〔 機械工学科 〕

〔区 分 A〕

浅地　豊久

Verification for Aluminum Multi-Charged Ions Generation Using ECR Ion Source

Seitatsu Onosaka*1, Syotaro Oue*1, Taku Shinohara*1, Tsubasa Nakamura*1, Daichi Ishii*2, Syo Itimiya*3, Shiori Kobayashi*3, Hiroya Uyama*4, Suzuka Fujita*4, Ayumu Inagaki*2, Toyohisa Asaji*3, Kazumasa Takahashi*4, Toru Sasaki*4, Takashi Kikuchi*4

*1 Electronic-Mechanical Engineering Department, National Institute of Technology, Oshima College
*2 Department of Mechanical Engineering, National Institute of Technology, Oita College
*3 Department of Mechanical Engineering, National Institute of Technology, Toyama College
*4 Nagaoka University of Technology

During semiconductor manufacturing, ions are injected into SiC, which is a common substrate material. Conventional ion-injection methods require high voltage to accelerate ions. This voltage can be decreased using multi-charged ions. In our laboratory, we can achieve ion injection via an electron cyclotron resonance ion source, which is relatively inexpensive compared with other ion sources and capable of generating multi-charged ions. The present research was conducted to improve the production rate of Ar^{7+}, which has an ionization energy close to that of Al^{4+}, and generate aluminum ions. The generation of aluminum ions could be confirmed using a sputtering source. Research results were shared with plural KOSENs and the Nagaoka University of Technology students through Zoom, and we successfully confirmed the educational effect of the model core curriculum and development of the general-purpose abilities of the students.

越智　真治

Mechanical properties of bamboo fiber bundle-reinforced bamboo powder composite materials

Shinji Ochi*

*Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College

This paper reports the mechanical properties of bamboo fiber bundle-reinforced bamboo powder composite materials. The tensile and flexural strengths of the fabricated products were investigated. First, the effect of the water content of bamboo powder and molding temperature on the strength characteristics was studied. The results showed that the bamboo powder product prepared with a water content of 7.2% and molded at a temperature of 200 ° C exhibited the highest adhesive strength between short fibers and bamboo powder. The tensile and flexural strengths of the bamboo fiber reinforced bamboo powder composites increased at temperatures ranging from 160 to 180 ° C but decreased at 200 ° C. Therefore, 180 ° C was concluded to be the most suitable molding temperature in terms of fiber bundle reinforcement. The composite

materials molded at 180 °C and with a fiber bundle content of 70% exhibited the highest tensile and flexural strengths, at 45.0 and 101.4 MPa, respectively, with a density of 1.42 g/cm^3. These results are equivalent to those of engineering plastics such as POM and PVC, indicating that the prepared composite materials are suitable substitutes for plastics in terms of density, tensile and flexural strength.

田中　大介

Elementary approach on the prediction of next material composition using AI technology: Improvement of characteristic by changing two components

Daisuke Tanaka*1, Susumu Nakayama*2
*1 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College,
*2 Department of Applied Chemistry and Biotechnology, National Institute of Technology (KOSEN), Niihama College

This study aims to identify the factors affecting the characteristics of samples, such as photoluminescence intensities, and identify the relationship between performance improvement and the search parameters for material composition. Subsequently, we optimize the experimental conditions to provide the maximum characteristic value. First, the process parameters are introduced as input values to the artificial intelligence (AI)-based model; then, we obtain a generalized equation to establish relationship between the characteristics of the samples and the process parameters. Subsequently, the new samples suitable for determining an accurate model and optimizing the process parameters are calculated and recommended to the user. Finally, the obtained formula is optimized, and the optimum values for achieving maximum characteristic are determined. Experimental validation using the AI program developed in this study found that the two components (x, y) that provide the strongest PL intensity in the $Srx(La10-x-yEuy)(SiO4)6O3-x/2$ (x=2–6, y=0.6–1.2) red-emitting phosphors can be easily estimated from approximately 10 initial data points.

