Advanced Fluidics and Nanotechnology Laboratory (AFNTL)

Professor

Prof. Kang, Hyun Wook

Contact

Office: Eng. bldg.1A-403
Tel: +82-62-530-1662
H.P. +82-10-6414-6803
Email: kanghw@jnu.ac.kr

Educations

Ph.D. KAIST (Mechanical Engineering, 2013)
Thesis: Hierarchical nanostructure formation and application using microfluidic system and microcontact printing technology
M.S. KAIST (Mechanical Engineering, 2009)
B.S. Chonnam National University (Mechanical Engineering, 2007)

Research Experiences

Chonnam National University
Associated Professor 2018. 9. ~ present
Assistance Professor 2014. 9. ~ 2018. 8.

KIST (Korea Institute of Science and Technology)
Senior Researcher 2013. 9. ~ 2014. 8.

KAIST (Korea Advanced Institute of Science and Technology)
Graduate Student Researcher 2007.2. ~ 2013. 8.

Memberships in Professional Societies

Member of Board of directors
Korean Society of Precision Engineering (KSPE)
Korean Society of Mechanical Engineers (KSME)
Korean Society of Manufacturing Technology Engineers (KSMTE)

Member of
American Society of Mechanical Engineers (ASME)
MRS (Materials Research Society) / APS (American Physical Society)

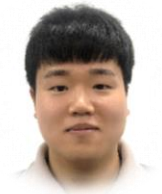
Advanced Fluidics and Nanotechnology Laboratory (AFNTL)

AFNTL Members

Mr. Kang, Dong Hee
Ph.D Candidate
M.S. Chonnam Natl. Univ., ME 2018
Nanomaterial based functional membrane fabrication

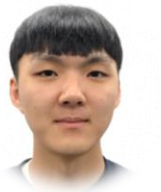
Ms. Kim, Na Kyong
Ph.D Candidate
M.S. Chonnam Natl. Univ., ME 2019
Artificial intelligent-based fluidic mechanics

Mr. Zheng, Liangjun
Ph.D Candidate
M.S. Chonnam Natl. Univ., ME 2020
Solar steam generator fabrication



Mr. Cho, Woo Young
M.S. Student
Hospital air-purification simulation

Mr. Wang, Min Liang
M.S. Student
Extrinsic tuning of the wettability of 2D materials



Mr. Kim, Byeong Wook
M.S. Student
ANN algorithm for predicting energy loss in a system

Mr. Kim, Gu Woo
M.S. Student
CFD – based air cleaner sensor optimization

Ms. Park, Ju Yeon
M.S. Student
Thermofluidic characteristic analysis of 3D printed channel

Mr. You, Nae Won
M.S. Student
ANN – based driver state prediction

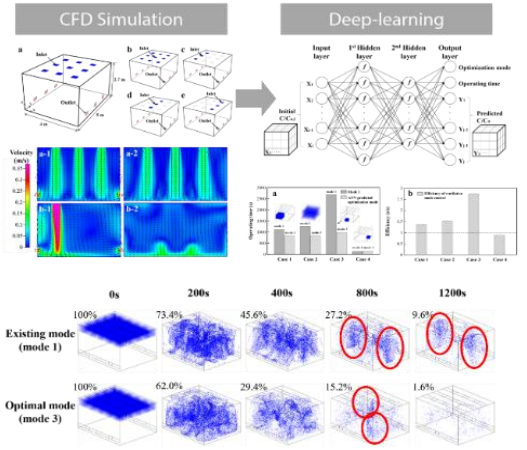
Mr. Im, Sung Min
M.S. Student (Part-time)
Bone-implant material analysis
Collaboration with CNU Hospital

Mr. Kwon, Ki Beom
M.S. Student (Part-time)
Reliability of electronic parts
Collaboration with KATECH

