PRESM

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International Symposium on
PRecision Engineering and Sustainable Manufacturing

PRESM 2020

PROGRAM BOOK

November 15 Sun - 18 Wed, 2020
Online Symposium

Organizer

KSPE Korean Society for Precision Engineering (KSPE, Korea)

Development of Advanced Designers for Highlyreliable Mechanical Components in Kangwon National University

KNU KANGWON NATIONAL UNIVERSITY

Development of Advanced Designers for Highlyreliable Mechanical Components for Strengthening the competitiveness of the machinery industry

Contact

Kangwon National University MNBS LAB

033-244-8910, kus2172@kangwon.ac.kr

KOMMA

02-3459-0031~3, pi03@komma.org

Overview

- **Project name : The Competency Development Program for Industry Specialist**
- **Project title: Development of Advanced Designers for Highlyreliable Mechanical Components**
- **Project period : 2018.03.01. ~ 2023.02.28.**
- **Objective : Training R&D experts in the field of high-reliability precision machine parts and smart machine parts for the advancement of major industries based on industry-academia projects**

Student recruitment

- **Target for support :** Graduates of a university student who wishes to get a job in the machinery parts related industry
- **Qualification for application :** Graduate from a four-year university in mechanical engineering or similar major, and hold a bachelor's degree
- **Support contents :**

Government scholarship and project research fund support employment linkage with companies, such as conducting industry-academic cooperation research projects. Providing professional training opportunities related to machine parts based on industrial demand.

- **Apply for track :**

Kangwon National University's Graduate School Admission Selection Reference

Kangwon National University Graduate School website

(graduate.kangwon.ac.kr)

Confirmation of general graduate school application announcements

General institution 산업통상자원부 Institution beyond leading technology KIAT 한국산업기술진흥원 Organizing Komma 한국공작기계산업협회 Korea Machine Tool Manufacturers' Association

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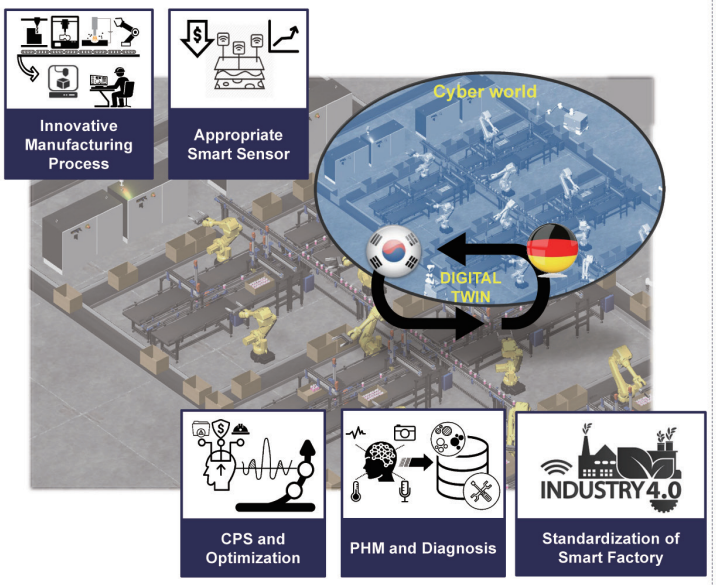
Korea-Germany Intelligent Manufacturing Systems Laboratory

Visions

"Korea-Germany Collaborative Research for Industry 4.0 and Smart Manufacturing"



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Seoul National University
Professor, PI of project
Sensors and manufacturing process

Manufacturing process

Byeng-Dong Youn
Seoul National University
Professor
Prognostics and health management

In-Soon Yang
Seoul National University
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Cyber physical system

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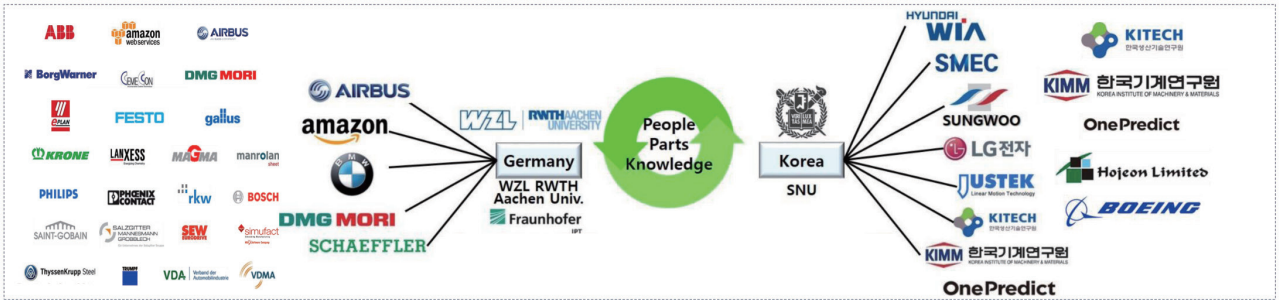
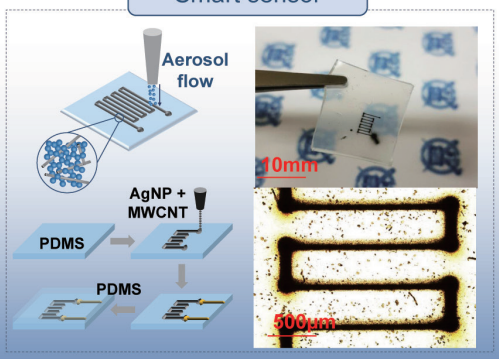
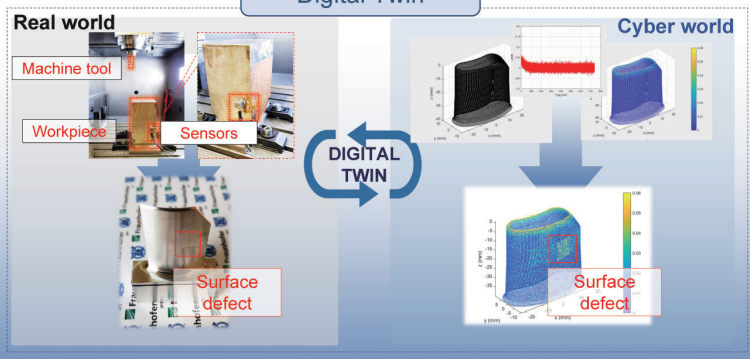


Main research

Smart sensor



Digital Twin



IMSL KOREAN-GERMANY INTELLIGENT MANUFACTURING SYSTEMS LABORATORY 한국-독일 지능형 제조시스템 연구실

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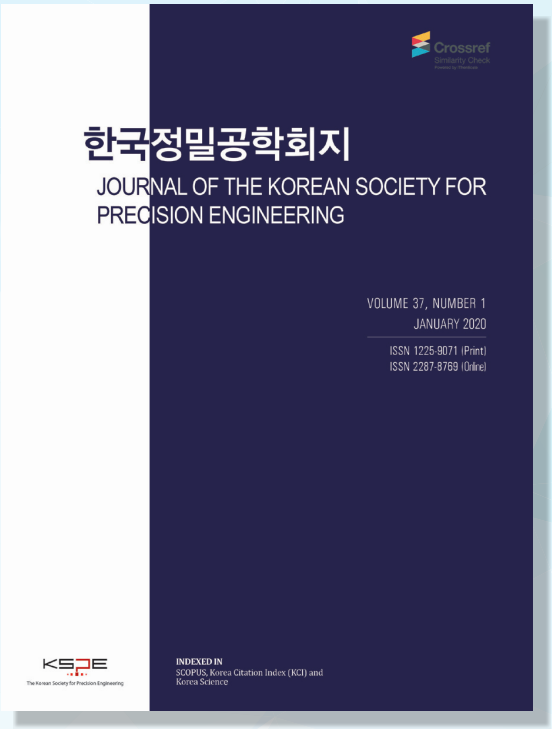

Indexed in SCOPUS

Scope

- Precision Manufacturing Processes
- Precision Measurements
- Robot and Automation / Control
- Smart Manufacturing System
- Design and Materials
- Machine Tools
- Nano/Micro Technology
- Biomechanical Engineering
- Additive Manufacturing System
- Green Manufacturing Technology

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AWARDS

JKSPE Highly Commended Paper Award

–The most outstanding paper published in the Journal of the Korean Society for Precison Engineering

INDEXED IN

- SCOPUS
- Korea Citation Index (KCI)
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IJPEM-GT is co-published by the Korean Society for Precision Engineering and Springer Nature. The journal is published bimonthly, and **JCR 2019 impact factor is 4.171**, which **ranks it top 13.8% (18/130)** journal in the category of Engineering-Mechanical and **top 24% (12/50)** journal in the category of Engineering-Manufacturing.

Topics of the Special Issue cover novel research contributions of "**Green**" precision engineering and manufacturing - theories and applications in the field of

Soft and Green Manufacturing and Applications

The potential focus areas to be covered in this Special Issue include, but are not limited to:

- **Stretchable/flexible electronics, optics, structures and sensors**
- **Soft/green robotics and actuators**
- **Bio printing/manufacturing process**

Special Issue Invitation

Submission Procedures

Deadline for Submission Date	**November 30, 2020**
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Volume, Number	**Vol. 8, No. 3**

Guest Editors

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- Professor **Seung Hwan Ko** (Seoul National University, Korea)
- Professor **Hugo Rodrigue** (Sungkyunkwan University, Korea)

Editor-in-Chief

- Professor **Sung-Hoon Ahn** (Seoul National University, Korea)

Impact Factor: 4.171

by JCR in 2019

Springer
the language of science

KSPE Korean Society for Precision Engineering

PRESM 2020

Contents

Welcome Message

Welcome to PRESM 2020

On behalf of all the committee members of PRESM 2020, we would like to welcome you to PRESM 2020 which will be held online from November 15 to 18, 2020. The International Symposium on Precision Engineering and Sustainable Manufacturing (PRESM) is an international symposium that covers a wide range of topics related to precision engineering and sustainable manufacturing. PRESM is dedicated to the development of precision engineering and sustainable manufacturing for the benefit of the global society. It is organized annually by the Korean Society for Precision Engineering (KSPE) and attracts participants from all over the world.

Particularly in today's world where demand for green and smart technology is expanding, the role of engineers and scientists in paving a sustainable future is becoming evermore important. To this end, PRESM 2020 will serve as a platform for researchers, practitioners and students from various arenas to gather and share their latest achievements in precision engineering and manufacturing.

Given the grave situation the entire world is facing with the COVID-19 pandemic, we have decided that PRESM 2020 will be held online. As online conferences have become the new normal in 2020, we are confident that online PRESM 2020 will be executed effectively without compromising the high quality of the oral and poster presentations.

With your participation, we are confident that PRESM 2020 will be enjoyable and fruitful to everyone. Please join us in this exciting event as KSPE continues to expand its vision of "Precision Engineering for Sustainable and Prosperous Life, Forever". Thank you.

Chair of PRESM 2020

Dae-Eun Kim, Yonsei University, Korea

"K-Precision, Smart & Green"

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PRESM2020 Online Program

15-18 November, 2020 at Online

http://online.presm.org

Guest Speaker

3days Streaming (16-18 Nov.)

1. Plenary Speech
2. Invited Speech

Focus Session

Real Time Streaming

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1. Holonic Manufacturing System towards Agility and Customization in the New Normal Era
2. Advanced Manufacturing Processes for Hydrogen and Fuel Cell Technologies
3. Bio Manufacturing Platform
4. Hot Issues on Dimensional Metrology
5. Korea-Germany Intelligent Manufacturing Systems

General Session

3days Streaming (16-18 Nov.)

1. Manufacturing Processes
2. Machine Tools & Systems
3. Automation, Measurement & Control
4. Materials & Design
5. Micro Nano Technology
6. New and Renewable Energy
7. Sustainable Technology

Organized Session

3days Streaming (16-18 Nov.)

