shield structures and compared with those obtained from a static finite element method analysis. The recording fields under the main pole were in good agreement, while some discrepancies were found below the shields and the return yoke. Next, the time variations of the head field and magnetization processes were obtained for a high-frequency recording current and for various shield structures. Magnetization rotation in the main pole tip, which is the origin of the dynamic recording field, was strongly affected by the magnetization in the side and trailing shields.

Simon J. GREAVES, Yasushi KANAI and Hiroaki MURAOKA: Shingled Recording for 2-3 Tbit/in^2；IEEE Transactions on Magnetics; **45**(10), pp.3823-3829, Oct. 2009 (**招待論文**). Abstract: Head and media designs for shingled recording are described, targeting areal recording densities of 2-3 Tbit/in^2. The potential of the designs was evaluated using micromagnetic simulations. The possibility of achieving multiple Tbit/in^2 is demonstrated using a continuous, perpendicular recording medium. The effects of write head skew, inter-granular exchange coupling and read head offset are discussed.

国 際 会 議 論 文

Masahiro TSUNOYAMA and Hiroei IMAI: An Evaluation Method for Delay Time and Its Jitter of WLAN Using a GSPN Model; Proc. of the IEEE Local Computer Networks, pp.811-812, Nov. 2008. Abstract: This paper proposes a method for evaluating mean delay time and its standard deviation (jitter) of wireless local area networks (WLAN) using Generalized Stochastic Petri Nets (GSPN). The WLAN is modeled using GSPN and the mean delay time and its jitter are calculated using equations derived from the Markov chain associated with the GSPN model. The method is applied to evaluate delay time and its jitter for 802.11e WLAN. The results reveal that the values calculated based on the equations agree well with the values obtained from simulations.

Shigeo NAKAJIMA: Use of Histograms at Decoder Outputs to Evaluate Performance of Turbo Codes; The 18th ICT Mobile and Wireless Communications Summit, Session 3B (CD-ROM) , Santander, Spain, Jun. 2009. **概要：ターボ符号の特性を机上で評価する方法には，モンテカルロ・シミュレーションによるビット誤り率法とハミング距離を用いたデスタント・スペクトル法**

が知られている．これらの評価法は非常に長い評価時間を要する欠点がある．本文では，この欠点を改善するためにターボ復号器出力の尤度値分布に着目して，この分布特性からターボ符号の特性を評価する方法を提案し，その精度を検討した結果を述べている．

Simon J. GREAVES, Hiroaki MURAOKA and Yasushi KANAI: Simulations of Magnetic Recording in Bit Patterned Media; The 5th Asia Forum on Magnetics, Beijing, China, 2008. Abstract: Areal densities of hard disks must increase to remain competitive with alternate technologies. Patterned media, in which bits are written to discrete magnetic dots, offer the possibility for recording at multiple Tb/in^2. Here, we use simulations to examine the potential of patterned media with the dots located on a triangular lattice. Conventional and "microwave" assisted recording are compared.

Simon J. GREAVES, Hiroaki MURAOKA and Yasushi KANAI: Simulations of RF Field-Assisted Recording in 3 Tb/in^2 Patterned Media; 53rd Conference on Magnetism and Magnetic Materials, EC-08, Austin, TX, U.S.A., Nov. 2008. Abstract: Simulations of dual track recording in patterned media with staggered dots are carried out. The effect of adding a high frequency (HF) oscillating magnetic field on the recording performance is investigated. Whilst simulations of single dots predict a large reduction in dot switching field for a moderate intensity HF field, the recording performance is hardly improved. The cause is the spatial and temporal variation of the field from the write head within the dots which makes it difficult to take advantage of the HF field effect.

Eisei UDA, Natsuumi UDAGAWA, Kazuetsu YOSHIDA and Yasushi KANAI: Influences of Eddy Current in Microwave Oscillation Layer of MAMR; 53rd Conference on Magnetism and Magnetic Materials, EC-15, Austin, TX, U.S.A., Nov. 2008. Abstract: Microwave-assisted magnetic recording (MAMR) has been proposed as one of the candidates to achieve a higher area recording density over 1.0 Tbits/in^2. MAMR needs a device to generate strong oscillating magnetic field to induce magnetic resonance in a recording medium. Its oscillating frequency is needed over 20 GHz, implying that eddy current might influence the dynamic magnetization behaviors of the field generating layer (FGL). In this presentation the influences of eddy current on the dynamic behaviors of FGL are discussed using micromagnetic simulations that includes eddy current field in the effective fields of the L-L-G equation with spin torque term. The device comprises two stacked layers, that is, FGL and a perpendicular layer (PL). Their layers are coupled by exchange interaction. The thicknesses of FGL and PL are 4 nm and 12 nm and their lateral length is 40 nm. The saturation magnetization and anisotropy constant of FGL are 2.0 T and 5×104 J/m^3, and those of PL are 1.0 T and 1.5×10^7 J/m^3, respectively. The interlayer exchange is set to 1.0×10^{-11} J/m. The region of the device is discretized into 2nm-cubic cells and all the magnetization vectors are solved with a gyromagnetic damping constant (α) of 0.02. The electric conductivity is 2M Ω^{-1}m^{-1}. Although the field with eddy current starts at lower oscillating frequency than that without eddy current at the initial state, its frequency gradually increases until both the fields oscillate with the same frequencies. These results show that the eddy current little influences the dynamic behaviors of the FGL.

Yasushi KANAI, Kazunori HIRASAWA, Yoshihiro JINBO, Kazuetsu YOSHIDA, Simon J. GREAVES and Hiroaki MURAOKA: Write Head Modeling for Shingled Recording; IEEE International Magnetics Conference (INTERMAG), DC-08, Sacramento, CA, U.S.A., May 2009. Abstract: It is considered that a new scheme has to be introduced to achieve areal

densities above 1 terabit per square inch (Tbit/in^2). Bit-patterned media (BPM), thermally-assisted magnetic recording (TAMR), or microwave-assisted magnetic recording (MAMR) are possible candidates, however, technological breakthroughs and substantial investment are necessary to realize these techniques. Another technique, two-dimensional magnetic recording (TDMR) on conventional media was proposed to achieve 10 Tbit/in^2, using a shingled writing scheme. In this paper, FEM modeling of a new write head for shingled writing is investigated in conjunction with micromagnetic media simulations targeting 2 Tbit/in^2.