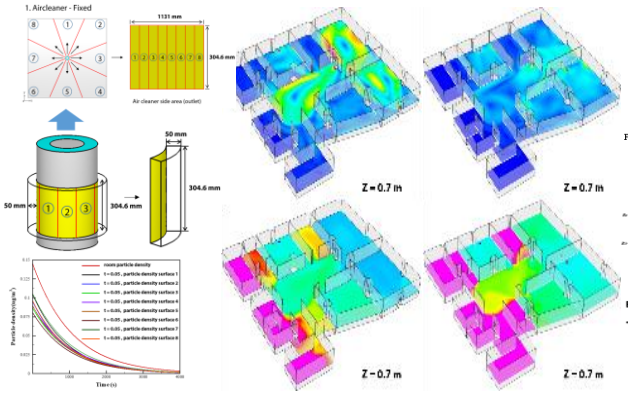
Advanced Fluidics and Nanotechnology Laboratory (AFNTL)

whose PI is Prof. Kang studies broad and interdisciplinary fields of **Fluid Mechanics** and **Nanotechnology** from fundamental to application aspects. Also, we are having a broad interest in Mechanical/Electrical engineering, Nano/Bio technology, Physics and Material Science.

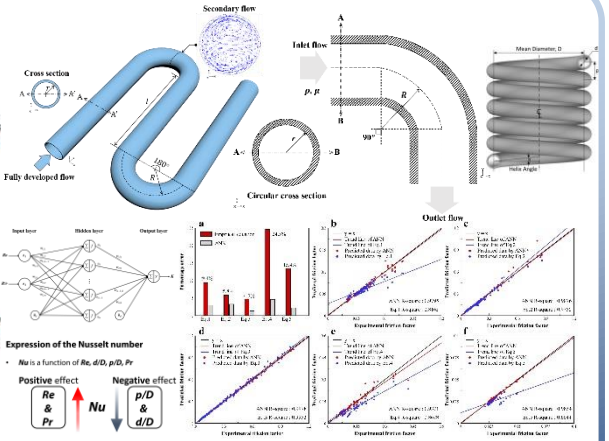
AI-based Fluid Mechanics



Optimal Ventilation Stratgy