1. System Engineering using Computational Mechanics
2. Precision Machinery and Related Materials
3. Industry and Academia R&D Collaborations
4. The Future of Additive Manufacturing
5. Smart Manufacturing

e-Booth

1. Development of Advanced Designers for Highlyreliable Mechanical Components in Kangwon National University
2. Intelligent Manufacturing System Laboratory

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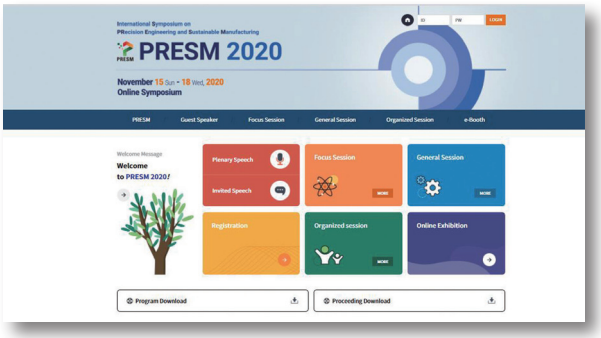
PRESM2020 will be held online on Nov 15~18, 2020. Please go through following information on how to participate.

1. Go to PRESM2020 Online symposium website : http://online.presm.org



2. Log in with the username(e-mail) and password you registered when you joined in PRESM2020.

3. Search interested presentations and enjoy.

• Plenary speech • Invited talk • General Session • Organized session	One-way streaming Available for whole 3 days of conference (Nov. 16~18, 2020)
• Focus session	Live streaming See p.17-18

4. **QnA:** The audience can ask a question by writing a comment below presentation video. The notification email is sent to the presenter so that he or she can answer as soon as possible. The presenters are highly recommended to answer to the question at least one time per day.

5. **The proceeding of PRESM [ISSN 2635-7887]** is downloadable on the website http://www.presm.org & http://online.presm.org (15-18 Nov.)

6. **Certificate of participation & receipt**
   (1) Can be printed out on "my page" after the conference finishes. You can find "my page" on top right side of website (http://www.presm.org)
   (2) The receipt of registration can be printed out on "my page" of website

7. Downloading, illegal recording, and screen capturing of all presentation materials is strictly prohibited in accordance with relevant laws and research ethics. We ask for your observance of research ethics so that valuable research results can be developed further.

[Online Registration Fee]

Category Early	Registration	On-Site Registration
Date	by November 14, 2020	November 15~18, 2020
Non-Student	250USD / 250,000KRW	270USD / 270,000KRW
Student	150USD / 150,000KRW	170USD / 170,000KRW

*Go to online registeration ▶ http://www.presm.org/registration/index.html?sgubun=2&event=9

*PRESM Secretariat operating hours are from 10:00 to 17:00, and registration operation dates and times are based on KST(UTC+09:00).

Guest Speakers

Plenary Speakers

PL-001 **CPS Based Robotic Grinding and Polishing of 3D Surfaces**

Jwu-Sheng Hu
Institute Industrial Technology Research Institute (ITRI), (Taiwan)

PL-002 **Toward Unmanned Lapping for a Large Work Surface**

Sun-Kyu Lee
Gwangju Institute of Science & Technology (Korea)

PL-003 **Challenge to Defect-free Machining (One Step beyond Precision)**

Libo Zhou
National Ibaraki University (Japan)

Invited Speakers

IT-001 **Precise Measurement of the Thickness of Silicon Wafers and Bilateral Comparison**

Akiko Hirai
Research Institute for Engineering Measurement National Metrology Institute of Japan (NMIJ), National Institute of Advanced Industrial Science & Technology (AIST), (Japan)

IT-002 **A Framework for Deployment of Collaborative Robotics in Human Centric Industrial Environments**

William Melek
University of Waterloo (Canada)

IT-003 **Multi-scale Topology Optimization for Additive Manufacturing**

David Rosen
Georgia Institute of Technology (USA)

IT-004 **Optical Angle Measurement with a Mode-locked Femtosecond Laser**

Yuki Shimizu
Tohoku University (Japan)

IT-005 **Field Emission Characteristics of Carbon-based Structures Fabricated by CVD**

Hung-Yin Tsai
National Tsing Hua University (Taiwan)

IT-006 **Micro/Nanoscale Surface Structuring for Functionalization of Materials**

Jiwang Yan
Keio University (Japan)

IT-007 **Current Approaches for Autonomous Production**

Daniel Zontar
Fraunhofer Institute for Production Technology IPT (Germany)

Jwu-Sheng Hu

Professor
Mechanical and Mechatronics Systems Laboratories,
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CPS Based Robotic Grinding and Polishing of 3D Surfaces

KEYWORDS : Grinding, Polishing, Robotics, Cyber-Physical Systems, Calibration

Grinding and polishing of work pieces are fundamental processes in manufacturing of metal products. For plane surface, CNC types of machines offer high precision and rigidity to achieve the surface finishing quality. However, for 3D surfaces such as water hardware, valves, and bone implant etc., the complexity of grinding motion requires more than 6 DOF manipulation. Articulated robots combined with grinding/polishing wheels become a necessary tool for the job. There are several challenges to put the tool into production. First, since the robot manipulator's rigidity is inherently lower than the CNC-type of structure, it is required to calibrate the robot to achieve a higher precision throughout the nonlinear motion. Secondly, the grinding/polishing paths, given a 3D surface, is non-trivial. For example, to have a machine mark free finish, certain type of motion should be emphasized due to the nature of grinding belts. This requirement is not only shape dependent, but also related to the grinder sharpness and material properties. There are other issues that need to be resolved. In this talk, a Cyber-Physical System (CPS) framework will be presented to accommodate the versatile engineering requirements. Real practice in manufacturing line is also shown to demonstrate the effectiveness of the approach.

ACKNOWLEDGEMENT
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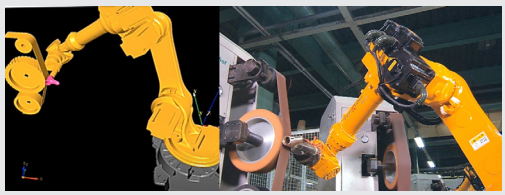


Fig. 1 CPS based robot grinding

Plenary Speaker

Sun-Kyu Lee

Professor
School of Mechanical Engineering
Gwangju Institute of Science & Technology (Korea)
E-mail: sklee@gist.ac.kr

Toward Unmanned Lapping for a Large Work Surface

KEYWORDS: Robotic machining, Surface finishing, Feed-forward torque control, Surface inspection, Tool mark

This paper presents a development of lapping machine including surface inspection technique toward the automated lapping of large size die mold. 5 axis manipulator is attached on the 3-axis gantry machine that can secure the positioning accuracy as well as the high rigidity in wide work surface. The manipulator consists of swing arm and parallelogram mechanism which adopts the angular contact ball bearing-based passive joints to improve the rigidity of end effector in both normal and tangential directions. To avoid the complexity of control, 3 axis gantry machine and 5 axis manipulator are controlled separately, the latter receives only the data of position and velocity data from the former. Grinding and lapping process generates highly dynamic forces on the end effector. For an effective countermeasure of resistance, both the rubbing motion with deadweight and the feedforward torque control are adopted. Furthermore, to inspect the finishing level of machined surface on machine state rapidly, the light scanning and image processing is employed. A statistical technique for the scanned surface is proposed to evaluate the distribution of tooling marks and scratches. In results, the machined surface roughness below 0.5mm was achieved.

Libo Zhou

Professor
Head of Department of Mechanical System in School of Engineering,
National Ibaraki University (Japan)
E-mail: libo.zhou.1618@vc.ibaraki.ac.jp

Challenge to Defect-free Machining (One Step beyond Precision)

KEYWORDS : Subsurface damage, Chemo-Mechanical-Grinding, Precision machining, Substrate

Most industrial materials are engineered into designated dimensions in the same way our ancestors made their axheads. Although modern machine tools are used in today's manufacturing, the fundamental principle of material removal is still based on break-off of the chemical bonding between atoms by high stress. As the result of violent destruction, the atom arrangement on the newly created surface and subsurface is different from its bulk material. This phenomenon is described as the sub-surface damage.
A new Chemo-Mechanical Grinding (CMG) technology will be presented for single-crystal substrates to achieve a high degree of crystalline perfection. CMG is a fixed abrasive process by integrating both chemical reaction and mechanical grinding into a one-stop process and shows advantages in finishing efficiency, geometric controllability, and waste disposal. The CMG process has been successfully applied to improve surface and subsurface quality for mono-crystal wafers such as silicon, silicon nitride, quartz and sapphire.

Agenda of presentation

1. One step beyond precision
   - Ultimate goal
   - Approaches
2. CMG process
   - CMG wheel development
   - Process development
3. CMG evaluation
   - Surface quality
   - Subsurface integrity
4. CMG applications
   - Planarization
   - Thinning
   - Other functional mono-crystals

Invited Talk

Akiko Hirai

Group Leader of Nanoscale Standards Group

Research Institute for Engineering Measurement National Metrology Institute of Japan (NMIJ)

National Institute of Advanced Industrial Science and Technology (AIST), (Japan)

Precise Measurement of The Thickness of Silicon Wafers and Bilateral Comparison

The Semiconductor Equipment and Materials International (SEMI) standards, which contributes to cost reduction and smooth production and supply in the semiconductor industry, has specifications for wafer dimensions. Thickness of wafer is one of the important specifications. The reliability of the measured thickness is becoming more important as novel manufacturing processes are developed. The spectral interference method is widely used for non-contact measurement of thickness. With this method, light is transmitted through the sample, so measurement results are affected by the refractive index. Because the refractive index varies from one lot to the next and is dependent on the additive concentration, reliability of results from this method cannot be guaranteed. We have developed a double-sided interferometer for non-contact thickness measurement, which is traceable to SI units. The interferometer uses only front surface reflected light to measure the surface shape on both sides of the sample with two optical interferometers and determine the thickness. Because the method does not use transmitted light, it is not affected by the refractive index of the sample. The thickness distribution of wafers of different thickness were measured. The evaluated expanded uncertainty (coverage factor k = 2) was 19 nm. These wafers were also measured by KRISS (Korea Research Institute of Standards and Science), which used different technique based on spectral interference method that they developed. The results were consistent within the uncertainties reported by both.

William Melek

Professor

University Research Chair and the Director the RoboHub

Department of Mechanical and Mechatronics Engineering University of Waterloo (Canada)

A Framework for Deployment of Collaborative Robotics in Human Centric Industrial Environments

This short talk discusses a generic framework for cobots to operate safely and reliably for human-machine interaction/collaboration in industrial settings. The proposed framework should facilitate situational awareness and realization of human intent. Changing task requirements according to the human intent requires determination of the mode of collaboration and application of advanced control to ensure safe and accurate completion of collaborative tasks. With the advantages of human-robot interactive behaviours handling operations in human-centric environments, the application areas are numerous with high significance to advanced manufacturing. The future of machines liesin enhancing the operational capabilities of intelligent systems so they can advance to functional reality in industrial environments.

David Rosen

Professor

The George W. Woodruff School of Mechanical Engineering

Georgia Institute of Technology (USA)

Multi-scale Topology Optimization for Additive Manufacturing

Advanced manufacturing methods like multi-material additive manufacturing are enabling realization of multiscale materials with intricate spatially varying microstructures and, thus, material properties. This blurs the boundary between material and structure, enabling lighter, stiffer, and stronger structures. Taking advantage of these tunable multiscale materials warrants development of novel design methods that effectively combine the concepts of material and structure. We propose such a design to manufacture workflow and demonstrate it with laminated continuous fiber-reinforced composites that possess variable stiffness enabled by spatially varying microstructure. This contrasts with traditional fiber-reinforced composites which typically have a fixed, homogenous microstructure and thus constant stiffness.