田中　大介

Effectiveness Verification of DETR for Detecting Weld Defects

Kotaro Kii*1, Hironori Kumeno*1, Daisuke Tanaka*1, Takanori Hino*2, Shigeru Kato*3
*1 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College,
*2 Department of Environmental Materials Engineering, National Institute of Technology (KOSEN), Niihama College, *3 Department of Electrical Engineering and Information Science, National Institute of Technology (KOSEN), Niihama College

Welding appearance inspections have still depended on the visual information of humans. In recent years, automatic welding appearance inspection systems utilizing technologies like current sensing, contact sensing, ultrasonic inspection, and more have been introduced. However, the systems could be expensive and complicated. In this paper, artificial-intelligence-based automatic inspection system is proposed. The system uses DEtection TRnsformer (DETR) which detects welding defects from two-dimensional image data combining three images that welded parts are photographed by three cameras. This paper shows the overview of the system and its

effectiveness for the inspection with limited images.

田中　大介
Development of an Object Recognition Method Based on Transformer Architecture
Shunpei Morita*, Daisuke Tanaka*

* National Institute of Technology (KOSEN), Niihama College

Multimodal sensors, which are combinations of various sensors, are beginning to be installed in robots, and if we can handle these sensor information at the same time and compensate for the missing information, we can expect robust and highly accurate environment recognition in various situations. In addition, when handling multimodal sensor information, a good recognizer must have low computational complexity during recognition as well as during training. In this research, we use the Vision Transformer, which is an architecture that uses the encoder part of the Transformer, a basic model that is still used in the latest natural language processing models. Based on the Vision Transformer, we have developed an object recognition method which utilizes multimodal sensor information in a complementary manner with low computational complexity.

田中　大介
Integration of Multimodal Sensor Information Using VRAE and Application to Object Recognition
Kazuki Hayashi*, Daisuke Tanaka*

* National Institute of Technology (KOSEN), Niihama College

To achieve object recognition, it is necessary to find the unique features of the objects to be recognized. Prior research results have shown that high accuracy can be achieved when multiple sensors information is used. These results suggest that methods that use multiple sensors information are effective to acquire a high accuracy. In this paper, the overview of the system that can extract the features of the objects to be recognized by integrating visual, tactile, and auditory information as multimodal sensor information with the results of verification experiments is shown.

Hironori Kumeno
Effectiveness Verification of DETR for Detecting Weld Defects
Kotaro Kii*1, Hironori Kumeno*1, Daisuke Tanaka*1, Takanori Hino*2, Shigeru Kato*3

*1 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College, *2 Department of Environmental Materials Engineering, National Institute of Technology (KOSEN), Niihama College, *3 Department of Electrical Engineering and Information Science, National Institute of Technology (KOSEN), Niihama College

Welding appearance inspections have still depended on the visual information of humans. In

recent years, automatic welding appearance inspection systems utilizing technologies like current sensing, contact sensing, ultrasonic inspection, and more have been introduced. However, the systems could be expensive and complicated. In this paper, artificial-intelligence-based automatic inspection system is proposed. The system uses DEtection TRnsformer (DETR) which detects welding defects from two-dimensional image data combining three images that welded parts are photographed by three cameras. This paper shows the overview of the system and its effectiveness for the inspection with limited images.

<u>Hironori Kumeno</u>

Fault Detection from Bend Test Images of Welding Using Faster R-CNN

Shigeru Kato*1, Takanori Hino*2, Hironori Kumeno*3, Shunsaku Kume*1, Tomomichi Kagawa*1, Hajime Nobuhara*4

*1 Department of Electrical Engineering and Information Science, National Institute of Technology (KOSEN), Niihama College, *2 Department of Environmental Materials Engineering, National Institute of Technology (KOSEN), Niihama College, *3 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College, *4 University of Tsukuba, Graduate School of Systems and Information Engineering

The human visual inspection to find defects from welding joints is very tough. The examiners have to inspect many bend test fragments carefully. The present study aims to build an automatic detection system capable of finding cracks from bend test fragments. This paper describes the automatic detection method employing Faster R-CNN to detect crack regions. First, we introduce our achievement and explain the focused issue. Second, the structure of the proposed Faster R-CNN is explained, and then the present paper shows the experiment of automatic detection using web-camera working in real-time. Finally, conclusions and future works are discussed.