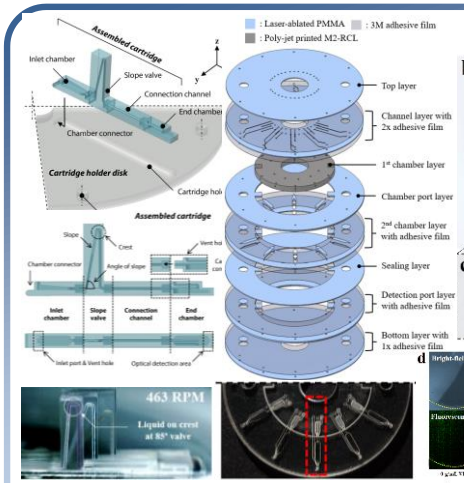


Vertual sensor

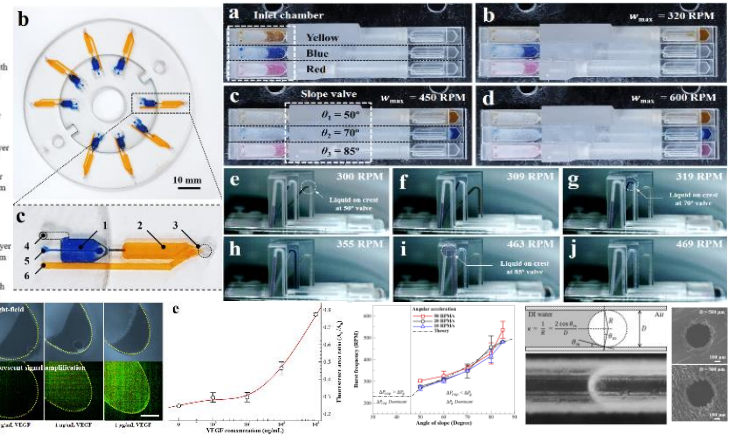


ANN-based Energy Prediction

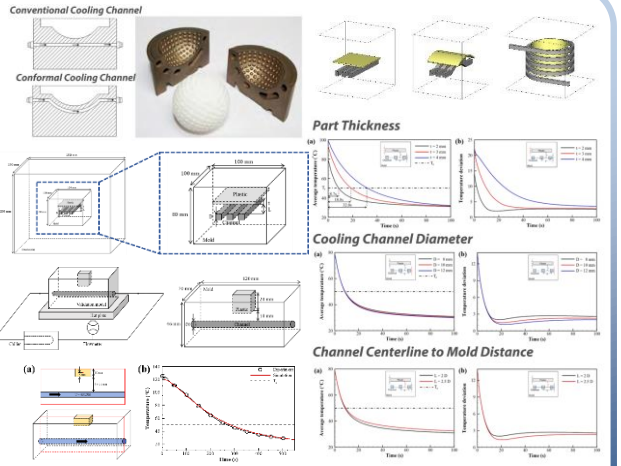
Microfluidics in 3D platform



3D-Printed Diagnosis Platform

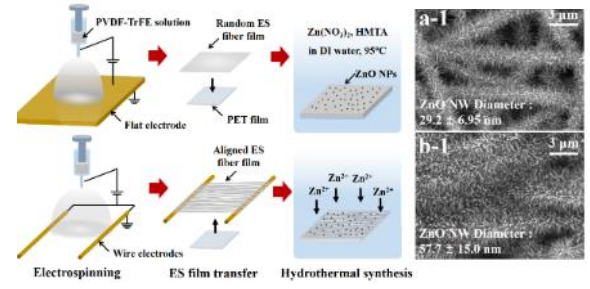


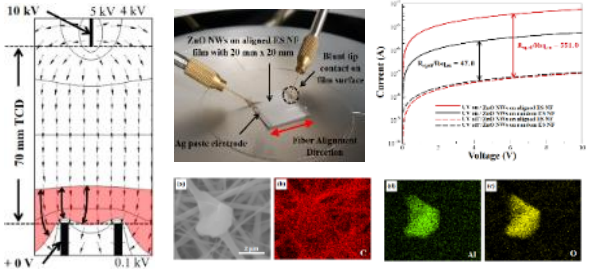
Sequential Micro-Liquid Control



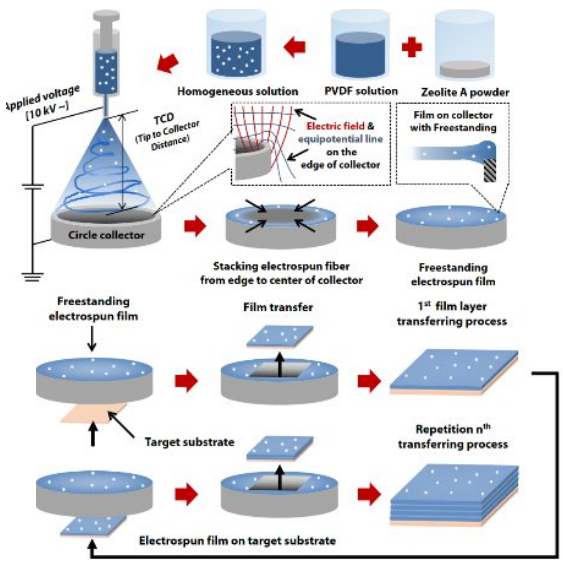
Conformal Cooling Technology

Multifunctional Micro/Nano Fiber Membrane