The proposed workflow includes three steps: 1) design automation –synthesis of an optimized multiscale design with microstructure homogenization enabling computational efficiency, 2) material compilation – conversion of the homogenized design as an idealized (mathematical) representation into a manufacturable structure, and 3) digital manufacturing – automated manufacture of the compiled structure. In the first step, we adapt a multiscale topology optimization approach with a parameterized microstructure model of fiber orientation, volume fraction, and properties. Homogenization is used to compute effective material stiffness tensor to use at the macroscale. Such a representation is sufficient for design, but not for manufacturing, since geometric detail is necessary. Hence, the second step converts the optimized, idealized material model into a voxel representation that can be manufactured. The third step is manufacture. For most of our work, we use a voxel-based multimaterial jetting additive manufacturing process. Additionally, we propose the usage of a novel automated fiber placement based workcell for the fabrication of continuous fiber reinforced composites. The workflow was demonstrated on a series of arbitrary 2D and 3D surfaces, which will be presented. We validated the complete workflow with experiments on two simple planar structures; the results agree reasonably well with simulations.

Yuki Shimizu

Associate Professor

Department of Finemechanics

Tohoku University (Japan)

Optical Angle Measurement with a Mode-locked Femtosecond Laser

Optical angle metrology is gaining its importance in today's precision manufacturing industry. The authors' group is working on the development of multi-axis optical sensor technologies for precision positioning, including highly-sensitive optical angle sensors based on the laser autocollimation. Meanwhile, in the last two decades, many efforts have been made to employ a mode-locked femtosecond laser as the light source for dimensional measurement. Due to the unique characteristics of the mode-locked femtosecond laser source having highly-stable, equally spaced optical modes in the optical frequency domain, it is expanding its applications in many scientific and industrial fields. The authors' group has also applied a mode-locked femtosecond laser source to the optical angle sensors. In this invited talk, an optical sensor technology referred to as the "angle scale comb" is introduced. By combining the dispersive characteristics of a two-axis diffraction grating with the equally-spaced optical modes in a mode-locked femtosecond laser source, highly-stable optical graduation for angle measurement can be realized. The principle and the instrumentation of the angle scale comb are introduced, as well as its practical application for form measurement of precision optical components.

Invited Talk

Hung-Yin Tsai

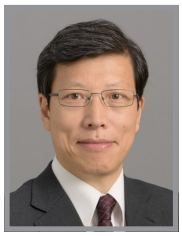
Distinguished Professor

Department of Power Mechanical Engineering

National Tsing Hua University (Taiwan)

Field Emission Characteristics of Carbon-based Structures Fabricated by CVD

The field emission theory was proposed by Fowler and Nordheim. It states that when the material is applied an electric field, the barrier at the surface of an electron conductor becomes rounded triangular, and individual electrons can escape from the material in various circumstances. In recent years, a lot of field emission studies used carbon nanotubes (CNTs), graphene, diamond and other carbon materials as cathodes. Although CNTs have good field emission effect, the lifespan of the CNTs and the screening effect limits its applications. Diamond nano-tip arrays, lateral diamond emitter device, carbon nano-flake balls, MCD/CNTs double-layered pyramid arrays and composite of carbon nano-flake ball/CNT hybrid material are proposed and their field emission characteristics are studied and compared. Different kinds of carbon-based structures are created. The field emission characteristics can also be measured. The screening effect is affected by the shape of emitter and even weakened. The field emission stability is very important to the applications. CNT with other carbon-based materials (diamond or carbon nano-flake ball) can increase the stability.



Jiwang Yan

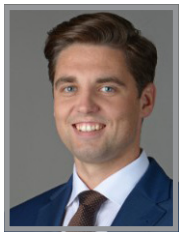
Professor

Department of Mechanical Engineering

Keio University (Japan)

Micro/Nanoscale Surface Structuring Technologies for Functionalization of Materials

Creating micro/nanoscale structures on material surfaces can dramatically alter the properties of the material itself and generate novel surface functions. To precisely and efficiently generate these surface structures, it is important to clearly understand the micro/nanoscale machinability of the materials in various machining methods. In this talk, recent research outputs by the speaker's group on micro/nanoscale surface structuring of metals/alloys, glass/polymers, ceramics, diamond and semiconductors by micromechanical machining, thermos/thermochemical imprinting, and laser processing will be introduced. The applications of the micro/nanoscale structured surfaces include light operation/control, fluid drag reduction, energy storage, super hydrophobicity/hydrophilicity, mould release ability improvement, and so on.



Daniel Zontar

Head of Department of Precision Technology and Automation

Fraunhofer Institute for Production Technology IPT (Germany)

Current Approaches for Autonomous Production

Along the industrial revolutions, the automation technology has improved the manufacturing industry enormously. However, the manufacturers still face challenges in the era of industry 4.0. Since the manufacturing processes are getting more individual and complex with higher requirements, the needs of intelligences in the production systems are getting higher. The current state of the industry shows, that those demanding processes are often depending strongly on individual persons and their knowhow. Moreover, for the 3Ds (Dirty, dangerous and demeaning) and even catastrophic situations, demands in autonomous production are increasing significantly. Thus, this speech provides the current approaches and developments regarding the autonomous production at Fraunhofer Institute for Production Technology IPT. Focusing on the vision of the "Internet of Production (IoP)", which is presented at the former PRESEM 2019, the speech is divided into three categories: 1. Infrastructure for high quality data acquisition, 2. Platform als Enabler for cross-domain data usage, 3. Agent for information extraction and decision-making. The overview of the retrofit solutions for intelligent machines and the data analysis methods are given based on concrete industrial applications and current projects at the institute.

Focus Session

[Focus Session 1] Holonic Manufacturing System towards Agility and Customization in the New Normal Era

Introduction

The recent outbreak of COVID-19 has brought the new normal era, and manufacturing research is also facing unprecedented challenges. In this context, interest in Holonic Manufacturing Systems (HMS) has been emerging as a key concept that enables agile and customized production in the new normal era. In this session, distinguished and talented speakers will give talks on their vision towards HMS based on the connection between the physical world and the cyber world. Iwould like to welcome all audience to participate in active and insightful discussions.

Moderator Prof. Sang Won Lee (Sungkyunkwan Univ., Korea)

PT Date 17 November (Tuesday), 2020 **Time** 10:00-11:50 (KST, UTC+09:00)

Streaming Details Google Meet : meet.google.com/ijp-zykn-ede

Session Chair: Prof. Sang Won Lee (Sungkyunkwan Univ., Korea)

PT time	Title	Speaker
10:00-10:20 (20')	Communication Framework for Smart Manufacturing with Remote Human Involvement	**Prof. Martin Jun** *Purdue University, USA*
10:20-10:40 (20')	A Systematic Review of Augmented Reality in Smart Manufacturing: Collaboration Interface between Human and Artificial Intelligence	**Prof. Chih-Hsing Chu** *National Tsing Hua University, Taiwan*
10:40-11:00 (20')	Industrial Digital Twin for Holonic Manufacturing Applications	**Prof. Sang Won Lee** *Sungkyunkwan University, Korea*
11:00-11:20 (20')	Digitalization and Digital Twin Applications in Production Logistics for Sustainable Production Development	**Dr. Yongkuk Jeong** *KTH Royal Institute of Technology, Sweden*
11:20-11:30 (10')	Break Time	
11:30-11:50 (20')	Q&A and Panel discussion	

[Focus Session 2] Advanced Manufacturing Processes for Hydrogen and Fuel Cell Technologies

Introduction

Hydrogen presents the opportunity for a safe, carbon-free energy path for the world, allowing flexible and decentralised power generation in multiple applications, with zero-emission at point of usage. Top developed and developing countries rely on hydrogen technologies and fuel cells in order to reach its ambition of a low carbon economy. However, as a new energy technology, significant market penetration of hydrogen technology and fuel cells has not yet been achieved. In this session, we discuss the key research findings on fundamentals of fuel cell and hydrogen technology to overcome barriers in commercialization.

Moderator Prof. Suk Won Cha (Seoul Nat'l Univ., Korea)

PT Date 17 November (Tuesday), 2020 **Time** 14:00-15:45 (KST, UTC+09:00)

Streaming Details Google Meet : meet.google.com/pvc-wrdb-bhs

Session Chair: Prof. Suk Won Cha (Seoul Nat'l Univ., Korea)

PT time	Title	Speaker
14:00-14:15 (15')	In-Situ Monitoring of Temperature Distribution in an Operating Solid Oxide Fuel Cell using Proprietary Sensory Techniques vs. Commercial Thermocouples	**Prof. Jung-Sik Kim** *Loughborough University, UK*
14:15-14:30 (15')	Functional Oxide Thin Film Fabrication by Flash Light Irradiation for Solid State Energy Devices	**Prof. Young-Beom Kim** *Hanyang University, Korea*
14:30-14:45 (15')	Moisture-dependent Electrochemical Performance Evaluation of Barium-doped SFMO Fuel Electrode for Solid Oxide Cells	**Prof. Pei-Chen Su** *Nanyang Technological University, Singapore*
14:45-15:00 (15')	Atomic-scale Oxide Overcoat for the Durability and Activity of Solid Oxide Fuel Cell Electrodes	**Prof. Min Hwan Lee** *University of California at Merced, USA*
15:00-15:15 (15')	Realization of Social Value through Fuel Cell	**Dr. Sehoon Hwang** *SK E&C Fuel Cell Business Group, Korea*
15:15-15:25 (10')	Break Time	
15:25-15:45 (20')	Q&A and Panel discussions (6:25~6:45 GMT, 14:25~15:45 SGT)	

[Focus Session 3] Bio Manufacturing Platform

Introduction Bio manufacturing strategies can be applied to engineer 3D tissue models by recapitulating the structures and functions of native tissue through the precise control and assembly of materials and cells. These engineered bio manufacturing platforms have been applied for drug discovery, the mechanistic study of diseases, and regenerative medicine. In this session, we would like to exchange multidisciplinary ideas and accomplishments as well as to foster closer networks and collaborative ties concerning the future of bio manufacturing research.

Moderator Prof. Dong Sung Kim (POSTECH, Korea) & Prof. Jinah Jang (POSTECH, Korea)
PT Date 17 November (Tuesday), 2020 **Time** 09:00-11:00 (KST, UTC+09:00)
Streaming Details Google Meet : meet.google.com/cub-zwdg-ted

Session Chairs: Prof. Dong Sung Kim (POSTECH, Korea)
Prof. Jinah Jang (POSTECH, Korea)

PT time	Title	Speaker
09:00-09:15 (15')	Human Blood-Brain Barrier on a Chip for Nanoparticle Transport Studies	**Dr. YongTae Kim** *Georgia Institute of Technology, USA*
09:15-09:30 (15')	A Physiodynamic Human Gut-on-a-Chip: From Organomimetics to Precision Medicine	**Prof. Hyun Jung Kim** *The University of Texas at Austin, USA*
09:30-09:45 (15')	Brain-on-a-Chip Technology for Assessing Neuropathology and Environmental Toxicity	**Dr. Hong Nam Kim** *Korea Institute of Science & Technology, Korea*
09:45-09:55 (10')	Break Time	
09:55-10:10 (15')	3D Hybrid Bioprinting Technology and its Applications	**Prof. Hyun-Wook Kang** *UNIST, Korea*
10:10-10:25 (15')	3D Bioprinted Human Tissues for the Next-Generation Therapeutics	**Prof. Jinah Jang** *POSTECH, Korea*
10:25-10:40 (15')	Next-generation Neural Interfaces: From Optoelectronic Fibers to Multimodal Nanomaterials	**Prof. Seongjun Park** *KAIST, Korea*
10:40-11:00 (20')	Q&A and Panel discussion	

[Focus Session 4] Hot Issues on Dimensional Metrology

Introduction This focus session deals with hot issues on dimensional metrology. In precision engineering, dimensional metrology is one of the most essential tools for manufacturing high-quality products and exploring the natural sciences. This focus session consists of 5 interesting invited talks covering a range of metrology techniques, from basic researches to practical applications.