Simon J. GREAVES, Yasushi KANAI and Hiroaki MURAOKA: Shingled Magnetic Recording for 2 Tbit/in^2; IEEE International Magnetics Conference (INTERMAG), FA-03, Sacramento, CA, U.S.A., May 2009 (**招待講演**). Abstract: To increase the areal density in magnetic recording it is necessary to increase the linear density, requiring a reduction in grain size, and to reduce the written track width. For narrower tracks, a reduction of the main pole width at the air bearing surface and the use of side shields is effective. However, both approaches reduce the maximum head field in the medium and it appears difficult to reduce the written track width below 50 nm, limiting the maximum areal density to around 1 Tb/in^2 in a continuous recording medium (assuming a bit aspect ratio of 4:1). The concept of shingled recording envisages partially overwriting existing tracks, leaving only the track edge behind as a record of the original data. This allows the use of wider write poles which only need a shield on one side to increase the head field gradient and write sharp-edged tracks. In this paper we use micromagnetic simulations to investigate the potential of shingled recording in perpendicular media.

Yasushi KANAI, Yoshihiro JINBO, Toshio TSUKAMOTO, Simon J. GREAVES, Kazuetsu YOSHIDA and Hiroaki MURAOKA: FEM and Micromagnetic Modeling of Write Heads for Shingled Recording; IEEE The Magnetic Recording Conference (TMRC 2009), B2, Tuscaloosa, AL, U.S.A., Oct. 2009 (**招待講演**). Abstract: Two-dimensional magnetic recording on conventional media has been proposed as a way to achieve 10 Tbit/in^2, using a shingled writing scheme. The concept of shingled recording envisages partially overwriting existing tracks, leaving only the track edge behind as a record of the original data. This allows the use of wider write poles, with a shield on only one side of the head to increase the head field gradient and write sharp-edged tracks. Static finite element method (FEM) modeling was used to optimize the head structure with regard to obtaining a recording field distribution with high down-track and cross-track recording field gradients, as well as a large recording field strength. Because a conventional continuous medium was assumed, a recording layer thickness of 16 nm (total ABS - SUL spacing of 22 nm) was necessary to maintain a sufficiently large energy barrier. The key design parameters were the main pole to trailing shield distance and main pole to side shield distance, as well as the wider write pole, with a shield on only one side of the head. With regard to obtaining a higher recording field gradient, leading to a higher areal density, reducing the ABS – recording layer distance, including smaller magnetic spacing is effective. Landau-Lifshitz-Gilbert (LLG) micromagnetic modeling was used to validate the static FEM calculations and to investigate dynamic phenomena in the write heads. The recording field distribution of the optimized head was used in LLG micromagnetic simulations of the media magnetization to investigate the potential of shingled recording in conventional, continuous perpendicular media and

areal densities of 2 - 3 Tbit/in^2 were predicted.

Hiroshi TAMURA, Yuki SHIMIZU, Masakazu SENGOKU and Shoji SHINODA: The Shortest Step Algorithm with Network Coding on Multihop Wireless Cyclic Networks; Proc. the 24th International Technical Conference on Circuits/Systems, Computers and Communications (ITC-CSCC2009), pp. 38-41, Jul. 2009. **概要：ネットワークコーディングとは，通信データをノードにおいて代数的処理を施し，通信効率を向上させようとするものである．本文では，サイクル状のネットワークにおいて,ネットワークコーディングを用いた場合の最適な配信法を示し,ネットワークコーディングを用いない場合との効率の比較を行なった.**

Shoji SHINODA, Hiroshi TAMURA, Keisuke NAKANO and Masakazu SENGOKU: Recent Topics on the Applications of Graph/Network Theory to Problems in Communications; the 9th International Symposium on Communication and Information Technology (ISCIT2009), Sep. 2009 (Invited Speech). **概要：通信分野には，グラフ・ネットワーク理論の研究が応用できることが多い．本文では，近年注目されている無線マルチホップネットワークをとりあげ，関連する諸問題について，グラフ・ネットワーク理論の研究との関係について言及した.**

Go IMADA, Tran Thanh SON, Masataro SUZUKI and Wataru MASUDA: Evaluation of High-Repetition-Rate Excitation Discharge in TEA Gas Laser with Supersonic Gas Flow; Proc. XVII Int'l Symp. on Gas Flow and Chem. Lasers & High Power Lasers Conf., Lisbon, Portugal, **SPIE -7131**, pp. 71310T-7-1310T-8, Apr. 2009. Abstract: A double-pulse discharge method is applied to simulate high-repetition-rate excitation discharge in TEA gas laser with supersonic gas flow. In gas flow with the Mach number M = 2, not only gas density depression but also shock wave produced by the previous pulsed discharge has a key effect on stability of the subsequent discharge. For pulse repetition rate f = 60–25 kHz, the gas density depression has already been removed from discharge cavity, whereas the traveling shock wave against the supersonic gas flow still remains. For f = 17 kHz, on the other hand, the subsequent discharge becomes glow discharge because both the shock waves and gas density depression have been removed from the discharge cavity.

Yu HOTTA and Kenichi ITOH: Evaluation of Muscle Fatigue during Handwriting in State of Pressurizing by Surface Electromyogram; 36th International Congress of Physiological Sciences(IUPS2009), Kyoto, Jul. 2009. Abstract: We performed EMG measurement during hand writing while applying pressure to the shoulder joint. Surface EMG was recorded in the biceps brachii, triceps brachii, abductor pollicis brevis and dorsal interossei. The muscle fatigue was characterized by median power frequency (MDPF), average EMG (AEMG) and subjective sensation. MDPF decreased over time with and without pressure, but the magnitude of the reduction with pressure was larger than that without pressure. AEMG showed the opposite trend. Based on these results, we believe that the application of pressure is effective in improving the measurement of muscle fatigue.

解 説・総 説

Yasushi KANAI and Kiyoshi YAMAKAWA: Narrow-Track Perpendicular Write Heads; Journal of Magnetism and Magnetic Materials, **321**(6), pp. 518-525, Mar. 2009. Abstract: Narrow-track perpendicular write heads are reviewed. Because of the strong magnetic interaction between the write head and double-layered medium in perpendicular recording, various types of media are also considered. Current technology is discussed to illustrate design issues; then,

for areal densities beyond 1 Terabit/inch^2 (Tb/in^2), future technological requirements, including single-pole-type (SPT) heads for discrete track and bit-patterned media, are examined based on numerical simulations.