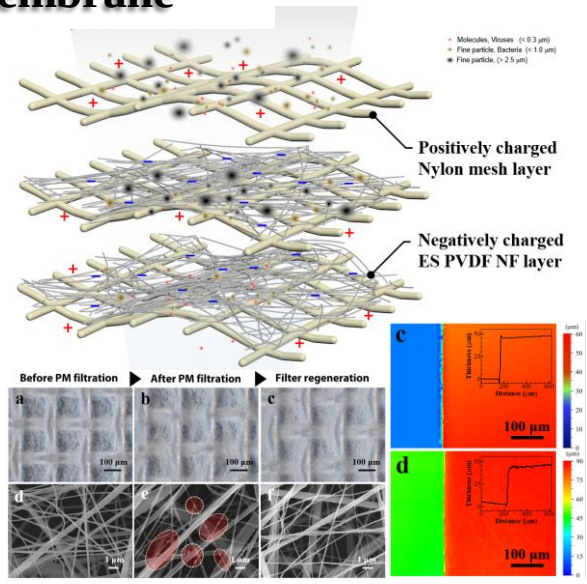




Fiber-based Photo Sensor

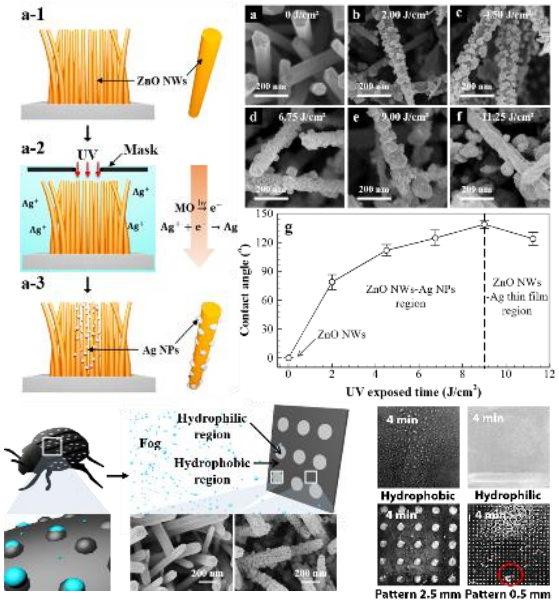


Multi-Layered Film Process

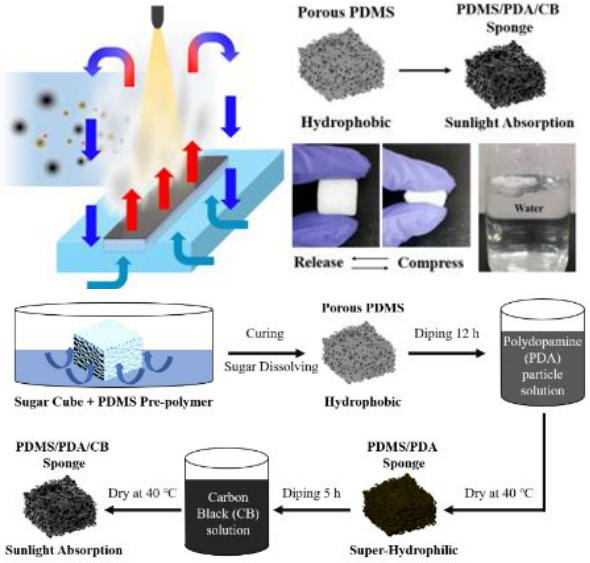


Renewable Electrostatic Filter

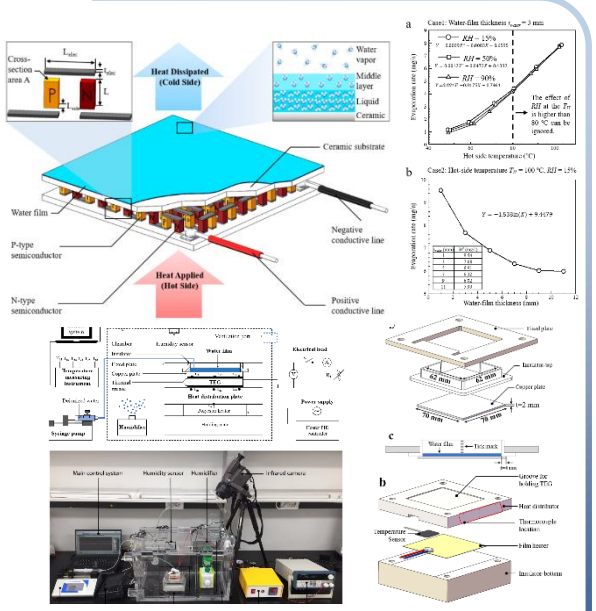
Nano Science & Technology



Hierarchical Structure



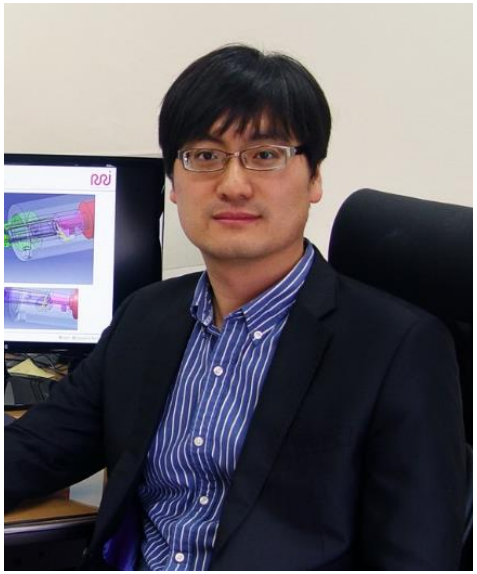
Solar Steam Generator



Theoretical Evaporation Analysis

의료로봇 및 지능제어 연구실 소개

(MeRIC-Lab : Medical Robotics and Intelligent Control Laboratory)