Moderator Dr. Jonghan Jin (Korea Research Inst. of Standards & Sci. / Univ. of Sci. & Tech., Korea)
PT Date 16 November (Monday), 2020 **Time** 09:00-11:00 (KST, UTC+09:00)
Streaming Details Google Meet : meet.google.com/ayc-uwso-qch

Session Chair: Dr. Jonghan Jin (Korea Research Inst. of Standards & Sci. / Univ. of Sci. & Tech., Korea)

PT time	Title	Speaker
09:00-09:20 (20')	Precise Measurement of the Thickness of Silicon Wafers and Bilateral Comparison	**Dr. Akiko Hirai** *National Metrology Institute of Japan / AIST, Japan*
09:20-09:40 (20')	Dimensional Characterization of A Large Silicon Wafer through Simultaneous Measurement of Thickness, Refractive Index, and Intrinsic Deformations	**Dr. Jungjae Park** *Korea Research Institute of Standards & Science, Korea*
09:40-10:00 (20')	Optical Metrology Solution for Large Ground-based Observatories and Space Telescopes	**Dr. Heejoo Choi** *University of Arizona, USA*
10:00-10:20 (20')	Evaluation of Optical Properties and Thermal Performances on Moldable Oxide Glasses	**Dr. Jun Park** *Korea Photonics Technology Institute, Korea*
10:20-10:40 (20')	Soliton Microcomb Distance Measurement toward Nanometric Precision	**Dr. Yoonsoo Jang** *Korea Research Institute of Standards & Science, Korea*
10:40-11:00 (20')	Q&A and Panel discussion	

Focus Session

[Focus Session 5] Korea-Germany Intelligent Manufacturing Systems

Introduction The Korea-German Intelligent Manufacturing System Laboratory(IMSL) aims to establish an intelligent manufacturing system that can predict and diagnose manufacturing system information (such as facility soundness, processing quality, energy efficiency) Seoul National University and Fraunhofer IPT in Germany are working together to develop appropriate smart sensors and utilize it to acquire data on the status of materials and manufacturing equipment generated in each process of the manufacturing system, including manufacturing machinery and industrial robots.

Moderator Prof. Sung-Hoon Ahn (Seoul Nat'l Univ., Korea)

PT Date 17 November (Tuesday), 2020 **Time** 16:00-17:50 (KST, UTC+09:00)

Streaming Google Meet : meet.google.com/uca-mngz-mea

Details

Session Chairs : Prof. Sung-Hoon Ahn (Seoul Nat'l Univ., Korea)
Dr. Hyung-Jung Kim (Seoul Nat'l Univ., Korea)

PT time	Title	Speaker
16:00-16:20 (20')	Session Keynote Current Approaches for Autonomous Production	**Mr. Daniel Zontar** *Fraunhofer Institute for Production Technology IPT, Germany*
16:20-16:30 (10')	Geometric Calibration of Five-Axis Machine Tool Using Dynamic R-Test with Simple Data Acquisition Method	**Mr. Tae Hun Lee** *Fraunhofer Institute for Production Technology IPT, Germany*
16:30-16:40 (10')	Aerodynamically Focused Nanomaterials (AFN) Printer with high productivity and Fabrication of Highly Sensitive Sensor for Strain and Vibration Measurement	**Mr. Janghyeon Lyu** *Seoul National University, Korea*
16:40-16:50 (10')	Experimental investigation on laser polishing of STS 316L surface with various Design of Experiments	**Mr. Kui-Kam Kwon** *Seoul National University, Korea*
16:50-17:00 (10')	Break Time	
17:00-17:10 (10')	Tool Wear Prediction based on Vibration and Acoustic Emissions using Deep Learning Techniques	**Ms. Zhen Zhen** *Fraunhofer Institute for Production Technology IPT, Germany*
17:10-17:20 (10')	Domain Adversarial Neural Network based Unit Adaptation Method for Fault Detection of Overhead Hoist Transports	**Mr. Chaehyun Suh** *Seoul National University, Korea*
17:20-17:30 (10')	Diagnosis for Rolling Element Bearings in Variable Speed Conditions by a Mel-frequency Cepstral Coefficient Method	**Mr. Jongmin Park** *Seoul National University, Korea*
17:30-17:50 (20')	Q&A and Panel Discussion	

Development of Advanced Designers for Highlyreliable Mechanical Components in Kangwon National University

Representative	Byeong Hee Kim (Prof., Kangwon Nat'l Univ.)		
Address	[24341] Kangwon National University, Chuncheon, Korea		
Contact	Yoo Su Kang	**T.** +82-033-244-8910	**F.** +82-033-244-8910
	MNBS lab., Ph.D student	**E.** kus2172@kangwon.ac.kr	

Preview

Industry-academia projects to cultivate highly reliable mechanical parts design experts.

Development of advanced designers for highly-reliable mechanical components specialized training courses to strengthen the expertise of master's and doctor's personnel, such as promoting industry-academic projects based on industrial demand.

Development of Advanced Designers for Highlyreliable Mechanical Components in Kangwon National University

KNU KANGWON NATIONAL UNIVERSITY

Contact

Development of Advanced Designers for Highlyreliable Mechanical Components for Strengthening the competitiveness of the machinery industry

Kangwon National University MNBS LAB

033-244-8910, kus2172@kangwon.ac.kr

KOMMA

02-3459-0031~3, pi03@komma.org

Overview

- **Project name : The Competency Development Program for Industry Specialist**
- **Project title: Development of Advanced Designers for Highlyreliable Mechanical Components**
- **Project period : 2018.03.01. ~ 2023.02.28.**
- **Objective : Training R&D experts in the field of high-reliability precision machine parts and smart machine parts for the advancement of major industries based on industry-academia projects**

Student recruitment

- **Target for support :** Graduates of a university student who wishes to get a job in the machinery parts related industry
- **Qualification for application :** Graduate from a four-year university in mechanical engineering or similar major, and hold a bachelor's degree
- **Support contents :**

Government scholarship and project research fund support employment linkage with companies, such as conducting industry-academic cooperation research projects. Providing professional training opportunities related to machine parts based on industrial demand.

- **Apply for track :**

Kangwon National University's Graduate School Admission Selection Reference

Kangwon National University Graduate School website

(graduate.kangwon.ac.kr)

Confirmation of general graduate school application announcements

General institution 산업통상자원부 Institution beyond leading technology KIAT 한국산업기술진흥원 Organizing Komma 한국공작기계산업협회 Korea Machine Tool Manufacturers' Association

University KNU 강원대학교 KANGWON NATIONAL UNIVERSITY 서울과학기술대학교 SEOULTECH 조선대학교 CHOSUN UNIVERSITY 영남대학교 Yeungnam University 동아대학교 DONG-A UNIVERSITY

Intelligent Manufacturing System Laboratory

Representative	Sung-Hoon Ahn (Prof., SNU)	
Address	[08826] B313, 323, 1, Gwanak-ro, Gwanak-gu, Seoul, Korea	
Contact	Su-Young Park	**T.** +82-2-886-9074
	IMS lab., Ph.D student	**E.** swimpark@snu.ac.kr

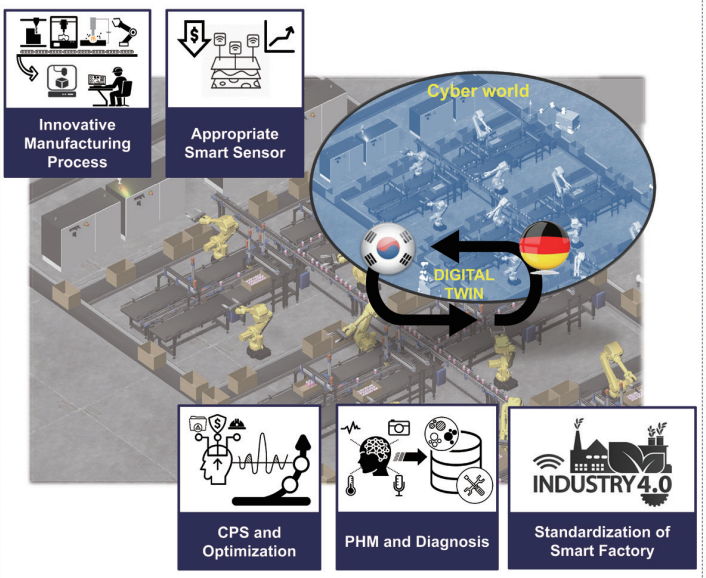
Preview

The Korea-German Intelligent Manufacturing System Laboratory(IMSL) aims to establish an intelligent manufacturing system that can predict and diagnose manufacturing system information (such as facility soundness, processing quality, energy efficiency).
Seoul National University and Fraunhofer IPT/Aachen University in Germany are working together to develop appropriate smart sensor and utilize it to acquire data on the status of materials and manufacturing equipment generated in each process of the manufacturing system, including manufacturing machinery and industrial robots.

Korea-Germany Intelligent Manufacturing Systems Laboratory

Visions

"Korea-Germany Collaborative Research for Industry 4.0 and Smart Manufacturing"



Members

Sung-Hoon Ahn
Seoul National University
Professor, PI of project
Sensors and manufacturing process

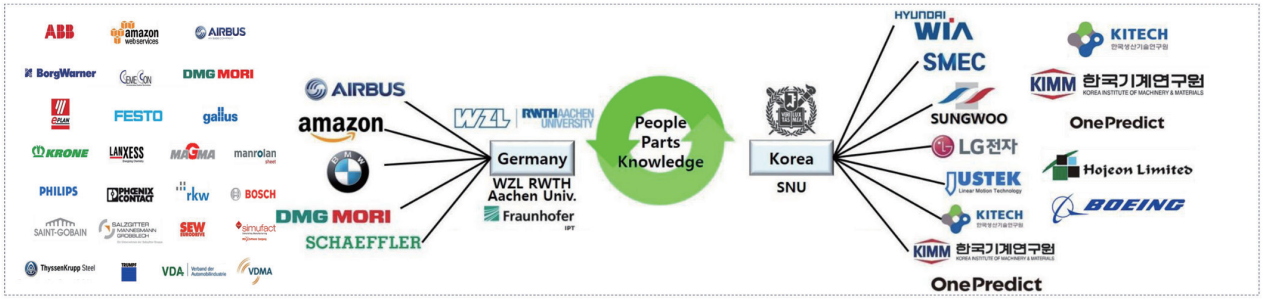
Byeng-Dong Youn
Seoul National University
Professor
Prognostics and health management

In-Soon Yang
Seoul National University
Professor
Cyber physical system

Christian Brecher
Director of Fraunhofer IPT
RWTH Aachen University
Professor
Machine automation and machine data analysis

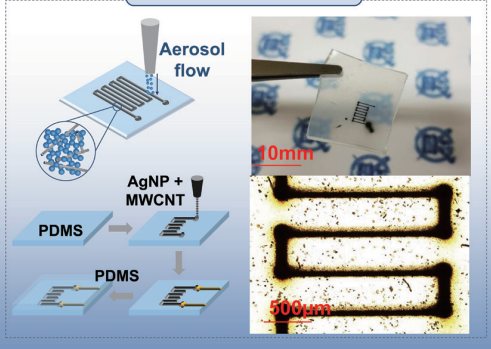
Manufacturing process
ICT
Industry standard

Network

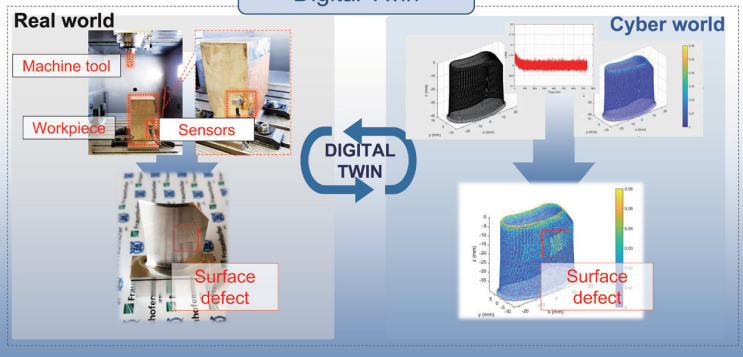


Main research

Smart sensor



Digital Twin



IMSL KOREAN-GERMANY INTELLIGENT MANUFACTURING SYSTEMS LABORATORY 한국-독일 지능형 제조시스템 연구실

Contact: Su-Young Park [swimpark@snu.ac.kr]
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Seoul Gwanak-gu Gwanak-ro 1 Seoul National University, Institute of Advanced Machines and Design