<u>Hironori Kumeno</u>

Evaluation for Angular Distortion of Welding Plate

Shigeru Kato*1, Shunsaku Kume*1, Takanori Hino*2, Fujioka Shota*3, Tomomichi Kagawa*1, Hironori Kumeno*4, Hajime Nobuhara*5

*1 Department of Electrical Engineering and Information Science, National Institute of Technology (KOSEN), Niihama College, *2 Department of Environmental Materials Engineering, National Institute of Technology (KOSEN), Niihama College, *3 Center for Engineering Design Education, National Institute of Technology (KOSEN), Niihama College, *4 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College, *5 University of Tsukuba, Graduate School of Systems and Information Engineering

Welding is essential in our life. It is crucial to nurture welding skills in Japan nowadays. The experts have to evaluate the many beginners' welding. Since the experts' burden is critical, a computational assistant for evaluating beginners' welding is required. This paper describes a simple evaluation system of welding plates by beginners. The authors considered four types of beginners' typical defects: lack of welding metal, linear misalignment, welding metal unevenness, and angular distortion. To capture these defects simultaneously, the authors propose an original

equipment to photograph the welding plates. The computer extracts only the part of the welding plate using color markers. CNN (Convolutional Neural Network) evaluates the defects. As a first step, the authors addressed evaluating only angular distortion. The angular distortion is one of the typical failures by beginners. In the experiment, the authors conducted the validation of CNN. In the conclusion part, we discuss the experimental result and future works.

〔区　分　C〕

田中　大介
人工知能によるみかんの糖度判定システムの実現

森下諒大*、粂野紘範*、田中大介*
*新居浜工業高等専門学校機械工学科

Saccharinity of oranges which is one of Ehime's local specialities is very important property to appraise each product. The most precise method to determine the saccharinity of the product is to use the squeezed juice. However, the squeezed product could not be shipped. Therefore non-destructive test is required. Although the infrared-based non-destructive method is used at agricultural cooperatives, the method requires large-scale facilities. It makes difficult for each farmer to introduce the method. In this study, the development of an easy-to-implement non-destructive saccharinity testing system is focused. A method called home selection is applied in this study. Using the following property: "The peel color of the orange is darker, its saccharinity is higher", a model which represents the relationship between the image of the orange and its saccharinity are learned using artificial intelligence technology. Because the learned model estimates the saccharinity using only the image, the testing system could be implemented on a smartphone. In this paper, the overview of the proposed method and testing system and its verification result are shown.

粂野　紘範
ディープラーニングを用いた溶接外観判定

加藤茂*1、粂野紘範*2、日野孝紀*3
*1 新居浜工業高等専門学校電気情報工学科、*2 新居浜工業高等専門学校機械工学科、*3 新居浜工業高等専門学校環境材料工学科

初心者が行ったステンレス TIG 溶接の CNN による評価方法について述べた。

粂野　紘範
人工知能によるみかんの糖度判定システムの実現

森下諒大*、粂野紘範*、田中大介*
*1 新居浜工業高等専門学校機械工学科

　Saccharinity of oranges which is one of Ehime's local specialities is very important property

to appraise each product. The most precise method to determine the saccharinity of the product is to use the squeezed juice. However, the squeezed product could not be shipped. Therefore non-destructive test is required. Although the infrared-based non-destructive method is used at agricultural cooperatives, the method requires large-scale facilities. It makes difficult for each farmer to introduce the method. In this study, the development of an easy-to-implement non-destructive saccharinity testing system is focused. A method called home selection is applied in this study. Using the following property: "The peel color of the orange is darker, its saccharinity is higher", a model which represents the relationship between the image of the orange and its saccharinity are learned using artificial intelligence technology. Because the learned model estimates the saccharinity using only the image, the testing system could be implemented on a smartphone. In this paper, the overview of the proposed method and testing system and its verification result are shown.