吉田和悦，金井靖，サイモン グリーブズ，高岸雅幸，赤城文子: マイクロマグネティクスの磁気記録への応用 I－磁気記録・再生シミュレータの概要－; まぐね, **4**(4), pp.197-205, 2009,4． Abstract: Micromagetics simulator has been utilized in the fields of magnetic recording as a strong tool not only to understand complicated magnetic recording phenomena, but also to design a writer, a recording medium and a reader. Many researchers and engineers engaged in magnetic recording seem to long to have aside their own micromagnetic simulators and to run easily them to solve the encountered problems. In the previous lecture written by Dr. Hayashi et al., micromagnetic were described in detail from the fundamental side. The aim of the lecture is to provide the concrete ways for the readers to be interested in micromagnetic simulators for magnetic recording. The lecture comprises five chapters: Outline of micromagnetic simulator, Advanced magnetic recording medium model, Recording head model, GMR head model and the application to the future technologies, TAMR, BPM. In the present chapter, we describe the outline of a micromagnetic simulator, focusing on the programming ways for multilayered medium.

サイモン グリーブス, 吉田和悦，金井靖，高岸雅幸，赤木文子：マイクロマグネティクスの磁気記録への応用 II -先進的な磁気記録媒体モデル -; まぐね，**4**(7)，pp.358-365，2009,7． Abstract: Micromagnetic models are often used to investigate the potential of magnetic recording medium. For this purpose, an accurate model of the medium microstructure is essential if artifacts are to be avoided. In this paper we describe how micromagnetic simulations can be used to model magnetic recording media. Irregular grains and grain size distributions are modeled using Voronoi cells and methods to deal with magnetostatic interactions are presented. A treatment of inter-granular exchange coupling across non-magnetic grain boundaries and between layers of dissimilar grains is proposed. The implications of sub-grain discretisation schemes on the simulated properties of exchange-coupled composite media grains are discussed. The effect of finite temperature on the switching field distribution is examined and a comparison of recording on media with regular and irregular grains is used to demonstrate the need for realistic microstructures.

金井靖，吉田和悦，サイモン グリーブズ，高岸雅幸，赤城文子：マイクロマグネティクスの磁気記録への応用 III－記録ヘッドへの適用（１）－; まぐね，**4**(10)，pp.484-492，2009,10． Abstract: Analysis of the recording field and magnetization of recording write heads is surveyed as part of a series of articles entitled “Applications of Micromagnetics to Magnetic Recording.” The present article discusses write head modeling with various methods, the necessity of self-consistent analysis, and speed-up of Landau-Lifshitz-Gilbert (LLG) micromagnetic calculations.

特　　許

金井靖，神保義裕：垂直磁気記録ヘッド；特願 2009-236528，2009,10． 概要：シングル記録方式では，主磁極幅の広い記録ヘッドを使ってエッジ記録を行い，主磁極幅よりも狭いトラック幅を形成し，高いトラック密度を実現する．主磁極幅の広い記録ヘッドは，強い記録磁界を発生し得るため，高い線密度を可能であり高いトラック密度とあいまって高い面密度を実現可能である．本発明は，

シングル記録方式を採用した垂直磁気記録方式 HDD(Hard Disk Drive)用の記録用磁気ヘッドに関する.

村上肇，株式会社白川製作所，酒井伸浩：歩行運動器具；特開 2009-95625，2009,5． 概要：歩行運動をする際に使用者の足に本歩行運動器具を取り付けるための左右一対の足接続部，同じく左右一対の回転自在な回動部，そして左右の前記回動部をつなぐリンク部とから構成される，歩行運動器具.

そ　の　他（概要は記載しない）

石黒雄一，角山正博：組込み教育評価システムの構築；平成 21 年度電子情報通信学会信越支部大会講演論文集，p.36，2009,10.

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平澤和則，小山和也，神保義裕，金井靖，吉田和悦，Simon Greaves，村岡裕明：単磁極ヘッドの FEM 静磁界およびマイクロマグネティック動磁界解析；電子情報通信学会技術研究報告. MR2008-48，磁気記録，**108**(346)，pp.61-66，2008,12.

貝瀬達哉，平澤和則，金井靖，丹下裕，大谷忠生：熱アシスト磁気記録用金属薄膜から発生する近接場光の3次元FD-TD解析;電子情報通信学会技術研究報告. MR2009-10，磁気記録,**109**(80),pp.51-57，2009，6.

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神保義裕，金井靖，Ｓ.GREAVES，村岡裕明，吉田和悦：シングル記録方式のための SPT ヘッド記録磁界解析；第 33 回日本磁気学会学術講演会，**15aB-3**，2009,9.

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長谷川誠，田村裕，仙石正和，篠田庄司：ネットワークコーディングを用いた通信の効率化に関する考察；平成 21 年度電子情報通信学会信越支部大会講演論文集，p.12，2009,10.

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今田剛，鈴木正太郎，増田渉：超音速ガス流を用いたショックフリーTEA-CO_2 レーザーの基礎検討；第56回応用物理学関係連合講演会「科学技術としての衝撃応用とその拡がり」シンポジウム（招待講演），第56回応用物理学関係連合講演会講演予稿集，**56**(0)，p.107，2009,3.

菊池崇志, 佐々木徹, 今田剛, 江偉華, 原田信弘, 堀岡一彦：大電流電子ビームを用いたWarm Dense Matter生成；日本物理学会講演概要集，**64**(2)，p.126，2009,9.

Guowei CHEN, Wipaporn CLAYBOOT, Kenichi ITOH and Takuro SATO: A Handoff Algorithm Based on Combination of RSSI and Distance for Relay Networks; 多次元移動通信網研究会講演論文集(JSST-MDMC2009)，pp.5-11，Oct．2009.

丸田愛子，金成航，山岸愛，日下部征信，佐藤栄一，竹園恵，茂野俊也，小野寺正幸：生ゴミからのバイオガス生産について（その3）；日本農芸化学会大会講演要旨集, 2009, p.329, 3P1310B, 2009,3.