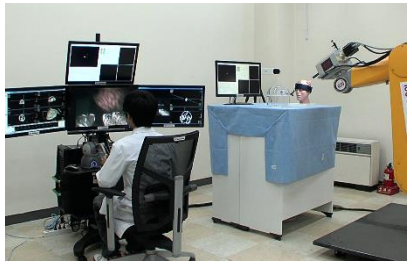
지도 교수 : 고 성 영

연 락 처

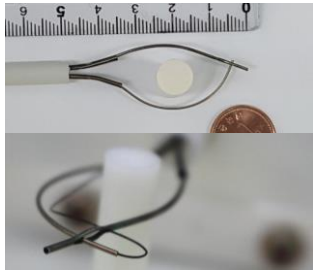
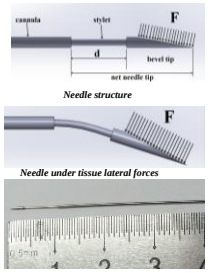
전화번호: 062-530-1679
사 무 실 : 공대 1A-410
실 험 실 : 공대 1B-101
실 험 실 : 공대 1B-211
E-mail : sko@jnu.ac.kr
홈페이지: https://meric.jnu.ac.kr

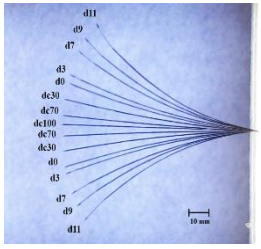
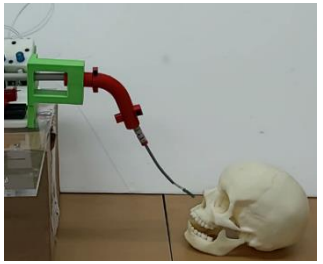
➢ 주요 연구 주제

- 의료용 로봇 (수술용 로봇 + 재활 로봇)

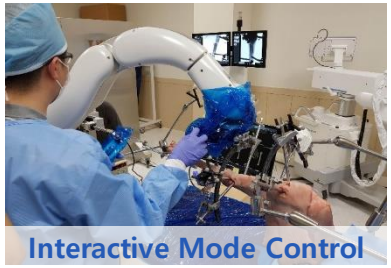
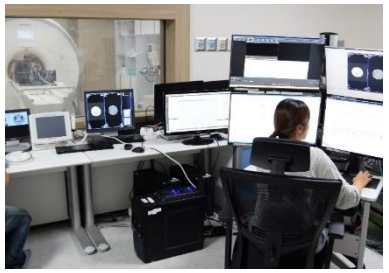


- 수술용 디바이스, 보조 장치

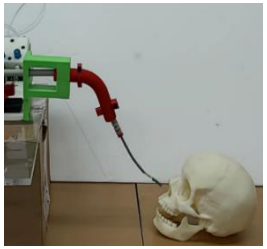




Superimposed insertions in gelatin 6%


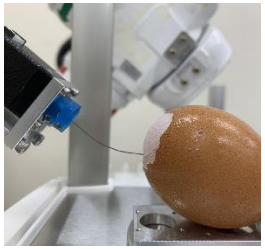
- 지능형 제어, 원격제어, 햅틱제어


Remote Mode Control

Interactive Mode Control


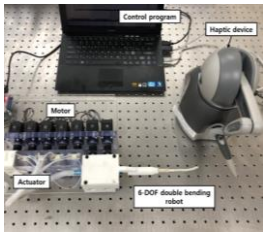
연구실 멤버



Mr. Farooq, M. Umar
Ph.D Candidate
M.S. Chonnam Natl. Univ., ME 2017
MRI-compatible trans-nasal surgical robot /
Stiffness-changing mechanism