〔区　分　E〕

吉川　貴士

CONSIDERATION OF THE SPECIAL COURSE FOR ASSISTIVE TECHNOLOGY ENGINEER DEVELOPMENT IN COLLABORATION WITH MEDICAL INSTITUTIONS

Mitsuhiro TANIWAKI*1, Takashi YOSHIKAWA*1, Mikio DEGUCHI*2, Yoshikazu MINAMOTO*3, Masafumi IMAI*3
*1 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College, *2 Department of Electronics and Control Engineering, National Institute of Technology (KOSEN), Niihama College, *3 Department of Electrical Engineering and Information Science, National Institute of Technology (KOSEN), Niihama College

　医療機関と連携したモノづくり教育は非常に重要であり有益である。新居浜高専では、「アシスティブテクノロジー技術者育成特別課程」として、2 年間の系統的なカリキュラムを新規開講している。これは、医療福祉工学の基礎知識を学び、そして臨床現場からのニーズに基づくものづくりを行っていく課程である。この AT 課程では、臨床現場での課題がテーマとして与えられ、学生が主体となって、教員から流体、制御、センサー、プログラミングなどのアドバイスを受けながら課題解決に向けて取り組んでいる。しかし、実際の臨床現場の課題をイメージすることは難しく、課題解決においても、多面的な視点、考え、知識が必要となってくる。また、臨床現場では、学生が作ったことに大きな意味はなく、現場で使えるレベルの試作機が必要となる。そのため、臨床現場で試用できるものをつくるためには、ユーザーが必要とする機能と同時に、クオリティーの高いものづくりができる「技術」と「戦略」が必要となる。このように実践的なものづくりができるエンジニアの育成は、学校教育のみでは不可能であり、地域と連携した社会実装教育が必要である。このレポートでは、AT コースの概要と実際の取り組み例を紹介する。また、学生の取り組みと医療機関からのフィードバックの内容をまとめ、課程の受講前後での学生の意識の変化について考察すると共に、医療機関と連携することによる有益性を述べる。

<u>吉川　貴士</u>

コロナ禍でのコミュニケーションの密接化による訓練室内の換気改善効果

鈴木裕一*1、吉川貴士*2

*1 松山リハビリテーション病院リハビリテーション部、*2 新居浜工業高等専門学校機械工学科

　当院では医療福祉機器の開発に携わる人材育成も踏まえ、工学部との連携による機器開発に取り組んでいるが、コロナ禍での 3 密回避と移動自粛により、リモートでの連携方法を再構築した。これによりネットワーク上で共同作業が可能となり、コミュニケーションの密接化を実現している。本研究の目的は、感染症対策として室内の温度管理をしながら、窓を開けての換気を迫られる状況で、効率的な換気と温度管理を実現することである。その結果、夏季の実際の訓練室内にて、換気状態を確保しながら室内の温度上昇を 0.6 度に、エリア内の温度差を 35%に軽減させることができた。迅速な連携により、効率的な換気と温度管理を実現することができた。この連携で重視したのは、互いのアウトプット情報の明確さである。口頭やメールでの簡易表現ではなく、報告書、仕様書など誤解を招きにくい論理的文書表現を互いの目標とした結果、今年度の連携全体でも、開発課題毎の平均文書数は 3.6 倍、院内評価に至った開発課題数は 2 倍に増加した。この文書表現能力は、コロナ禍を経験して改めて、迅速な医工連携と人材育成に必須であると考えている。