寺島正二郎，荻原憲，中村一夫，佐藤栄一，小竹和夫：RFIDを用いた重度障害者用リモートコントローラーの開発―試作機の性能評価と有効性の検討―；日本機械学会北陸信越支部第46回総会・講演会講演論文集，**097-1**，pp.483-484，2009,3.

寺島正二郎，荻原憲，中村一夫，佐藤栄一，小竹和夫，植木一範，佐々木栄一：重度障害者のための口腔内コントローラーの開発；第21回バイオメカニズム・シンポジウム前刷 **2009**，pp.381-391，2009,7.

寺島正二郎，佐藤栄一，小竹和夫：口腔内コントローラーを用いた電動車椅子の操作；第24回リハ工学カンファレンス講演論文集，24thJCAART，pp.283-284，2009,8.

環　境　科　学　科

研　究　論　文

Norio FUKUZAKI and Hideaki HAYASAKA: Seasonal Variations of Nitrogen Isotopic Ratios of Ammonium and Nitrate in Precipitations Collected in the Yahiko–Kakuda Mountains Area in Niigata Prefecture, Japan ; Water Air and Soil Pollution, **203**(1-4), pp.391-397, Oct.2009.

Abstract: Precipitation was collected from May 15, 2001 to November 18, 2002, at the mountain top (620 m a.s.l.) and mountain foot (47 m a.s.l.) of the Yahiko–Kakuda Mountains area, which is located in the western part of the Niigata Plain in central Japan. Major ion constituents and nitrogen isotopic ratios of ammonium (δ^{15}N-NH_4^+) and nitrate (δ^{15}N-NO_3^-) were measured in order to investigate the sources and behavior of NH_4^+ and NO_3^- in precipitations. The concentrations of sea salt constituents considerably increased in the cold season from November to March, and for the majority of the ion species, the concentrations at the mountain foot were higher than those at the mountain top. The precipitation weighed monthly and seasonal means of δ^{15}N-NH_4^+ values in the warm season were lower than those in the cold season at both the mountain top and mountain foot. The δ^{15}N-NH_4^+ values at the mountain foot were lower than those of mountain top in both seasons. This seasonal variation of ^{15}N-NH_4^+ could be caused by the incorporation of ammonia gas (NH_3) with lower δ^{15}N values, emitted from agricultural activities. On the other hand, the monthly and seasonal means of δ^{15}N-NO_3^- values showed noticeable seasonal difference with higher in the cold season at both the mountain top and mountain foot; however, the elevation

difference was not observed either in the warm or cold season. The obtained $\delta^{15}N\text{-}NH_4^+$ and $\delta^{15}N\text{-}NO_3^-$ values were regarded as intermediate in comparison with the reported values. No significant correlations were observed either between NH_4^+ concentrations and $\delta^{15}N\text{-}NH_4^+$ values or between NO_3^- concentrations and $\delta^{15}N\text{-}NO_3^-$ values. These results suggest that different factors may affect the nitrogen isotopic variations and concentration variations of NH_4^+ and NO_3^- in precipitations collected at the two sites.

Saori TAKAYAMA, Eiichi SAITOH, Ryuta KIMIZUKA, Satoru YAMADA and Tetsuo KATO: Effect of Eel Galectin AJL-1 on Periodontopathic Bacterial Biofilm Formation and Their Lipopolysaccharide-mediated Inflammatory Cytokine Induction; International Journal of Antimicrobial Agents **34**(4), pp.355-359, Oct. 2009. Abstract: *Porphyromonas gingivalis, Prevotella intermedia* and *Aggregatibacter actinomycetemcomitans*, infectious pathogenic bacteria found in oral biofilm, cause periodontal disease. The inhibitory effect of AJL-1, a galectin present in the skin mucus of the Japanese eel *Anguilla japonica*, on biofilm formation by each of these strains was investigated by staining adherent bacteria on culture plates with crystal violet. An ATP bioluminescence assay was used to determine whether inhibition of biofilm formation was due to the bactericidal activity of AJL-1. The effect of AJL-1 on cytokine induction in human umbilical vascular endothelial cells (HUVECs) by lipopolysaccharide (LPS) isolated from *A. Actinomycetemcomitans* was also investigated by enzyme-linked immunosorbent assay (ELISA). AJL-1 significantly inhibited biofilm formation by *A. Actinomycetemcomitans* strains Y4, ATCC 29523 and ATCC 29524 but not by any strain of *P. Gingivalis* or *P. Intermedia*, and showed no bactericidal activity against *A. Actinomycetemcomitans* strains. AJL-1 markedly suppressed interleukin (IL)-6 and IL-8 induction in HUVECs by LPS from*A. Actinomycetemcomitans* strains Y4 and ATCC 29523. These observations indicate that AJL-1 is an effective inhibitor of biofilm formation by *A. Actinomycetemcomitans* as well as of inflammatory cytokine induction in HUVECs by LPS. These findings indicate that AJL-1 may be of therapeutic value in *A. Actinomycetemcomitans*associated periodontal diseases.

Eishiro OKAMOTO, Hitoshi KASAHARA, Akira CHIBA, Masayuki TANIGUCHI and Eiichi SAITOH: Purification and Characterization of Two Novel Cysteine Protease Inhibitors, Eel-CPI-2 and Eel-CPI-3, in the Skin Mucus of the Japanese Eel *Anguilla Japonica*; Fisheries Science, **75**(2), pp.463-471, Apr. 2009. Abstract: We have discovered multiple acidic cysteine protease inhibitors other than Eel-CPI-1, in the skin mucus extract of the Japanese eel *Anguilla japonica* by using the two-dimensional gel system of gelatin reverse zymography. Two of the acidic inhibitors, which we have named Eel-CPI-2 and Eel-CPI-3, were purified to homogeneity by anion exchange chromatography on a column of DEAE-Sepharose CL-6B, followed by fast protein liquid chromatography on Superdex 75 10/300 GL and HiTrap Q HP columns. The amino acid compositions of Eel-CPI-2 and Eel-CPI-3 were almost identical and closely similar to that of the eel galectin AJL1. The molecular masses of Eel-CPI-2 and Eel-CPI-3 were elucidated to be 16,089.080 and 16,089.137 Da, respectively, by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry. The apparent dissociation constant of Eel-CPI-2 and Eel-CPI-3 for cysteine protease papain was determined to be, respectively, 179 and 105 nM by a quartz crystal microbalance technique.