PRESM 2020

Presentation List

General Session

Focus Session

Organized Session

1. Manufacturing Processes

P-001 **A012** **Monitoring of Inkjet Droplets with Deep Learning Methods**
Poster
Jongyoul Lee (Korea Electronics Technology Institute)
Kyoung Il Lee (Korea Electronics Technology Institute)
Jin Koog Shin (Korea Electronics Technology Institute)
Seongho Mo (Korea Electronics Technology Institute)

P-002 **A016** **Influences of Energy Events on Dimensional Accuracy When Joining of Stainless-Steel Powders with Heterogeneous Metal Substrates**
Oral
Chunliang Kuo (National Taiwan University of Science & Technology)
Jhihjie Liu (National Taiwan University of Science & Technology)
Yuren Chen (National Taiwan University of Science & Technology)

P-003 **A025** **On-Machine Fabrication of Boron-Doped Polycrystalline Diamond Cutting Tools by Combining Wire-EDM and Abrasive Grinding**
Oral
Mu-Tian Yan (National Chin-Yi University of Technology)
Wei-Chun Lin (National Chin-Yi University of Technology)
Jui-Yuan Chuang (National Chin-Yi University of Technology)

P-004 **A043** **A Novel ECM System for Drilling Curved Holes**
Poster
Myeongjin Lee (Chonbuk National University)
Shihyoung Ryu (Chonbuk National University)
Byeongjik Jo (Chonbuk National University)
Chanju Jeon (Chonbuk National University)
Jaejin Og (Chonbuk National University)
Yifan Tang (Chonbuk National University)

P-005 **A049** **Electrically Enhanced Diffusion Joining of Dissimilar Steels: SUS316L and SUS410**
Oral
Shengwei Zhang (University of Ulsan)
Sung-Tae Hong (University of Ulsan)
Kun Gao (University of Ulsan)
Sam Yaw Anaman (Hanbat National University)
Hoon-Hwe Cho (Hanbat National University)

P-006 **A050** **Electrically Assisted Pressure Joining of Dissimilar Steels: Effect of Joining Temperature and Electric Current Density**

Oral

Thuong Do Thanh (University of Ulsan)
Sung-Tae Hong (University of Ulsan)
Anh Bui Thi Tu (University of Ulsan)
Jong-Seok Lee (Iljin Global Co., Ltd.)
Ho-Wook Choi (Seoul National University)
Heung-Nam Han (Seoul National University)

P-007 **A051** **Evaluation of Electroplasticity of Aluminum 1100 and Magnesium AZ31 by Electric Current with Subsecond Duration**

Poster

Tu Anh Bui Thi (University of Ulsan)
Sung-Tae Hong (University of Ulsan)
Thuong Do Thanh (University of Ulsan)
Ho-Wook Choi (Seoul National University)
Heung-Nam Han (Seoul National University)

P-008 **A056** **Development of a Discrete-event Simulator for Garment Manufacturing Processes**

Poster

Young-Uk Song (Seoul National University)
Eun-Suk Suh (Seoul National University)
Woo-Kyun Jung (Seoul National University)
Jae-Won Lee (Hojeon Ltd.)

P-009 **A057** **Evaluation of Microstructural and Mechanical Properties of Friction Stir Spot Welded Dissimilar Ultra-high Strength Steels**

Oral

Mounarik Mondal (University of Ulsan)
Sung-Tae Hong (University of Ulsan)
Hrishikesh Das (Pacific Northwest National Laboratory)
Soumyabrata Basak (University of Ulsan)
Ji Woo Lee (Hanbat National University)
Hoon-Hwe Cho (Hanbat National University)

P-010 **A063** **Surface Modification of 316L Austenitic Stainless Steel by Electron Beam Melting**

Oral

Soumyabrata Basak (University of Ulsan)
Sung-Tae Hong (University of Ulsan)
Sumit K. Sharma (Indian Institute of Technology Kharagpur)
Mounarik Mondal (University of Ulsan)
Kisor K. Sahu (Indian Institute of Technology Bhubaneswar)
Srikant Gollapudi (Indian Institute of Technology Bhubaneswar)
Jyotsna Datta Majumdar (Indian Institute of Technology Kharagpur)

P-011 **A064** **Electroplastic Phenomenon during Uniaxial Tension of a Ferritic Stainless Steel Alloy**

Poster

Lihong Cai (University of Ulsan)
Sung-Tae Hong (University of Ulsan)
Kun Gao (University of Ulsan)
Shengwei Zhang (University of Ulsan)

P-012 **A069** **Micro Fabrication of Tapered Hole Pattern of Graphite Carbon**

Poster

Ui Seok Lee (Soongsil University)
Bo Hyun Kim (Soongsil University)
Yung Na (Soongsil University)

P-013 **A070** **Ultrashort Laser Ablation of Metal Thin Films without Substrate Damage**

Oral

Byunggi Kim (KAIST)
Seung-Woo Kim (KAIST)
Han Ku Nam (KAIST)
Shotaro Watanabe (Tokyo Institute of Technology)
Sanguk Park (KAIST)
Yunseok Kim (LASERNICS Co.)
Young-Jin Kim (KAIST)
Kazuyoshi Fushinobu (Tokyo Institute of Technology)

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Jae-Hyun Kim (KAIST)
Byung-Soo Kim (KAIST)
Dong-Chel Shin (KAIST)
Seung-Woo Kim (KAIST)
Seung-chul Kim (Pusan National University)

P-110 **A074** **Microscale Surface Patterning of Zirconia by Femtosecond Pulsed Laser Irradiation**

Poster

Yuka Yamamuro (Keio University)
Jiwang Yan (Keio University)
Tomotaka Shimoyama (TOSOH Co.)

P-111 **A085** **Color Tunable Gas Sensor Using Fabry-Perot Cavity by Controlling the Top Metal Thickness in E-beam Evaporation Process**

Poster

Young-Gyun Kim (Seoul National University)
Sung-Hoon Ahn (Seoul National University)
Younggyun Cho (Seoul National University)

P-112 **A115** **Evaluation of Degree of Alignment of Polymer Microfibers Electrospun on a Rotating Water Collector**

Oral

Shichen Li (Chonnam National University)
Bong-Kee Lee (Chonnam National University)

P-113 **A128** **Self-attachable Flexible Transparent Electrodes with Robust Mechanical Adhesion and low Contact Resistance**

Poster

Minho Seong (UNIST)
Hoon-Eui Jeong (UNIST)
Insol Hwang (UNIST)
Joosung Lee (UNIST)
Kahyun Sun (UNIST)
Sang-Hyeon Lee (UNIST)
Minsu Kang (UNIST)
Hyejin Jang (UNIST)
Geonjun Choi (UNIST)
Jaeil Kim (UNIST)
Seongjin Park (UNIST)

P-114 **A130** **Investigation of Tribological Properties with Respect to Nano-patterns on Surface**

Poster

Youn-Hoo Hwang (Yonsei University)
Dae-Eun Kim (Yonsei University)

P-115 **A135** **Antifouling Nanostructure with Phosphorylcholine Grafted to Cellulose Acetate for Eco-friendly and Sustainable Strategy**

Poster

Seongjin Park (UNIST)
Hoon-Eui Jeong (UNIST)
Kahyun Sun (UNIST)
Geonjun Choi (UNIST)
Minsu Kang (UNIST)
Hyejin Jang (UNIST)
Insol Hwang (UNIST)
Sang-Hyeon Lee (UNIST)
Minho Seong (UNIST)
Jaeil Kim (UNIST)

P-116 **A142** **Enhanced Infraspinatus Muscle Activation via FES during Shoulder External Rotation**

Poster

Jeongho Sohn (Korea University)
Seung-Jong Kim (Korea University)
Jaewook Kim (Korea University)

P-117 **A143** **Surface-enhanced Raman Scattering on the Warped Nanopatterns Fabricated by Multiple Exposure Interference Lithography**
Poster
Seong Jae Kim (KAIST)
Sanha Kim (KAIST)
June Sik Hwang (Chungnam National University)
Jong-Eun Park (KAIST)
Minyang Yang (The State University of New York Korea)

P-118 **A157** **Serial Fluidic Control using Slope Valve in Customized Microfluidic Lab-on-a-Disk Platform**
Oral
Dong Hee Kang (Chonnam National University)
Hyun Wook Kang (Chonnam National University)
Na Kyong Kim (Chonnam National University)

P-119 **A165** **Simultaneous Measurement of Optical Flats Using Wavelength-tuned Interferometer and Fringe Analysis**
Poster
Jiwon Seo (Pusan National University)
Yangjin Kim (Pusan National University)
Wonjun Bae (Pusan National University)
Young Hoon Moon (Pusan National University)

P-120 **A168** **Study on SERS Spectra from Circulating Tumor Cells based on Principal Component Analysis**
Poster
Jong-Eun Park (KAIST)
Minyang Yang (KAIST)
Hyeono Nam (KAIST)
Jessie Jeon (KAIST)

P-121 **A198** **All Printed SWCNT-TFT Using Fully Revers-Offset Printer on Flexible Substrate**
Poster
Minhun Jung (Hanbat National University)
Dong Soo Kim (Hanbat National University)

P-122 **A245** **Salvinia-Inspired Hydrodynamic Drag Reducing Surface**
Oral
Minsu Kim (Kyungpook National University)
Moonkyu Kwak (Kyungpook National University)
Seunghoon Yoo (Kyungpook National University)

P-123 **A246** **Enhanced Photo Luminescence of Zinc Oxide Nanowire with Intense Pulsed Light Treatment**

Poster

Youngwook Noh (Konkuk University)
Dongjin Lee (Konkuk University)

P-124 **A247** **Fabrication Method of High Performance Fluoroelastomeric Pad based on the Micro Structure**

Oral

Sung Ho Lee (Kyungpook National University)
Moon Kyu Kwak (Kyungpook National University)
Han Jun Park (Kyungpook National University)
Hyun Woo Song (Kyungpook National University)

P-125 **A253** **Fabrication of Quasi-seamless Roll Molds via Visually Tolerable Tiling**

Oral

Jihoon Lee (Kyungpook National University)
Moon Kyu Kwak (Kyungpook National University)

P-126 **A293** **Measurement of Refractive Index of Liquids Using the Diffraction Gratings Fabricated by Flat-top Laser Interference Lithography**

Poster

Sungjae Lee (Pusan National University)
Bosung Shin (Pusan National University)
Youngwon Ma (Pusan National University)
Junhan Park (Pusan National University)

6. New and Renewable Energy

P-127 **A018** **High Efficiency PbS Quantum Dot Solar Cell with Reduced Hysteresis Using Transfer Printing**
Poster
Hyung Cheoul Shim (Korea Institute of Machinery & Materials)
Jung Hoon Song (Samsung Display Co.)
Sohee Jeong (Sungkyunkwan University)
Seungmin Hyun (Korea Institute of Machinery & Materials)

P-128 **A118** **Power Responses of MW Wind Turbine for Time Constant of LPF**
Poster
Chae Wook Lim (Hanbat National University)

P-129 **A137** **Dendritic Nafion/Ceria Interfacial Structure for Durable and High Performance Polymer Electrolyte Membrane Fuel Cell (PEMFC)**
Poster
Segeun Jang (Hanbat National University)
Jiwoo Choi (Seoul National University)
Je Hyeon Yeon (Seoul National University)
Mansoo Choi (Seoul National University)

P-130 **A146** **On the Determination of Cell Dimension of Low-Temperature Solid Oxide Fuel Cells with Oxide-Capped Thin-Film Electrode**
Poster
Sanghoon Ji (Korea Institute of Civil Engineering & Building Technology)
Won Jae Kim (Korea Institute of Civil Engineering & Building Technology)

P-131 **A177** **Performance Enhancement of Low Temperature Solid Oxide Fuel Cells with Platinum-Gadolinium Doped Ceria Cathodic Cermet Interlayer**
Poster
Wonyeop Jeong (Seoul National University)
Suk Won Cha (Seoul National University)
Wonjong Yu (Seoul National University)
Sangbong Ryu (Seoul National University)

P-132 **A180** **Effect of Electrodes Placement at Different Positions in Microchannel on Performance of Microfluidic Enzymatic Biofuel Cell**
Poster
Haroon Khan (Kyungpook National University)
Gyu Man Kim (Kyungpook National University)
Asad Ullah (Kyungpook National University)
Hye Jin Choi (Kyungpook National University)