Mr. Xu, Binxiang
Ph.D Candidate
M.S. Chonnam Natl. Univ., ME 2017
Concentric tube-based eye surgical robot /
Optical force sensing module for thin structure



Ms. Kim, Chae Won
M. S. Student
MRI-compatible trans-nasal surgical robot /
Mechanism design & Tele-operation

Mr. Chen, Rongwan
M.S. Student
Meal assistant robot for the handicapped /
Advanced tool design & Path generation

Ms. Lala, Bijoya
M.S. Student
Shape tracking of steerable needle /
CNN-based US-image analysis

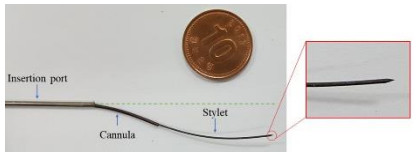
Ms. Liu, Rongrong
M.S. Student
MRI-compatible prostate biopsy robot /
Optical force sensing module for thin structure

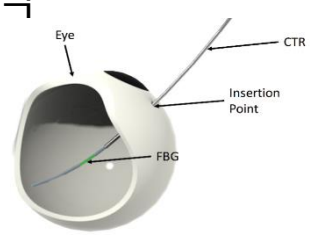
Mr. Shin, Mi Jung
Administrative staff

진행 중인 주요 프로젝트 ('20. 10. 기준)

원격/힘제어 가능 미세안구수술 로봇

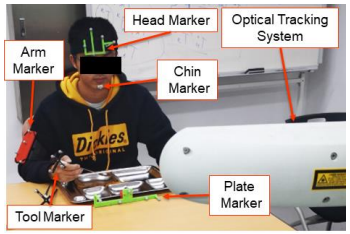
- **과기부 중견연구** 사업
  - ◯ 19.09.~22.02. (30개월)
- **첨단 바늘형 로봇/고정밀 원격 제어**
  - ◯ 직경 0.5mm, 4자유도 동작
  - ◯ 마스터-슬레이브 구조





식사로봇 도구교체모듈 및 동작생성

- **산업부** 돌봄로봇 개발 사업
  - ◯ 사이맥스, 생산기술연구원, 전자부품연구원, GIST, 서울대병원과 공동연구
  - ◯ 19.04.~21.12. (33개월)



MRI 호환 전립선 생검 로봇 개발

- **범부처** 신개념 메디봇 개발 사업
  - ◯ 대구첨단의료재단/한양대병원과 공동연구
  - ◯ 20.09.~22.12. (28개월)
- **MRI 호환 로봇**
  - ◯ 힘측정 생검 바늘
  - ◯ 고정밀 로봇 개발

산업부 로봇인재 양성 사업

- **4차산업혁명** 혁신 신기술을 이해하는 융합형 **로봇** 전문 **인재** 양성
  - ◯ 연 10명의 대학원생 선발 / 2년간 지원
  - ◯ 산학연계프로젝트, 현장실습
  - ◯ 단기교육 및 취업 지원 프로그램 운영
  - ◯ 19.03.~24.02. (총 5년간)

보유 장비 목록

➢ Hardware

- Hyundai, 6-DOF Robot X 2
- 독일 Franka, 7-DOF Panda Robot
- 삼성 Medison, 초음파영상장치
- NDI, Optical Tracking System
- ATI, Force sensor (Nano, Mini, Mega)
- JSV-H1000 인장압축 시험기
- NI, CompactRIO (8 slots / 4 slots)
- NI, MyRIO Controller
- Formlabs, Form2/3 3D Printer (SLA)
- CUBICON, 3D Printer (FDM)
- Maxon, EPOS2 / ESCON 제어기 다수
- Maxon, DC/EC Motor 다수
- Stepper Motor

Hyundai 6-DOF Robot

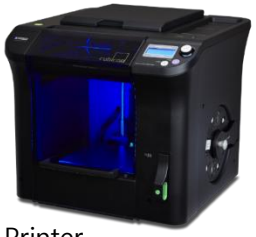

Franka 7-DOF
Panda Robot


삼성 Medison
초음파영상장치 HS40


Optical Tracking System


Compact Rio


Motor
Controller


3D Printer


인장/압축 시험기

Building Self-monitoring, Analysis & Reporting Technologies Lab.