<u>吉川　貴士</u>

立ち上がり訓練専用クッションのセラピストにおける満足度評価

大崎智之*1、鈴木裕一*1、吉川貴士*2

*1 松山リハビリテーション病院リハビリテーション部、*2 新居浜工業高等専門学校機械工学科

　リハビリテーション医療で使用する機器において使用者であるセラピストの満足度を評価することは、継続的な機器利用において重要と考えている。今回、我々が開発中の機器は高さ別で使用可能な立ち上がり訓練専用クッションである。開発中である専用クッションのコンセプトの妥当性を確認するために、セラピストの満足度評価を研究の目的とした。改良した機器メーカーの試作器は改良前の工学部の試作器と比較し、満足度に有意差はなかった。しかし、SUS スコア介入群 80.25 点、対照群 74.50 点と、どちらも SUS スコアの平均点 68 点以上と高く、満足度に対する配慮がなされているという結果が示された。

<u>吉川　貴士</u>

専用クッションを用いた立ち上がり訓練歩行耐久性に対する効果検証

片桐知美*1、鈴木裕一*1、吉川貴士*2

*1 松山リハビリテーション病院リハビリテーション部、*2 新居浜工業高等専門学校機械工学科

　リハビリテーション医療において、屋外活動の参加促進を図るために効果的な歩行耐久性に対する介入方法を提案する必要がある。同院では専用クッションを用いた立ち上がり訓練に注目しており、本研究は歩行能力の低下した高齢者に対し、歩行訓練と比較し専用クッションを用いた立ち上がり訓練の歩行耐久性に対する優位性検証を目的に実施した。その結果、6 分間歩行距離、等尺性膝伸展筋力体重比の増加量に有意差はなく、訓練時間と訓練効率に有意差があった。この結果は専用クッションの有効利用で、適切負荷にて短時間での訓練が可能なことを示している。また、立ち上がり訓練は時間だけでなく訓練スペースや転倒リスクにおいても配慮しやすい利点があり、専用クッションの積極的な利用による訓練の効率化を図る取り組みを今後も検討している。

<u>吉川　貴士</u>

AI スピーカーを用いたナースコールの音声操作における満足度検証

鈴木裕一*1、今西望*2、吉川貴士*2

*1 松山リハビリテーション病院リハビリテーション部、*2 新居浜工業高等専門学校機械工学科

第 5 回日本リハビリテーション医学会秋季学術集会　抄録集　S511、（2021.11）

　一般家庭でも利用が進む AI スピーカーに着目し、頚髄損傷患者でもテレビや電話など周辺機器を健常者と同様に音声で操作可能となる環境を整えており、利用者の反応も良好である。しかし、AI スピーカーによる病院内の既存製品への対応は容易ではない。そこで、本研究では環境の準備者にとっても満足度の高い AI スピーカー対応の機器開発を目的とした。

　評価指標は SUS スコアによる準備者の満足度で、統計学的解析は有意水準を 5%未満とし、ノンパラメトリック検定として Wilcoxon の符号付き順位検定を用いた。その結果、SUS スコアにて介入試験は 72.3±10.6 点、比較対照試験は 54.0±17.9 点であり、有意に介入試験の満足度が高かったことを報告した。

<u>吉川　貴士</u>

省コストで行える歩行解析システム

山内幸太*1、今井雅文*1、吉川貴士*2、鈴木裕一*3

*1 新居浜工業高等専門学校電気情報工学科、*2 新居浜工業高等専門学校機械工学科、*3 松山リハビリテーション病院リハビリテーション部

第 5 回日本リハビリテーション医学会秋季学術集会　抄録集　S488、（2021.11）

　理学療法の歩行解析において、筋電図を活用した手法が用いられている。しかし、既存の歩行解析ソフトは高価であり、臨床の現場において容易に入手することは困難である。そこで、本研究では、理学療法士が簡単に扱え、省コストの歩行解析ソフトを提案した。手法として、汎用性に長け、無償の Java ベース Autoplot を用いて、歩行解析プログラムを作成する。このソフトでは、事前に測定した筋電図データを CSV 形式で取り込み、データ内のノイズ処理や歩行秋季に対する時間・振幅の正規化を行い、出力結果については 6 歩行周期の平均値を表示するもとした。本研究で開発した歩行解析ソフトは Windows、MacOS、Linux に対応しているため、臨床現場の理学療法士が普段使用しているパソコンで利用でき、現場への導入が容易である。また、現場からの新たな工学的なフィードバックを受けて、より良いソフトに改善することも期待される。