P-133 **A185** **Development of Thermal Nanoimprinting-based Process for the Fabrication of Practical Triboelectric Nanogenerator**

Oral

Donghyeon Yoo (POSTECH)
Dong Sung Kim (POSTECH)
Dongwhi Choi (Kyung Hee University)
Jeong-Won Lee (POSTECH)
Kwangseok Lee (POSTECH)
Eun Yeong Go (POSTECH)
Woonbong Hwang (POSTECH)

7. Sustainable Technology

P-134 **A030** **Long Short-Term Memory Approach to Estimate Battery Remaining Useful Life Using Partial Discharge Data**

Oral

Benvolence Chinomona (National Cheng Kung University)
Chunhui Chung (National Cheng Kung University)
Wei-Chih Su (NARLabs)
Lien-Kai Chang (National Cheng Kung University)
Mi-Ching Tsai (National Cheng Kung University)

P-135 **A079** **433 MHz Radio Frequency and 2G Based Smart Irrigation Monitoring System for Developing Countries**

Poster

Frank Andrew Manongi (Seoul National University)
Sung-Hoon Ahn (Seoul National University)
Kunik Lee (Seoul National University)
Xinlin Wang (Seoul National University)

P-136 **A139** **Computational Wear Depth and Area Prediction of Knee Implant with Flatback Deformity during Gait for TKR Design**

Poster

Hye Kyeong Lee (Dongguk University)
Hong Seok Lim (Dongguk University)
Sung Min Kim (Dongguk University)

P-137 **A154** **Development of High Wet Strength Microfibrillated Cellulose (MFC) Paper for Ultrafiltration**

Oral

Van Son Nguyen (Chonnam National University)
Bong-Kee Lee (Chonnam National University)

P-138 **A183** **Intestinal Obstruction Detection using Simple Neural Networks Classification of Bowel Sounds**

Poster

Juyong Sim (Korea University College of Medicine)
Seung-Jong Kim (Korea University College of Medicine)
Jaewook Kim (Korea University College of Medicine)
Juhee Jang (KU-KIST Graduate School of Converging Science & Technology)
Eun Sun Kim (Korea University College of Medicine)

P-139 **A214** **Characterization of Power Demand and Energy Consumption for Fused Filament Fabrication Using CFR-PEEK**

Poster

Kyudong Kim (Incheon National University)
Kijung Park (Incheon National University)
Heena No (Incheon National University)
Seungwon Jin (Incheon National University)
Hyun Woo Jeon (Louisiana State University)
Sunghoon Lim (UNIST)

P-140 **A232** **Life Prediction of a Thermoelectric Device Under Thermal Cycling**

Poster

Seungik Shin (University of Science & Technology)
Seungwoo Han (Korea Institute of Machinery & Materials)
Da-hye Kim (University of Science & Technology)

P-141 **A241** **A Development of Structure Analysis Model of Spinal Internal Fixation System for Utilizing Mechanical Performance Evaluation**

Poster

Hye Kyeong Lee (Dongguk University)
Hong Seok Lim (Dongguk University)
Chae Hyeon Kim (Dongguk University)

Focus Session

1. Holonic Manufacturing System towards Agility and Customization in the New Normal Era

Real Time Streaming
17 Nov. (Tue), 2020
10:00-11:50 (KST, UTC+09:00)

Session Chair : Prof. Sang Won Lee (Sungkyunkwan Univ., Korea)

FS1-001 A310 **A Systematic Review of Augmented Reality in Smart Manufacturing: Collaboration Interface Between Human and Artificial Intelligence**
Oral
Chih-Hsing Chu (National Tsing Hua University)
Dawi Karomati Baroroh (National Tsing Hua University)

FS1-002 A331 **Communication Framework for Smart Manufacturing with Remote Human Involvement**
Oral
Martin Jun (Purdue University)
Huitaek Yun (Purdue University)
Eunseob Kim (Purdue University)

FS1-003 A335 **Industrial Digital Twin for Holonic Manufacturing Applications**
Oral
Sang Won Lee (Sungkyunkwan University)

FS1-004 A336 **Digitalization and Digital Twin Applications in Production Logistics for Sustainable Production Development**
Oral
Yongkuk Jeong (KTH Royal Institute of Technology)

2. Advanced Manufacturing Processes for Hydrogen and Fuel Cell Technologies

Real Time Streaming
17 Nov. (Tue), 2020
14:00-15:45 (KST, UTC+09:00)

Session Chair: Prof. Suk Won Cha (Seoul Nat'l Univ., Korea)

FS2-001 A337 **In-Situ Monitoring of Temperature Distribution in an Operating Solid Oxide Fuel Cell using Proprietary Sensory Techniques vs. Commercial Thermocouples**
Oral
Jung-Sik Kim (Loughborough University)
Erdogan Guk (Loughborough University)
Manoj Ranaraweera (University of Moratuwa)
Vijay Venkatesan (Loughborough University)
Yunus Sayan (Bitlis Eren University)
Lisa Jackson (Loughborough University)

FS2-002 A341 **Functional Oxide Thin Film Fabrication by Flash Light Irradiation for Solid State Energy Devices**
Oral
Young-Beom Kim (Hanyang University)

FS2-003 A342 **Moisture-dependent Electrochemical Performance Evaluation of Barium-doped SFMO Fuel Electrode for Solid Oxide Cells**
Oral
Pei-Chen Su (Nanyang Technological University)
Kittiwat Kamlungsua (Nanyang Technological University)

FS2-004 A296 **Atomic-scale Oxide Overcoat for the Durability and Activity of Solid Oxide Fuel Cell Electrodes**
Oral
Min Hwan Lee (University of California, Merced)
Haoyu Li (University of California, Merced)
Hung-Sen Kang (University of California, Merced)

FS2-005 A340 **Realization of Social Value through Fuel Cell**
Oral
Sehoon Hwang (SK E&C Fuel Cell Business Group)

3. Bio Manufacturing Platform

Real Time Streaming
17 Nov. (Tue), 2020
09:00-10:45 (KST, UTC+09:00)

Session Chairs: Prof. Dong Sung Kim (POSTECH, Korea)
Prof. Jinah Jang (POSTECH, Korea)

FS3-001 A263 **Human Blood-Brain Barrier on a Chip for Nanoparticle Transport Studies**
Oral
YongTae Kim (Georgia Institute of Technology)
Song Ih Ahn (Georgia Institute of Technology)

FS3-002 A261 **A Physiodynamic Human Gut-on-a-Chip: From Organomimetics to Precision Medicine**
Oral
Hyun Jung Kim (The University of Texas at Austin)
Woojung Shin (The University of Texas at Austin)
Yong Cheol Shin (The University of Texas at Austin)
Yoko Ambrosini (The University of Texas at Austin)
Domin Koh (The University of Texas at Austin)
Soyoun Min (The University of Texas at Austin)

FS3-003 A262 **Brain-on-a-Chip Technology for Assessing Neuropathology and Environmental Toxicity**
Oral
Hong Nam Kim (Korea Institute of Science & Technology)

FS3-004 A295 **3D Hybrid Bioprinting Technology and its Applications**
Oral
Hyun-Wook Kang (Ulsan National Institute of Science & Technology)

FS3-005 A305 **3D Bioprinted Human Tissues for the Next-Generation Therapeutics**
Oral
Jinah Jang (POSTECH)

FS3-006 A260 **Next-Generation Neural Interfaces: From Optoelectronic Fibers to Multimodal Nanomaterials**
Oral
Seongjun Park (KAIST)

4. Hot Issues on Dimensional Metrology

Real Time Streaming
16 Nov. (Mon), 2020
09:00-11:00 (KST, UTC+09:00)

Session Chair: Dr. Jonghan Jin (Korea Research Inst. of Standards & Sci. / Univ. of Sci. & Tech., Korea)

FS4-001 A292 **Dimensional Characterization of a Large Silicon Wafer Through Simultaneous Measurement of Thickness, Refractive Index, and Intrinsic Deformations**
Oral
Jungjae Park (Korea Research Institute of Standards & Science)
Jonghan Jin (Korea Research Institute of Standards & Science)
Jaeseok Bae (Korea University of Science & Technology)
Yoon-Soo Jang (Korea Research Institute of Standards & Science)

FS4-002 A240 **Optical Metrology Solution for Large Ground-based Observatories and Space Telescopes**
Oral
Heejoo Choi (The University of Arizona)
Henry Quach (The University of Arizona)
Hyukmo Kang (The University of Arizona)
Stephanie Rodriguez (The University of Arizona)
Marcos A. Esparza (The University of Arizona)
Tom Milster (The University of Arizona)
Daniel Apai (The University of Arizona)
Christopher Walker (The University of Arizona)
Christian Veillet (The University of Arizona)
Dae Wook Kim (The University of Arizona)

FS4-003 A179 **Evaluation of Optical Properties and Thermal Performances on Moldable Oxide Glasses**
Oral
June Park (Korea Photonics Technology Institute)
Minwoo Seo (Korea Photonics Technology Institute)
Eui-Sam Lee (Korea Photonics Technology Institute)
Young Bok Kim (Korea Photonics Technology Institute)
Seung Heon Han (Korea Photonics Technology Institute)

FS4-004 A117 **Soliton Microcomb Distance Measurement Toward Nanometric Precision**
Oral
Yoon-Soo Jang (Korea Research Institute of Standards & Science)
Hao Liu (UCLA)
Chee Wei Wong (UCLA)

5. Korea-Germany Intelligent Manufacturing Systems

Real Time Streaming
17 Nov. (Tue), 2020
16:00-17:50 (KST, UTC+09:00)

Session Chairs : Prof. Sung-Hoon Ahn (Seoul Nat'l Univ., Korea)
Dr. Hyung-Jung Kim (Seoul Nat'l Univ., Korea)

FS5-001 A235 **Geometric Calibration of Five-Axis Machine Tool using Dynamic R-Test with Simple Data Acquisition Method**

Oral

Tae Hun Lee (Fraunhofer Institute for Production Technology IPT)
Seungil Oh (Fraunhofer Institute for Production Technology IPT)
Jungmin Lim (Fraunhofer Institute for Production Technology IPT)
Daniel Zontar (Fraunhofer Institute for Production Technology IPT)
Christian Brecher (Fraunhofer Institute for Production Technology IPT)

FS5-002 A339 **Aerodynamically Focused Nanomaterials (AFN) Printer with High Productivity and Fabrication of Highly Sensitive Sensor for Strain and Vibration Measurement**

Oral

Jang-Hyeon Lyu (Seoul National University)
Sung-Hoon Ahn (Seoul National University)
Soo-Hong Min (Seoul National University)
Tae-Hun Lee (Fraunhofer Institute for Production Technology IPT)
Christian Brecher (Fraunhofer Institute for Production Technology IPT)

FS5-003 A160 **Experimental Investigation on Laser Polishing of STS 316L Surface with Various Design of Experiments**

Oral

Kui-Kam Kwon (Seoul National University)
Sung-Hoon Ahn (Seoul National University)
Subin Huh (Seoul National University)
Insoon Yang (Seoul National University)

FS5-004 A338 **Tool Wear Prediction based on Vibration and Acoustic Emissions using Deep Learning Techniques**

Oral

Zhen Zhen (Fraunhofer Institute for Production Technology IPT)
Christian Brecher (RWTH Aachen University)
Daniel Zontar (Fraunhofer Institute for Production Technology IPT)
Arno Schmetz (Fraunhofer Institute for Production Technology IPT)

FS5-005 A164 **Domain Adversarial Neural Network based Unit Adaptation Method for Fault Detection of Overhead Hoist Transports**

Oral

Chaehyun Suh (Seoul National University)
Byeng D. Youn (Seoul National University)
Chan Hee Park (Seoul National University)
Hyeongmin Kim (Seoul National University)

FS5-006 A127 **Diagnosis for Rolling Element Bearings in Variable Speed Conditions by a Mel-frequency Cepstral Coefficient Method**