Gang WEI, Nozomu SASAGE, Yusuke KUSANAGI, Kazuhiro FUJIKI, Takeshi YAMAUCHI and

Norio TSUBOKAWA: Grafting of Hyperbranched Cyclotriphosphazene Polymer onto Silica Nanoparticle and Carbon Black Surfaces; Journal of Polymer Science Part A: Polymer Chemistry, **46**(12), pp.4218-4226, 〈Jun.〉2008. **概要：シリカナノ粒子及びカーボンブラック粒子表面に，シクロトリフォスファゼンを有する多分岐ポリマーをグラフトする反応について検討した．また，末端のシクロトリフォスファゼンとスルファニル酸との反応によるスルホン酸基の導入についても検討した．スルホン酸基を導入したシリカやカーボンブラックは，イオン伝導性を示すことが明らかとなり，ポリマーとの複合化により，燃料電池用の高分子複合膜として利用できる可能性が示唆された．**

吉本康文，金子和喜，小野寺正幸：バイオディーゼル燃料の燃焼特性に及ぼす脂肪酸メチルエステル組成の影響；日本機械学会論文集，75(752)，pp．847-854，2009，4．概要：（重複掲載につき機械制御システム工学科参照）

Ken-Ichi MITANI and Kichi-Suke SAITO: Dual of Two Dimensional Lorentz Sequence Spaces; Nonlinear Analysis; Theory, Methods & Applications, **71**(11), pp. 5238-5247. Dec. 2009. **概要：バナッハ空間の幾何学的構造を調べる上で，その構造を反映させることが出来る様々な性質及び定数が，今までに多くの研究者によって導入され，研究が進められている．本論文では，２次元ローレンツ空間に限定し，その幾何学的構造やそれに伴う定数を調べた．２次元ローレンツ空間の James 定数については他の論文で計算したが，本論文では２次元ローレンツ空間の双対ノルムを absolute ノルムが凸関数で表せることを用いて表現し，さらに２次元ローレンツ空間の双対空間における James 定数の計算を試みた結果，全ての場合において値を決定することに成功した．**

Ken-Ichi MITANI and Kichi-Suke SAITO: A New Geometrical Constant of Banach Spaces and the Uniform Normal Structure; Commentationes Mathematicae, **49**(1), pp. 3-14. 2009. **概要：バナッハ空間の代表的な定数である von-Neumann-Jordan 定数は，バナッハ空間における中線定理の不成立の度合いを表す定数として重要であり，この定数を使ってバナッハ空間の種々の構造を特徴づけすることができる．本論文では von-Neumann-Jordan 定数の一般化として，バナッハ空間の直和空間を用いた定数を導入し，バナッハ空間の一様非正方性や一様正規構造の評価を行った．さらに，ヒルベルト空間や Lp 空間における定数を計算した．**

国 際 会 議 論 文

Eiichi SAITOH, Takayuki KOTAJIMA, Satoko ISEMURA, Akira CHIBA and Masayuki TANIGUCHI: Protease Inhibitors of the Japanese Eel *Anguilla Japonica*, a Possible Defense Factor of Innate Immunity System on the Body Surface; Book of abstract of 6th General Meeting of International Proteolysis Society, p.107, Oct. 2009. Abstract: In this paper, we report the identification, isolation and characterization of multiple protease inhibitors other than Eel-CPI-1. Two of the acidic inhibitors, which we have named Eel-CPI-2 and Eel-CPI-3, were purified to homogeneity by anion exchange chromatography, followed by FPLC. Their masses M_r were elucidated and the apparent dissociation constants K_d of inhibitors for papain were determined. The amino termini of Eel-CPI-2 and -3 were elucidated to be blocked and their M_r were determined by MALDI-Tof-Ms, respectively, to be 16089.080 and 16089.137 Da. The apparent K_d of Eel-CPI-2 and -3 for papain were estimated by QCM sensorto be 179 and 105 nM, respectively. By utilizing FITC-gelatin as the substrate, each inhibitor was demonstrated to react with papain at a molar ratio of 1:1 to form an enzyme-inhibitor complex. Several serine protease inhibitors (Eel-SPIs) were also detected

by the 2D-gel system of reverse zymography. It is conceivable that the presence of multiple protease inhibitors such as CPIs and SPIs in the skin mucus provides a great advantage to innate host defense in *A. japonica* because a variety of proteases is produced by pathogens as infectious materials. Based on the idea, we propose two possibilities that Eel-CPIs or -SPIs; (1) would specifically control the activity of cathepins B and L in the skin mucus; (2) inactivate cysteine or serine. Proteases released from bacteria colonizing on the surface of skin layers of *A. japonica*.

Norihiko KUSHIMIYA, Sadami OHTSUBO, Masayuki TANIGUCHI, Satoko ISEMURA and Eiichi SAITOH: Inhibition Mechanism of Two Legume Lectins (Soybean Agglutinin and Favabean Lectin) for Cysteine Protease Papain ; Book of abstract of 6th General Meeting of International Proteolysis Society, p.79, Oct. 2009. Abstract: In this paper, we provide evidence that soybean agglutinin (SBA) and favabean lectin favin are inhibitors for papain. Two decapeptides spanning ß6-strand and loop C of SBA and favin, SBA-p10, DQVVAVEFDT, and FAV-p10, AQTVAVEFDT, were synthesized. The apparent dissociation constants (K_d) of SBA, SBA-p10, and FAV-p10 for papain were elucidated by QCM sensor, respectively, to be 32.7, 52.9, and 84.9 nM. The data provide strong evidence that legume lectins bind to papain. A strong inhibitory action of the lectins for papain was observed in a dose-dependent manner when FITC-gelatin was utilized as the substrate, but no inhibitory action of the lectins for papain could be detected for Z-Phe-Arg-MCA. This finding suggests the possibility that legume lectins bind to a site other than active creft of papain, thereby enabling a small peptide-MCA substrate to interact with the active cysteine in papain's active cleft. Based on the data, we conclude that legume lectins may bind to papain via a non-covalent interaction and inhibit papain by "blockage of the active center".