<u>浅地　豊久</u>

デスクトップ型 2.45GHz ECR イオンビーム装置の開発

川村時代*1、井上雄太*1、浅地豊久*1、中村翼*2

*1 新居浜工業高等専門学校機械工学科、*2 大島商船高等専門学校電子機械工学科

日本機械学会中国四国学生会 第 52 回学生員卒業研究発表講演会、04c2、（2022.3）

　本研究ではデスクトップサイズの電子サイクロトロン共鳴 (ECR) イオン源のイオンビーム電流量向上を目的とし、マイクロ波周波数を 1.3 GHz から 2.45 GHz へ高周波化した。その結果、イオンビーム電流量が約 5 倍の 240μA に増加した。さらにビーム直進性の改善のため、集束レンズ未使用の条件で三次元電磁場解析によるイオンビーム軌道計算を行った。これにより引出電極間隔を現状の 20 ㎜ から 35〜45 ㎜ に広げることが有効と分かった。その検証実験を電極間隔 39 ㎜ で行い、イオンビーム電流量が約 1.5 倍に増加することを明らかにした。

<u>浅地　豊久</u>

Plasma Generation and Diagnosis for Practical Application of Paint Peeling off System using Atmospheric Pressure Plasma

Masaya TSUBAKI*1, Yuki ABE*1, Syunsei TSUNEMORI*1, Kaya YOSHIHARA*1, Tsubasa NAKAMURA*1, Kosei NOZAWA*2, Tomoki TSURUMIYA*3, Atsushi UCHIDA*4, Ayumu INAGAKI*2, Toyohisa ASAJI*3, Kazumasa TAKAHASHI*4, Toru SASAKI*4, Takashi KIKUCHI*4

*1 Electronic-Mechanical Engineering Department, National Institute of Technology, Oshima College
*2 Department of Mechanical Engineering, National Institute of Technology, Oita College
*3 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College
*4 Nagaoka University of Technology

In this study, the generation and diagnosis of plasma for the practical application of the paint peeling off system using atmospheric pressure plasma will be carried out by utilizing the joint research system between plural KOSEN and Nagaoka University of Technology, which was practiced in 2020. While mixing the active learning of this system, the generated plasma is comprehensively diagnosed and evaluated by visual confirmation, observation of voltage and current waveforms, and spectral measurements. We are currently generating atmospheric pressure plasma using argon as the process gas, and we are diagnosing now. From these observations, it can be seen that when the process gas is helium, the entire inside of the reactor emits light and plasma is generated throughout the reactor. On the other hand, in argon, we can observe that the plasma is concentrated in some areas. This is related to the ionization voltage and metastable state (voltage) of the process gas.

浅地　豊久

Design and Production of Reactor for Atmospheric Pressure Plasma Generation Without use of Helium

Kaya YOSHIHARA*1, Yuki ABE*1, Syunsei TSUNEMORI*1, Masaya TSUBAKI*1, Tsubasa NAKAMURA*1, Kosei NOZAWA*2, Tomoki TSURUMIYA*3, Atsushi UCHIDA*4, Ayumu INAGAKI*2, Mitsuhiro TANIWAKI, Toyohisa ASAJI*3, Kazumasa TAKAHASHI*4, Toru SASAKI*4, Takashi KIKUCHI*4

*1 Electronic-Mechanical Engineering Department, National Institute of Technology, Oshima College
*2 Department of Mechanical Engineering, National Institute of Technology, Oita College
*3 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College
*4 Nagaoka University of Technology

In this study, utilizing active learning by the joint research system between plural KOSEN and Nagaoka University of Technology, the main purpose is design and production of a reactor that generates atmospheric pressure plasma without using helium gas. In designing the reactor, based on design indicators, proposal of a reactor structure consisting of a dielectric and electrodes, and preforms fluid analysis of the process gas flowing inside or performs electric field analysis inside the reactor. Also, the analysis results by ANSYS Fluent 19.0 were used to evaluate the flow behavior of designed reactor.