Oral

Jongmin Park (Seoul National University)
Byeng D. Youn (Seoul National University)
Keunsu Kim (Seoul National University)
Su J. Kim (Seoul National University)
Hwayong Jung (Seoul National University)
Jonghyun Choi (Seoul National University)

Organized Session - 1. System Engineering using Computational Mechanics

OS-001 A092 **Flash-Activated Plasmonic Welding of Silver Nanowire Network for Highly Conductive and Robust Transparent Flexible Electrode**
Oral
Jung Hwan Park (Kumoh National Institute of Technology)
Hye Jin Lee (Kumoh National Institute of Technology)

OS-002 A144 **Dynamic Reanalysis Method using Model Order Reduction and Woodbury Formula**
Oral
Seongmin Chang (Kumoh National Institute of Technology)
Maenghyo Cho (Seoul National University)

OS-003 A155 **Strong Ionic Artificial Muscles based on Carbon Cloth Electrodes with 3D Metallic Hetero-Nanostructures**
Oral
Jaehwan Kim (Kumoh National Institute of Technology)

OS-004 A156 **Remote Manipulation of Robot Arm Using EMG-Based Hand Motion Recognition**
Oral
Do Gyeong Yuk (Kumoh National Institute of Technology)
Jung Woo Sohn (Kumoh National Institute of Technology)

OS-005 A158 **Finger Motion Recognition of Both Hands Using Electromyogram**
Oral
Daun Lee (Kumoh National Institute of Technology)
Jung Woo Sohn (Kumoh National Institute of Technology)

OS-006 A175 **Autonomous Flight of Unmanned Aerial Vehicle based on Precision Relative Position Tracking Using Dual-GPS**
Oral
Junyoung Kwak (Kumoh National Institute of Technology)
Baeksuk Chu (Kumoh National Institute of Technology)
Junsoo Baek (Kumoh National Institute of Technology)

OS-007 A181 **Experimental Verification of End-Point Tracking Algorithm of Water Spraying Robot for Reduction of Fine Dust in Building Dismantling Sites**
Oral
Sangwoong Lee (Kumoh National Institute of Technology)
Baeksuk Chu (Kumoh National Institute of Technology)
Hyunbin Park (Kumoh National Institute of Technology)

OS-008 **A207** **Study on the Stiffness of Crossed Roller Bearings Considering the External Load and Axial Preload Effects**

Poster

Van-Canh Tong (Korea Institute of Machinery & Materials)
Seong-Wook Hong (Kumoh National Institute of Technology)

OS-009 **A234** **Improved Thermo-Mechanical-Viscoelastic Analysis of GY70/339 Composite Materials using an Enhanced LCW Theory in Laplace Domain**

Oral

Jang-Woo Han (Kumoh National Institute of Technology)
Maenghyo Cho (Seoul National University)
Jun-Sik Kim (Kumoh National Institute of Technology)

OS-010 **A268** **Performance Evaluation of Hybrid Type Magneto-Rheological Damper Using Vehicle Model**

Poster

Olivier Munyaneza (Kumoh National Institute of Technology)
Jung Woo Sohn (Kumoh National Institute of Technology)

Organized Session - 2. Precision Machinery and related Materials

OS-011 **A055** **A Study on Numerical Simulation and Experiments of CVT Gearbox for Vehicles**

Poster

Zhen Qin (Gyeongsang National University)
Sungki Lyu (Gyeongsang National University)
Yuting Wu (Gyeongsang National University)
Amre Eizad (Gyeongsang National University)
Dongseon Kim (Gyeongsang National University)

OS-012 **A114** **Study on Chemical Solution in Fluidized Bed CMP (FB-CMP) for SS304**

Poster

Seonghyun Park (Tongmyong University)
Hyunseop Lee (Tongmyong University)
Jungyu Son (Tongmyong University)

OS-013 **A333** **Synthesis of Core-shell VE-PVDF Nanofibers through Co-axial Electrospinning Method for Self-Healing Applications**

Poster

Naga Kumar Chitkur (Changwon National University)
Jung-Il Song (Changwon National University)
Venkata Chalapathi Kadapa (Changwon National University)
Prabhakar Muchukota Narendra (Changwon National University)

Organized Session - 3. Industry and Academia R&D Collaborations

OS-014 **A317** **Design of Defect Detection Algorithm Using AE Signal in Press**
Oral
Seong-Min Jeong (Kongju National University)
Jong-Seok Oh (Kongju National University)
Seok Moo Hong (Kongju National University)

OS-015 **A319** **Inverse Method of Tensile Behavior using Johnson-Cook Model**
Oral
Seungpyo Hong (Kongju National University)
Euy Sik Jeon (Kongju National University)
Dongsuk Shin (Kongju National University)

OS-016 **A320** **Analysis of Residual Stress in the Glass with Air and Water Mist Spray Cooling Conditions**
Oral
Young Shin Kim (Kongju National University)
Euy Sik Jeon (Kongju National University)
Ha Neul Lee (Kongju National University)

OS-017 **A321** **Analysis of Ventilation Uniformity in Ventilation Seat Chamber according to the Air-hole Arrangement**
Oral
Yeong Jo Ju (Kongju National University)
Euy Sik Jeon (Kongju National University)
Byeong Yong Kim (YOUNGMIN Hi-Tech Inc.)

OS-018 **A322** **Investigation of Dynamic Tensile Behavior of PP Composites based on Local Strain Measurement**
Oral
Bonjoon Gu (Kongju National University)
Seokmoo Hong (Kongju National University)
Minsoo Kim (Kongju National University)

OS-019 **A323** **Neural Network Control for Trajectory Tracking and Balancing of a Ball Balancing Robot with Uncertainty**
Oral
Hyo-Geon Jang (Kongju National University)
Bong Seok Park (Kongju National University)
Chang Ho Hyun (Kongju National University)

OS-020 A324 **Experimental Drying Characteristics of Polymer Pellets using Microwave**
Oral
Sangjun Jeon (Kongju National University)
Daejong Yang (Kongju National University)
Jaekyeong Kim (Kongju National University)
Hynmin Lee (SAC Co., Ltd.)

OS-021 A325 **Fabrication and Performance Analysis of Vacuum Glass using Microwave**
Oral
Jae Kyung Kim (Kongju National University)
Euy Sik Jeon (Kongju National University)

OS-022 A326 **Shape Optimization of Discontinuous Armature Arrangement PMLSM for Detent Force Reduction**
Oral
Jun Hwan Kwon (Kongju National University)
Euy Sik Jeon (Kongju National University)
Chang Il Beak (Bitech System, Inc.)

OS-023 A327 **Filling Rate Analysis of Ceramic Powders using DEM**
Oral
Seung Jun Na (Kongju National University)
Euy Sik Jeon (Kongju National University)
Seung Jin Jeon (KMF Co., Ltd.)

OS-024 A328 **Analysis of the Strength Characteristics for Spot Welded Joint with Dissimilar Steel using Design of Experiments**
Oral
Seung Min Cha (Kongju National University)
Euy Sik Jeon (Kongju National University)
Hoon Hyo Kang (ALGA Co., Ltd.)

OS-025 A329 **Estimating the Fracture Properties of Welded Structures Using Inverse Method**
Oral
Dong Seok Shin (Kongju National University)
Euy Sik Jeon (Kongju National University)
Seong Min Cha (Kongju National University)

OS-026 A330 **Analysis of Residual Stress on the Glass Surface with Air Cooling Conditions**
Oral
Ha Neul Lee (Kongju National University)
Euy Sik Jeon (Kongju National University)
Young Shin Kim (Kongju National University)

Organized Session - 4. The Future of Additive Manufacturing

OS-027 A009 **Femtosecond Laser Pulses Induce Graphene Patterns on Woods and Leaves for Green Electronics**

Oral

Truong-Son Dinh Le (KAIST)
Young-Jin Kim (KAIST)
Sangbaek Park (KAIST)
Hanku Nam (KAIST)
Byunggi Kim (KAIST)
Dongwook Yang (KAIST)
Seung-Woo Kim (KAIST)

OS-028 A047 **Process Characterization for Additively Manufactured ULTEM 9085 using Bayesian Inference**

Oral

Seung Ki Moon (Nanyang Technological University)
Yongjie Zhang (Nanyang Technological University)

OS-029 A171 **Bioprinting of Computer-designed Multiscale Micro-vascular Network**

Oral

Hyun-Wook Kang (UNIST)
Sungjoon Hong (UNIST)
Jeonghyun Son (UNIST)

OS-030 A226 **Development of a New Extrusion-based 3D Printing Method and its Application to Esophagus Tissue Engineering**

Oral

Hun-Jin Jeong (Wonkwang University)
Seung-Jae Lee (Wonkwang University)
Hyoryung Nam (POSTECH)
Jae-Seok Kim (Wonkwang University)
Younggwon Jo (POSTECH)
Jae Yeon Lee (POSTECH)
Dong-Heon Ha (POSTECH)
Ji Hyun Kim (Catholic University)
Jae Hee Chung (Catholic University)
Young-Sam Cho (Wonkwang University)
Dong-Woo Cho (POSTECH)
Jinah Jang (POSTECH)

OS-031 A230 **Design and Additive Manufacturing of Functionally Graded Lattice Using DLP Printing**

Oral

Keun Park (Seoul National University of Science & Technology)
Jung-Hwan Park (Seoul National University of Science & Technology)

OS-032 A231 **Detection of Abnormal Powder Feeding in Directed Energy Deposition Process using Multiple Sensing Methods**

Poster

Hoyoung Lee (Korea Institute of Industrial Technology)
Hyub Lee (Korea Institute of Industrial Technology)
Woongbeom Heogh (Korea Institute of Industrial Technology)
Jeong Ho Yang (Korea Institute of Industrial Technology)
Jongcheon Yoon (Korea Institute of Industrial Technology)
Seungweon Yang (Korea Institute of Industrial Technology)

OS-033 A238 **Monitoring Real time Contractility of 3D Engineered Heart Tissues by Printing a Strain Gauge-Embedded Microphysiological System**

Oral

Uijung Yong (POSTECH)
Jinah Jang (POSTECH)
Donghwan Kim (POSTECH)
Dong Gyu Hwang (POSTECH)
Hyoryung Nam (POSTECH)
Sungkeon Cho (POSTECH)
Seungyeun Cho (POSTECH)
Seokho Lee (POSTECH)
Jihwan Kim (POSTECH)

OS-034 A243 **Additive Manufacturing of a Highly Sensitive Piezoresistive Flexible Tactile Sensor**

Oral

Chaima Fekiri (Chungbuk National University)
In Hwan Lee (Chungbuk National University)
Hochan Kim (Andong National University)
Chiyen Kim (Korea Polytechnic University)

OS-035 A244 **Wear Properties of a Tempered Trimming Mold Fabricated by Additive Manufacturing**

Oral

Hochan Kim (Andong National University)
Sungjong Choi (Andong National University)
Jongduk Seo (Andong University)

OS-036 A255 **Evaluating Strength of a Material Extruded Part based on Inter-Bead Bonding Strength based on Cohesive Zone Modeling**

Poster

Sang-in Park (Incheon National Univerristy)
Jaeseung Ahn (Incheon National Univerristy)
Byunggil Moon (Incheon National Univerristy)

Organized Session - 5. Smart Manufacturing

OS-037 A104 **A Study of Parallel Robot System through Manufacturing Process Analysis of Extended Workspace**

Poster

Sung Rak Kim (Pukyong National University)
Kyung-Chang Lee (Pukyong National University)
Ki Min Jeong (Pukyong National University)
Hyun Hee Kim (Pukyong National University)

OS-038 A192 **Design and Fabrication of Motion Mimicking Robot Arm System Using Vision Detection**

Poster

Hyun-Su Jang (Changwon National University)
Jong-Kyu Park (Changwon National University)
Hyun-Suk Lee (Changwon National University)
Jeong-Ung Ha (Changwon National University)
Ikhyun Suk (Changwon National University)

OS-039 A264 **Deep Learning with Convolutional Neural Networks for Radar Imaging with FMCW MIMO Radar**