B-SMART Lab.

Professor

Kim Woohyun, Ph.D.

Contact

- **Office:** Eng. Bldg. 1A-420
- **Tel:** 062-530-1663
- **Email:** whkim@jnu.ac.kr

Work experience

- **Pacific Northwest National Laboratory**
  (Senior staff scientist)
- **Digital Appliance R&D Center, Samsung Electronics**
  (Senior Researcher)

Research

Transactive control	**Fault detection & diagnosis**	**Artificial intelligence**	**Virtual sensor**

Members

Ick sung Kim

PhD course
Multi-agent-based distributed energy control

Chan woo Park

M.S. course
Deep learning and transfer learning algorithm

Yu sung Lee

PhD course
Virtual sensor based fault detection and diagnosis
Building energy optimal control

Dong gyu Chung

M.S. course
Model predictive control based building energy control

Dae geun Jang

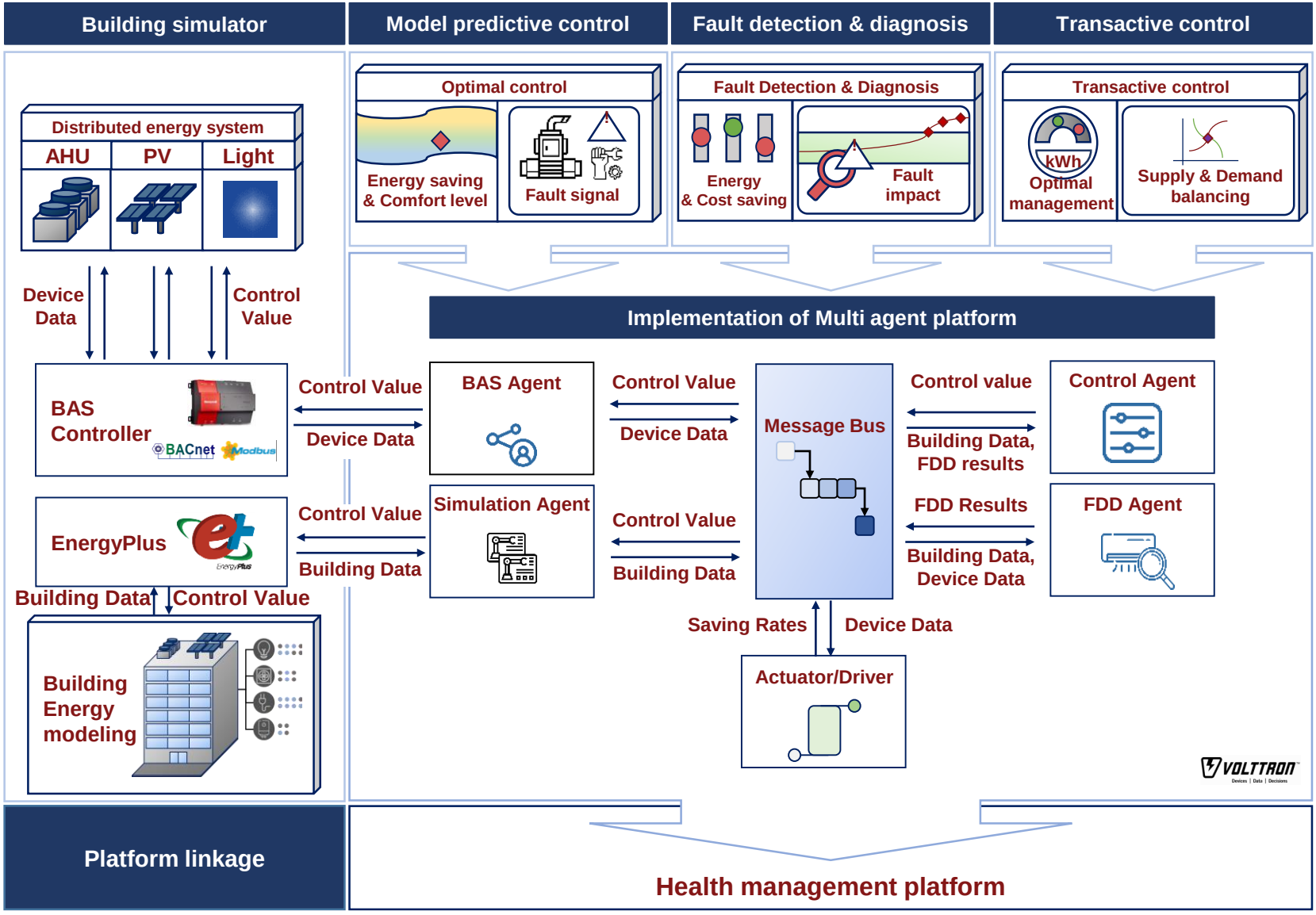
M.S. course
Reinforcement learning based building energy control