Currently, select argon as the process gas, we analyzed the behavior of the flow in the reactor. In the reactor shape, not only the behavior of the fluid, has to take account of the applied electric field too required for plasma generation. As a result, the spout velocity near the jet is a little faster in Figure 2, where a dielectric is inserted in the flow path.

浅地　豊久

Effect of Atmospheric Pressure Plasma Irradiation on the Interface between Paint and Base Material -Verification for application to paint peeling on ships-

Kaya Yoshihara*1, Tsubasa Nakamura*1, Takahisa Ueno*2, Ayumu Inagaki*3, Shinji Takeshita*4, Takao Ota*5, Toyohisa Asaji*6

*1 Electronic-Mechanical Engineering Department, National Institute of Technology, Oshima College
*2 Department of Electrical and Electronic Engineering, National Institute of Technology, Oita College, National Institute of Technology, Oita College
*3 Department of Mechanical Engineering, National Institute of Technology, Oita College
*4 Department of Electrical and Computer Engineering, National Institute of Technology, Wakayama College
*5 Department of Mechanical Engineering, National Institute of Technology, Nara College
*6 Department of Mechanical Engineering, National Institute of Technology (KOSEN), Niihama College

Irradiation of atmospheric pressure plasma to the painted surface tended to cause the painting to peel off easily. The crosslinking reaction causes inside the painting by the heat input from the atmospheric pressure plasma. This due to in partial paint peeling off by shear stress at the interface between the painting and the base material. As the results, it considered painting become easy to peeling off1. The purpose of this study is to examine in detail the effect of atmospheric pressure plasma irradiation on the interface between the painting and the base metal, and to examine the application of atmospheric pressure plasma irradiation on the ship paint peeling.

平田　傑之

超音波切削法による高脆材料の超精密加工の研究

岩井学*1、石黒愛瑠乃*1、伊東聡*1、平田傑之*2、岳義弘*3、二ノ宮進一*4
*1 富山県立大学工学部、*2 新居浜工業高等専門学校機械工学科、*3 超音波加工技術研究所、*4 日本工業大学基幹工学部

　石英ガラスは光学レンズや半導体製造部品に利用が拡大されているが、脆性材料であるため超精密加工が困難である。現在は研削および研磨による砥粒加工が採用されているが、ダイヤモンド砥粒の損耗が激しく形状精度の悪化を招くために低能率な加工条件を採用せざるを得ない。一方、1990 年頃より研究されてきた延性モード切削法は、ガラス材を割れの無い滑らかな表面性状で切削加工できるが、切り取り厚さが小さい条件($t \leqq 0.1\mu m$)に限られおり、加工能率がきわめて低い。またダイヤモンド工具の摩耗も深刻な問題であるため、切削加工による製造方法は実用化に至っていない。

　本研究では、加工能率の向上やダイヤモンド工具の寿命向上を目的に、超精密加工用に専用設計した超音波振動工具を適用するとともに、耐損耗に優れるボロン(ホウ素)ドープダイヤモンド工具を採用する。石英ガラス部品の切削加工による製造方法の実用化を目標としている。

谷脇　充浩

CONSIDERATION OF THE SPECIAL COURSE FOR ASSISTIVE TECHNOLOGY ENGINEER DEVELOPMENT IN COLLABORATION WITH MEDICAL INSTITUTIONS

谷脇充浩*1、吉川貴士*1、出口幹雄*2、皆本佳計*3、今井雅文*3

*1 新居浜工業高等専門学校機械工学科、*2 新居浜工業高等専門学校電子制御工学科、
*3 新居浜工業高等専門学校電気情報工学科
14th International Symposium on Advances in Technology Education, (2021.8)

　Manufacturing education in collaboration with medical institutions is very important and useful.