Poster

Jiho Seo (Pukyong National University)
Jaehyun Park (Pukyong National University)
Seongh Jun Hwang (Pukyong National University)
Hyungju Kim (Electronics & Telecommunications Research Institute)
Woojin Byun (Electronics & Telecommunications Research Institute)

OS-040 A265 **LDA/GSVD Based Micro-Doppler Signature Identification Using Distributed FMCW Radars**

Poster

Yong-Gi Hong (Pukyong National University)
Jaehyun Park (Pukyong National University)
Yunji Yang (Pukyong National University)

OS-041 A266 **A Deep Learning Framework for Optical Camera Communication Systems**

Poster

Sangshin Park (Pukyong National University)
Hoon Lee (Pukyong National University)
Youngo Lim (Pukyong National University)

OS-042 A267 **Efficient Learning Dataset Generation and Data Selection using Generative Adversarial Network and GSVD-Based Linear Discriminant Analysis**

Poster

Yunji Yang (Pukyong National University)
Jaehyun Park (Pukyong National University)
Yong-Gi Hong (Pukyong National University)

OS-043 A269 **Design and Implementation of HBC Systems for Smart Medical System Environments Using USRP**

Poster

Jiho Seo (Pukyong National University)
Jaehyun Park (Pukyong National University)
Seong Jun Hwang (Pukyong National University)

OS-044 A270 **Analysis of Micro-Doppler of the Ballistic Missile Using Monostatic/Bistatic RCS**

Poster

Zaihuan Sun (Pukyong National University)
Sang-Hong Park (Pukyong National University)

OS-045 A271 **Survey on Federated Learning in Wireless Edge Networks**

Poster

Khoa Anh Nguyen (Pukyong National University)
Jun-Pyo Hong (Pukyong National University)

OS-046 A272 **A 12 bit 1 MSps Asynchronous Fully Differential SAR ADC for SOC**

Poster

Jaeil Chun (Pukyong National University)
Jee-Youl Ryu (Pukyong National University)

OS-047 A273 **Neuromorphic Hardware Realization for Pattern Recognition**

Poster

Manas R. Biswal (Pukyong National University)
Jee-Youl Ryu (Pukyong National University)
Tahesin Samira Delwar (Pukyong National University)
Abrar Siddique (Pukyong National University)
Prangyadarsini Behera (Pukyong National University)
Murod Kurbanov (Pukyong National University)
Jae-Il Chun (Pukyong National University)
Ye-ji Choi (Pukyong National University)
EunKyo Choi (Pukyong National University)

OS-048 A274 **Design of Variable Gain Amplifier with Active Inductor**

Poster

Yeji Choi (Pukyong National University)
Jee-Youl Ryu (Pukyong National University)

OS-049 A275 **A Design and Performance Analysis of 23.74-30.08 GHz VCO Using High Quality Factor CTAI**

Poster

Prangyadarsini Behera (Pukyong National University)
Jee-Youl Ryu (Pukyong National University)
Abrar Siddique (Pukyong National University)
Tahesin Samira Delwar (Pukyong National University)
Murod Kurbanov (Pukyong National University)
Jae-Il Chun (Pukyong National University)
Ye-Ji Choi (Pukyong National University)
Manas R. Biswal (Pukyong National University)
EunKyo Choi (Pukyong National University)

OS-050 A276 **A High Linear Up Conversion Mixer in 130 nm RF CMOS Technology for 5G Applications**

Poster

Abrar Siddique (Pukyong National University)
Jee-Youl Ryu (Pukyong National University)
Tahesin Delwar (Pukyong National University)
Manas R. Biswal (Pukyong National University)
Prangyadarsini Behera (Pukyong National University)
Murod Kurbanov (Pukyong National University)
Jae-Il Chun (Pukyong National University)
Ye-ji Choi (Pukyong National University)
EunKyo Choi (Pukyong National University)

OS-051 A277 **A Highly Efficient Power Amplifier Using sCB-CPW for 24 GHz Applications**

Poster

Tahesin Samira Delwar (Pukyong National University)
Jee-Youl Ryu (Pukyong National University)
Abrar Siddique (Pukyong National University)
Manas R. Biswal (Pukyong National University)
Murod Kurbanov (Pukyong National University)
Prangyadarsini Behera (Pukyong National University)
Jae-Il Chun (Pukyong National University)
Ye-ji Choi (Pukyong National University)
EunKyo Choi (Pukyong National University)

OS-052 A278 **Optimal Path Search Algorithm of a Robotic Arm Using Deep Reinforcement Learning**
Poster
Yung Min SunWoo (Pukyong National University)
Won-Chang Lee (Pukyong National University)

OS-053 A279 **Path Planning of Mobile Robots Using Real-Time Q-Learning**
Poster
Ho Won Kim (Pukyong National University)
Won-Chang Lee (Pukyong National University)

OS-054 A280 **Process Parameters Optimization of Pipe-Bar Dissimilar Shape and Material Friction Welding for Pipe Fabrication**
Poster
Sol Mi Lee (Pukyong National University)
Young Whan Park (Pukyong National University)
Seong Jun Mun (Pukyong National University)
Yu Sik Kong (Pukyong National University)

OS-055 A281 **Evaluation of Weld Parameter in Tip-Rotating Arc Welding for Thick Plate Butt Welding in Shipbuilding**
Poster
Kee Bbeum Jeong (Pukyong National University)
Young Whan Park (Pukyong National University)
Jong Jung Lee (Pukyong National University)
Sang Hyun Ahn (Pukyong National University)
Seong Ho Bae (Magswitch Technology Korea Co., Ltd)

OS-056 A282 **A Study of Fault Diagnosis Algorithm for Magnetic Encoder**
Poster
Ki Min Jeong (Pukyong National University)
Kyung-Chang Lee (Pukyong National University)
Sung Rak Kim (Pukyong National University)
Hyun Hee Kim (Pukyong National University)

OS-057 A283 **Design of a Shoe Upper Inspection Algorithm Using YOLO**
Poster
Jung Ho Kang (Pukyong National University)
Kyung-Chang Lee (Pukyong National University)
Ki Min Jeong (Pukyong National University)
Hyun Hee Kim (Pukyong National University)

OS-058 A284 **Analysis of Welding Monitoring for Aluminum 5083 Alloy in Tip-Rotating Arc Welding**

Poster

Sang Hyun Ahn (Pukyong National University)
Young Whan Park (Pukyong National University)
Jong Jung Lee (Pukyong National University)
Kee Bbeum Jeong (Pukyong National University)
Sol Mi Lee (Pukyong National University)
SeongHo Bae (MAGswitch Technology Korea)

OS-059 A285 **Denoising Algorithm based on Pattern Matching in AWGN Environments**

Poster

Bong Won Cheon (Pukyong National University)
Nam Ho Kim (Pukyong National University)

OS-060 A286 **Linear Interpolation Method with Cross-Shaped Variable Mask in Salt and Pepper Noise Environments**

Poster

Ji Hyeon Baek (Pukyong National University)
Nam Ho Kim (Pukyong National University)

OS-061 A287 **Assessment of an Effective Thermal Conductivity of a Passive, High-speed Heat Spreader**

Poster

Jonghak Han (Pukyong National University)
Wukchul Joung (Pukyong National University)

OS-062 A288 **Altitude Control Design and Performance Validation for Unmanned Aerial Vehicle with Single Ducted-Fan**

Poster

Minh-Thien Tran (Pukyong National University)
Kyung-Chang Lee (Pukyong National University)
Young-Bok Kim (Pukyong National University)

OS-063 A289 **Structural Analysis of Rollers of Spring Operating Mechanism by Using ANSYS and RecurDyn Program**

Poster

Dae Kyung Lee (Pukyong National University)
Jeong Hyun Sohn (Pukyong National University)
Kyung-Chang Lee (Pukyong National University)
Ji Soo Jeong (Pukyong National University)

OS-064 A290 **A Study on Gimbal Motion Control System Design based on Super-Twisting Control Method**

Poster

Thinh Huynh (Pukyong National University)
Young Bok Kim (Pukyong National University)
Kyung-Chang Lee (Pukyong National University)

OS-065 A297 **A Study on the Correlation of Battery Performance according to Environmental Temperature Change and Discharge Rates of Lithium-polymer Battery**

Poster

Jaehun Choi (Changwon National University)
Heesung Park (Changwon National University)

OS-066 A298 **Shear Induced Nano/Micro Structure Using Bar Coating for Liquid Crystal Alignment**

Poster

Jong In Jang (Changwon National University)
Hae-chang Jeong (Changwon National University)
Hong-Gyu Park (Changwon National University)

OS-067 A299 **Suggestion of Step and Repeat UV Imprint Process Using Micro-Pattern as Align-Key**

Poster

Woo Young Kim (Changwon National University)
Young Tae Cho (Changwon National University)
Bo Wook Seo (Changwon National University)
Seok Kim (Changwon National University)

OS-068 A300 **Imprint Lithography Method for LC Alignment by Using the Wrinkle Structure of UVO Treated PDMS**

Poster

Jung Hyun Hwang (Changwon National University)
Hong Gyu Park (Changwon National University)
Jae Sung Hong (Tokyo Electron Korea Limited)
Chan Woo Oh (Defense Agency for Technology & Quality)
Min Je Joe (Changwon National University)
Hae Chang Jeong (Changwon National University)

OS-069 **A306** **Design of Cryogenic Blower for Recirculation Hydrogen of HTS Motor**
Poster
Yonghyun Kwon (Changwon National University)
Seokho Kim (Changwon National University)
Kihwan Kim (Changwon National University)

OS-070 **A307** **Measurement and Analysis Permeability of 3D Printing Composite Materials in Cryogenic Condition**
Poster
Kihwan Kim (Changwon National University)
Seokho Kim (Changwon National University)
Yonghyun Kwon (Changwon National University)
Jaehwan Lee (Changwon National University)

OS-071 **A308** **Measurement and Analysis Pressure Drop of 3D Printed Check Valve**
Poster
Gyeong-min Kim (Changwon National University)
Seokho Kim (Changwon National University)
Yonghyun Kwon (Changwon National University)
Geonhang Seo (Changwon National University)
Youngjun Choi (Changwon National University)

OS-072 **A311** **A Study on the Contact Angle Characteristics of the Biomimicked Surface Structure with Allium Seeds**
Poster
Seunghang Shin (Changwon National University)
Young Tae Cho (Changwon National University)
Seok Kim (Changwon National University)
Hyeok Jae Choi (Changwon National University)

OS-073 **A312** **Realization of Deep Learning Algorithm to Find the Rotation Angle of Two Plates with Same Patterns**
Poster
Bo Wook Seo (Changwon National University)
Young Tae Cho (Changwon National University)
Woo Young Kim (Changwon National University)
Seok Kim (Changwon National University)

OS-074 **A313** **6-Axis Robot Motion Control Using RoboDK and Python API**
Poster
Chang Jong Kim (Changwon National University)
Young Tae Cho (Changwon National University)
Seok Kim (Changwon National University)

OS-075 A314 **Manufacturing Process Optimization for STS303 Wire Rods based on Big Data Analytics**

Poster

Seokjun Seo (Changwon National University)
Heungseob Kim (Changwon National University)
Seongil Heo (Changwon National University)
Donghyun Ahn (Changwon National University)

OS-076 A315 **Material Evaluation by Ultrasonic Wave Mixing Technique for Fatigue Condition**

Poster

Jaesun Lee (Changwon National University)
Sunho Choi (Changwon National University)
Junpil Park (Pusan National University)
Hyunsoo Song (Changwon National University)

OS-077 A316 **A Study on the Collection of Fine Particles on the Surface of Metal Wire Using Dielectrophoresis in Air**

Poster

Jae Min Lee (Changwon National University)
Young Tae Cho (Changwon National University)
Do Hyeog Kim (Changwon National University)
Seok Kim (Changwon National University)

OS-078 A332 **A Study on the Microstructure Analysis of Ti-6Al-4V fabricated by DED Additive Manufacturing with Plasma-Assisted Machining**

Poster

Joon-Koo Park (Changwon National University)
Choon-Man Lee (Changwon National University)
Ho-In Jeong (Changwon National University)