Takayuki KOTAJIMA, Kenji UENO, Ryuichi MIZUGUCHI, Mayumi TAIYOJI, Sadami OHTSUBO and Eiichi SAITOH: Identification of Surimi-proteases Using a Two-dimensional Gel System of Real-time Zymography and Selective Synthetic Inhibitors; Book of abstract of 6th General Meeting of International Proteolysis Society, p.78-79, Oct. 2009. Abstract: In this paper, we have identified endogenous proteases of surimi by a two-dimensional gel system of real-time zymography and selective synthetic inhibitors. The extracts of surimi of *Anguilla japonica* and *Paralichthys olivaceus* were used as samples. For the first dimension, isoelectric focusing was conducted at 4 ºC for 16 h. SDS-separating gel containing 12 % polyacrylamide was copolymerized with 0.05 % FITC-gelatin and it was used for the second electrophoresis. For the identification of proteases, synthetic inhibitors were utilized. MMPs and cysteine proteases were detected as dark spots against a green fluorescent background. For *P. olivaceus* sample, multiple dark spots (M_r , 25-50 kDa; pI, 3-7.5) were detected by developing the gel with 0.1 M phosphate (pH 6.8, 2 mM DTT). The spots were disappeared when the gel was incubated in the presence of E-64 or CA-074, indicating that these are cathepsin B-like proteases. Multiple spots (M_r, 50-70 kDa, pI, 4.5-5) were appeared for *A. japonica* sample by developing with 0.1 M Tris-HCl (pH 7.5, 10 mM $CaCl_2$, 1 mM $ZnCl_2$). These activities were strongly inhibited by each 50 mM of MMP-9 inhibitor I, epigallocatechin gallate, collagenase inhibitor I, GM 6001 but not by MMP-2 inhibitor I, suggesting that the spots could be MMP-9 or its fragments. In conclusion, we propose this method as a convenient tool for identifying proteases in biological samples.

Naoto KOMURO, Kichi-Suke SAITO and Ken-Ichi MITANI: Extremal Structure of Absolute

Normalized Norms on R^2; Proceedings of Asian Conference on Nonlinear Analysis and Optimization ,Shimane, Japan, Mar. 2009.　概要：本論文では，２次元ユークリッド空間における absolute 正規ノルムは凸関数の言葉を用いて表すことが出来るという Bonsall-Duncan の結果を使って，absolute 正規ノルム全体の凸構造を調べた．実際，absolute 正規ノルム全体の集合は凸構造を持つことが，上記の凸関数の言葉を用いることにより示すことができ，absolute 正規ノルム全体の集合の端点にあたるノルムを凸関数の言葉を用いて決定した．さらに応用として，そのノルムを伴う２次元ユークリッド空間に対して James 定数を決定した．

そ　の　他（概要は記載しない）

福崎紀夫：新潟県柏崎市における大気中ガス状及び粒子状水銀の濃度変動；大気環境学会年会講演要旨集，**50**th，pp.419，2009,9.

串宮範彦，笠原仁，蔀泰幸，谷口正之，下村雅人，斎藤英一：水晶振動子センサーによる大豆アグルチニンとパパインの分子間相互作用の解析；第 31 回日本分子生物学会年会・第 81 回日本生化学会大会講演要旨集，p.202，2008,12.

斎藤英一，岡本永史郎，古田島隆行，上野顕司，千葉晃，谷口正之：日本産ウナギ体表上皮層由来のシステインプロテアーゼ阻害剤の包括的解析；第 31 回日本分子生物学会年会・第 81 回日本生化学会大会講演要旨集，p.202，2008,12.

大久保健介，大滝俊樹，笠原仁，伊勢村知子，斎藤英一：卵白シスタチン固定化センサーによる生体試料中のパパイン様システインプロテアーゼの定量；生化学，**81**(9)，p.282，2009,10.

竹園恵：泡沫層存在下での低環境負荷型界面活性剤の高効率・低コスト生産システム；平成 18 年度－平成 20 年度科学研究費補助金（基盤研究（C））研究成果報告書，2009,6.

藤木一浩：化学修飾したカーボンナノチューブを用いたゾル－ゲル法による無機／有機ナノ複合膜センサーの合成；日本板硝子材料工学助成会成果報告書，**26**，pp.198-208，2008.

丸田愛子，金成航，山岸愛，日下部征信，佐藤栄一，竹園恵，茂野俊也，小野寺正幸：生ゴミからのバイオガス生産について（その３）；日本農芸化学会大会講演要旨集 2009，p.329，3P1310B，2009，3.

日下部征信, 古石貴裕, 田巻繁:溶融塩における拡散係数;日本物理学会講演概要集, **64**(1), p.799, 2009,3.

日下部征信，松永茂樹，田巻繁：溶融塩における拡散係数Ⅱ，日本物理学会講演概要集，**64**(2)，p.725，2009,9.

松永茂樹，日下部征信，佐藤秀一，田巻繁：貴金属ハライド混合系の超イオン導電相におけるイオン分布と動的性質，日本物理学会講演概要集，**64**(2)，p.726，2009,9.

三谷健一，斎藤吉助，小室直人：Absolute ノルムの単調性について；日本数学会 2009 年度年会実函数論分科会講演アブストラクト，2009,3.

三谷健一：James 定数 Absolute ノルム空間の James 定数；研究集会「関数解析学の研究と応用」アブストラクト，2009,8.

三谷健一，斎藤吉助：Sharp triangle inequality の等号条件；日本数学会 2009 年度秋季総合分科会実函数論分科会講演アブストラクト，2009,9.

建　築　学　科

著　　書

深澤大輔ほか 39 名：現代住宅研究の変遷と展望;丸善株式会社, 2009, 9.　概要：激甚災害と農山魚村・農村住宅について，激甚災害法の制定，激甚災害に伴って実施された集落計画と住宅計画，これからの激甚災害に対して行われるべき集落計画と住宅計画について執筆した．担当部分：第 10 章　農村計画における住宅　10 -4.

研　究　論　文

安藤祐太郎，中野克彦，松崎育弘，杉山智昭：接着系あと施工アンカーのせん断耐力に及ぼすへりあき効果の影響に関する実験的研究；コンクリート工学年次論文集, 31(2), pp.679 -684, 2009,7.　概要：本研究は, へりあきの小さい接着系あと施工アンカーのせん断実験より, せん断耐力を求め，その評価方法を検討することを目的としている．その結果として，せん断ズレ変形を考慮したせん断耐力評価方法およびへりあき効果の必要性を示した.