　National Institute of Technology, Niihama College (NIT, Niihama College) offers a two-year systematic curriculum as the "Special Course for Assistive Technology Engineer Development (AT course)". This is the process of learning the basic knowledge of Medical welfare engineering, and manufacturing based on the needs of clinical field. In the AT course, problems in clinical environment are given as themes, and students take the initiative in working toward solving the issues while receiving advice on fluids, controls, sensors, programming, etc. from teaching staffs. However, it is difficult to imagine the problems in clinical environment, and multifaceted viewpoints, ideas, and knowledge are required to solve the problems. Also, in clinical environment, it doesn't matter who made it. Furthermore, in order to create products that can be used in clinical environment, it is necessary to have "technology" and "strategy" that enable high-quality manufacturing as well as the functions required by users. It is not possible to nurture engineers who can make practical things only by school education, and social implementation education in collaboration with the local community is necessary.
Therefore, as the AT course, we built an education system in collaboration with medical institutions. In addition, this system is designed to nurture engineers who can "manufacture with care" and to create an environment where they can learn manufacturing from various perspectives.

　This report provides an overview of the AT course and examples of actual efforts. Also summarize student efforts and feedback from clinical institutions, consider changes in student awareness before and after taking the course, and describe the benefits of collaborating with medical institutions.

　　田中　大介
ロボット制御シミュレーションによる高専低学年における AI 技術の啓発
粂野紘範*1、田中大介*1、山本浩二*2、木川田亘*3、加藤順之*3
*1 新居浜工業高等専門学校機械工学科、*2 新居浜工業高等専門学校エンジニアリングデザイン教育センター技術室、*3 MathWorks Japan
令和 3 年度電気・電子・情報関係学会四国支部連合大会講演論文集、p201、(2021.9)

　2021 年に本科第 2 学年の学生が実施した、AI を用いたロボット制御実習について述べた。実習を通して AI の学習工程を体験することで、AI 技術への興味をもたせると共に、AI 学習における学習データの役割を理解させるのが本実習の目的である。実習後に行ったアンケートと課題の回答から本実習がこれらの目的を達成できたかどうか確認した。

　　田中　大介
罹患家畜早期発見のための LSTM を用いた時系列データのクラス分類
土屋和也*1、石光俊介*1、湯本誠司*1、岡田なつみ*2、田中大介*3、三上修*4、井上寛暁*4、石田三佳*4
*1 広島市立大学大学院情報科学研究科、*2 広島市立大学情報科学部、*3 新居浜工業高等専門学校機械工学科、*4 国立研究開発法人農業・食品産業技術総合研究機構
日本音響学会 2022 年 春季研究発表会、pp475-476、(2022.3)

家畜個体ごとに耳標センサを取り付け、騒音に頑健な体内伝導音を収録することで、個体ごとでの罹患を判定する手法を検討している。本研究では、体内伝導音収録システムで収集した豚の時系列データに対し、LSTM（Long short-term memory）を用い、罹患前後の2クラス分類を試みた。

粂野　紘範
ロボット制御シミュレーションによる高専低学年における AI 技術の啓発

粂野紘範*1、田中大介*1、山本浩二*2、木川田亘*3、加藤順之*3
*1 新居浜工業高等専門学校機械工学科、*2 新居浜工業高等専門学校エンジニアリングデザイン教育センター技術室、*3 MathWorks Japan

　2021年に本科第2 学年の学生が実施した、AI を用いたロボット制御実習について述べた。実習を通して AI の学習工程を体験することで、AI 技術への興味をもたせると共に、AI 学習における学習データの役割を理解させるのが本実習の目的である。実習後に行ったアンケートと課題の回答から本実習がこれらの目的を達成できたかどうか確認した。