大風翼，持田灯，富永禎秀，吉野博，伊藤優：雪粒子の流れ場への影響を組み込んだ新たな飛雪モデルの提案，第 20 回風工学シンポジウム論文集，pp.73 -78，2008,12．概要：非平衡状態の発達過程の吹雪風洞実験の結果を踏まえて非平衡流れ場の飛雪現象を予測するための CFD モデルの提案を行った.

伊藤優，大風翼，持田灯，富永禎秀，根本征樹，吉野博，佐藤威:発達過程の吹雪境界層における飛雪流量の空間分布に関する風洞実験；第 20 回風工学シンポジウム論文集，pp.67 -72，2008,12．　概要：実際の雪粒子を用いた風洞実験により，非平衡状態の発達過程の saltation 層における雪粒子の空間分布の変化とその風速への影響を調べた.

Yoshihide TOMINAGA, Ted STATHOPOULOS：Numerical Simulation of Dispersion around an Isolated Cubic Building : Comparison of Various Types of k-ε Models, Atmospheric Environment, **43**(20), pp. 3200-3210, 2009,6.　概要：立方体建物モデルの屋上からガスが排出された場合の建物近傍の濃度分布を対象として，4 種類の k -ε モデルを用いた CFD 解析を行い，乱流モデルが解析結果に及ぼす影響を検討した.

富永禎秀，大風翼，持田灯，志田貴之，吉野博：雪面の侵食・堆積のモデル化に関する基礎的検討　CFD による建物周辺の飛雪現象の数値予測，日本建築学会環境系論文集,**74**(643)，pp.1083 -1089，2009.9．　概要：CFD による建物周辺の飛雪現象を予測するための基本的なモデリングの手法を整理し、その手法を立方体建物モデル周辺の地表面の飛雪現象に適用し，実測や風洞実験結果との比較に基づき，雪面の侵食・堆積のモデル化に関して基礎的な検討を行った.

田口太郎ほか３名：まちづくりオーラル・ヒストリー―個々人の口伝の人生史を積層させることから社会的文脈を出現させる試み；日本都市計画学会誌「都市計画」,**58**(1) no.277,pp.35 -40,2009,2.　概要：「ふつうのまちの歴史と景観」の記述手法としての「まちづくりオーラル・ヒストリー」を提示した上で，その具体的な取り組みによる成果と課題を示し，最後にこの手法を活かすことによる可能性を社会資源の発掘，新しい公共の誕生，社会資本の形成，社会システムの創発を挙げ，市民生活と景観との相互補完的な理解について示した.

田口太郎ほか６名：地域復興における熟度評価の試み；日本災害復興学会大会講演論文集，pp.29 -32, 2009,10.　概要：中越地震からの復興をめざす集落に対して，中越大震災復興基金による事業「地域復興デザイン策定事業」「地域復興デザイン先導事業」に着目し，事業評価として挙げら

れている「復興塾度」の具体的な評価手法を検討した上で，実際の取り組みについての発表会型の事業評価を行い，その妥当性の検証を行った.結果、事業評価の時期については事業完了後の評価よりも導入時の評価およびアドバイスが極めて重要であり、評価のプロセスを通じて長所短所を把握し今後の取組みへの参考とすること，発表会において他の集落の取組みを見ることによって相互に刺激を与え合い今後の取組みに活かすこと，の二点であることを明らかにした.

田口太郎,阿部巧：中山間地域に災害における「支援員」の活動；日本災害復興学会大会講演論文集, pp.35 -40，2009,10． 概要：中越地震からの復興において基金事業により「地域復興支援員」が設置されているが，具体的な活動目的や活動手法が提示されない中，活動が展開されている.これらの動きを体系的に整理し，総務省によるどうようの取り組みである「集落支援員」の取り組みとの総合的な連携を図る上での基礎的な調査をとりまとめた．その結果，復興支援員の活動の取り組みには各地域の状況に応じて多様な展開をみせており，行政が集落との距離感が活動の成果に結びつくことを明らかにした.

国 際 会 議 論 文

Akinaru IINO：Measurement and numerical simulation of thermal environment on railway platforms；1st Int'l Academic Seminars on Development of Regulation and Construction Technology for Urban Integrated Energy System for City Sustainability in Busan, Korea, pp.17-35，May 2009. 概要：日本の鉄道駅における熱環境の実態とその問題点について，実測調査結果および数値解析結果を交えて論じた。さらに，建物と地表面の表面温度分布を求めるアルゴリズムを紹介し，鉄道駅熱環境を改善するプロジェクトに応用した場合の効果を示した（招待講演)。

Ryuichiro YOSHIE, Akashi MOCHIDA, Yoshihide TOMINAGA, Taichi SHIRASAWA and Hideyuki TANAKA : AIJ Cooperative project for practical applications of CFD to air ventilation, pollutant and thermal diffusion in urban areas; The 7th International Conference on Urban Climate (ICUC-7), Yokohama, Japan, Jun. 29-Jul. 3, 2009. 概要：日本建築学会屋外空気環境小委員会で行った建物周辺の汚染質拡散のベンチマークテストを対象として実施した CFD の解析結果について報告した.

Yoshihide TOMINAGA, Tsubasa OKAZE, Akashi MOCHIDA, Hiroshi YOSHINO and Yu ITO : Applicability of CFD prediction to three-dimensional snowdrift around a cubic building model ; The 7th International Conference on Urban Climate (ICUC-7), Yokohama, Japan, Jun. 29-Jul. 3, 2009. 概要：新たに提案した CFD による飛雪予測モデルを立方体の建物モデル周辺の雪の飛散・堆積現象に適用し，既往の屋外観測結果と比較し，その有効性を検証した.

Yasunobu AOKI, Yoshihide TOMINAGA and Toru MURATA: Numerical study on relationship between residential building arrangement and snow distribution ; The 7th International Conference on Urban Climate (ICUC-7), Yokohama, Japan, Jun. 29-Jul. 3, 2009. 概要：CFD と熱収支計算に基づく数値解析によって，街区の形状が雪の吹きだまりや好天時の融雪に及ぼす影響を調べ，積雪地域に適した街区配置について検討した.

Tsubsa OKAZE, Yoshihide TOMINAGA, Akashi MOCHIDA, Yu ITO, Masaki NEMOTO, Hiroshi YOSHINO and Takeshi SATO : Numerical Modeling of Drifting Snow around Buildings ; The 6th International Symposium on Turbulence, Heat and Mass Transfer, Rome, Italy, Sep.14-18, 2009. 概要：新たに提案した CFD による飛雪予測モデルを立方体の建物モデル周辺の雪の飛散・堆積現象に適用し，既往の屋外観測結果と比較し，その有効性を検証した.

解　説・総　説

深澤大輔：積雪地域の地震災害と防災に関する報告書の刊行にあたって；積雪地域の地震災害と防災，日本雪工学会上信越支部，pp.1-2，2009,10.　概要：阪神淡路大震災に続いて中越地震・中越沖地震が起きたが，これが積雪期に起きるとどのようになるかを解説し，その条件によって千差万別の状況が生ずることを指摘し，その備えの必要性を解説した.

特　　許

青木泰伸，富永禎秀：融雪装置；特許第 4259943 号，2009,2. 概要：低コストで維持管理の負担の少ない電気式融雪マットを利用した埋設型の融雪槽を開発した.

そ　の　他（概要は記載しない）

油浅耕三：建築教育における建設現場が生み出すものつくりの方法に関する一考察，工学・工業教育研究講演会講演論文集，pp.462-463，2009,8.

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地濃茂雄，金山陽平：里山景観に関わるコンクリートの色調改善に関する検討；第 63 回セメント技術大会講演要旨 2009，pp.184-185，2009,4.

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地濃茂雄，佐藤茂治：コンクリート表層面を想定したモルタルの吸水試験；第 63 回セメント技術大会講演要旨 2009，pp.220-221，2009,4.

深澤大輔：近代化以前の自然災害の鎮め－新発田城下町を例に－；日本建築学会北陸支部研究報告集，**52**，pp.393-396，2009,7.

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深澤大輔:平成 18 年豪雪における住家被害の地域的分布;雪氷研究大会(2009･札幌)講演予稿集,D1-07，2009,9.

深澤大輔：雪がある時の木造家屋の地震被害；積雪地域の地震災害と防災，日本雪工学会上信越支部，pp.31-49，2009,10.

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林哲久，田口太郎，福留邦洋:転出者による無住化集落の土地利用と管理方法―新潟県小千谷市十二平集落を事例として―，日本都市計画学会ポスターセッション，2009,5.

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田口太郎：自力再生力の復活 -中越沖地震を振り返って;復興デザイン研究，11，p.5，2009,7.

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林哲久，田口太郎，福留邦洋: 無住化集落における転出者の土地利用活動　新潟県小千谷市十二平集落と「十二平を守る会」を対象として; 日本建築学会（東北）大会学術講演梗概集，E-2，pp.579-580，2009,8.

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一　般　科　目

著　　書

小山良一ほか 35 名：『ベーオウルフ』とその周辺；春風社，2009, 9.　概要：古代英詩「ベーオウルフ」に関する論文集．Electronic Beowulf の Kevin Kiernan による Glossary の説明の不足及び疑問箇所を網羅し,修正を提案した．担当部分:Some Suggestions for Improving the Glossary of the Electronic Beowulf，pp.409-422，CD-ROM 版.

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受　　賞

【論　　文】

ＳＲＣ論文賞（１）

情報電子工学科　金井　靖

ＳＲＣ（情報ストレージ研究推進機構）リードライト部門から補助金を受けた研究論文のうち下記論文が特に優秀と認められたため，第１回ＳＲＣ論文賞を受けた．Simon J. Greaves, Yasushi Kanai, and Hiroaki Muraoka: Shingled Magnetic Recording for 2 Tbit/in$^{2;}$ IEEE International Magnetics Conference (INTERMAG), **FA-03**, Sacramento, CA, U.S.A., May 2009 (**招待講演**).

[論文の概要]

Head and media designs for shingled recording are described, targeting areal recording densities of 2-3 Tbit/in^2. The potential of the designs was evaluated using micromagnetic simulations. The possibility of achieving multiple Tbit/in^2 is demonstrated using a continuous, perpendicular recording medium. The effects of write head skew, inter-granular exchange coupling and read head offset are discussed.

ＳＲＣ論文賞（２）

情報電子工学科　金井　靖

第１回ＳＲＣ論文賞として，ＳＲＣ（情報ストレージ研究推進機構）ヘッド部門から補助金を受けた研究のうち下記論文が特に優秀と認められたため，第１回ＳＲＣ論文賞を受けた．Yasushi KANAI, Kazunori HIRASAWA, Toshio TSUKAMOTO, Kazuetsu YOSHIDA, Simon J. GREAVES and Hiroaki MURAOKA: Micromagnetic Recording Field Analysis of a Single-Pole-Type Head for 1 - 2 Terabit/inch^2; IEEE Transactions on Magnetics, **44**(10), Oct. 2008, pp. 3609-3612.

[論文の概要]

Dynamic recording fields of single-pole-type (SPT) heads, having main pole tip dimensions of 25 nm × 25 nm at the air bearing surface (ABS), were investigated using a Landau-Lifshitz-Gilbert (LLG) micromagnetic analysis. The recording performance in combination with continuous media and bit-patterned media (BPM) was discussed for areal densities of 1 – 2 Terabit/inch^2 using the results of LLG micromagnetic media recording simulations. Trailing and side shields were indispensable and the switching speed of the SPT head did not deteriorate on reducing the area of the main pole tip. The advantage of BPM over continuous media was clear with regard to obtaining a higher areal density.

【功　　績】

Best oral presentation award　（最優秀講演賞）

機械制御システム工学科　寺島　正二郎，情報電子工学科　佐藤　栄一ほか１名

4th Asian Pacific Conference on Biomechanics（第４回アジア環太平洋バイオメカニクス学術講演会）において上記の賞を受けた。Shojiro George TERASHIMA, Takuya Kitazawa and Eiichi SATH；Development of Mouthpiece Type Remote Controller for Disability Persons - 3rd-.

日本材料学会学術奨励賞

機械制御システム工学科　山崎泰広

材料に関する優秀な学術業績を挙げ、将来の発展が期待されると認められ，上記の賞を受けた．受賞課題は「プラズマ溶射遮熱コーティングの熱疲労損傷機構の解明と寿命延伸」.