Building Self-monitoring, Analysis & Reporting Technologies Lab.

B-SMART Lab.

Development of health management platform for optimal operation of distributed energy resources

전남대학교 CHONNAM NATIONAL UNIVERSITY · NRF 한국연구재단 · KIER 한국에너지기술연구원 KOREA INSTITUTE OF ENERGY RESEARCH



Building Self-monitoring, Analysis & Reporting Technologies Lab.

B-SMART Lab.

전남대학교 CHONNAM NATIONAL UNIVERSITY

NRF 한국연구재단

Development of the plug-and-play model predictive control for building energy optimization

Development of Building energy simulator

Simulator

HVAC system

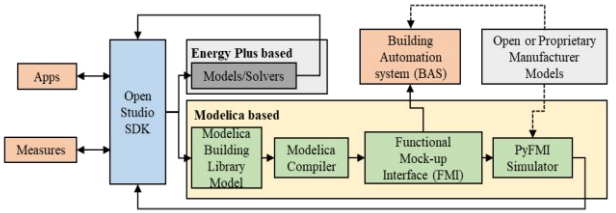
Controller

AHUs

BAS Controller

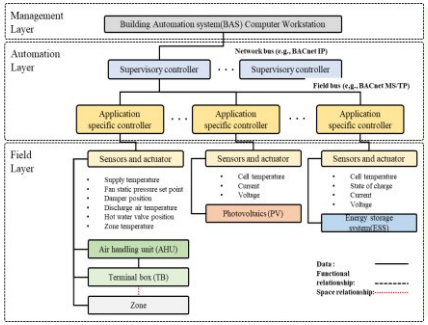
BACnet Modbus

Simulator based on Energyplus and Modelica



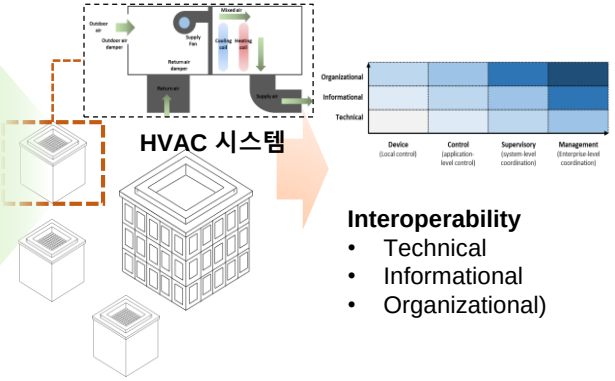
Plug and play based building energy point mapping automation

AI based building point mapping automation



Building control layer

Interoperability



Interoperability

- Technical
- Informational
- Organizational)

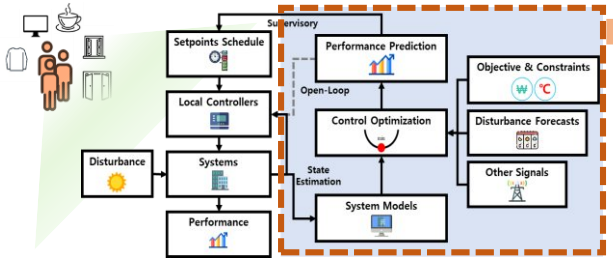
Reflect on operational efficiency improvements

Development of Model predictive control

Auto-mapped points

Database

Building energy optimization based on the objective function



Operational Efficiency improvement

Building Self-monitoring, Analysis & Reporting Technologies Lab.

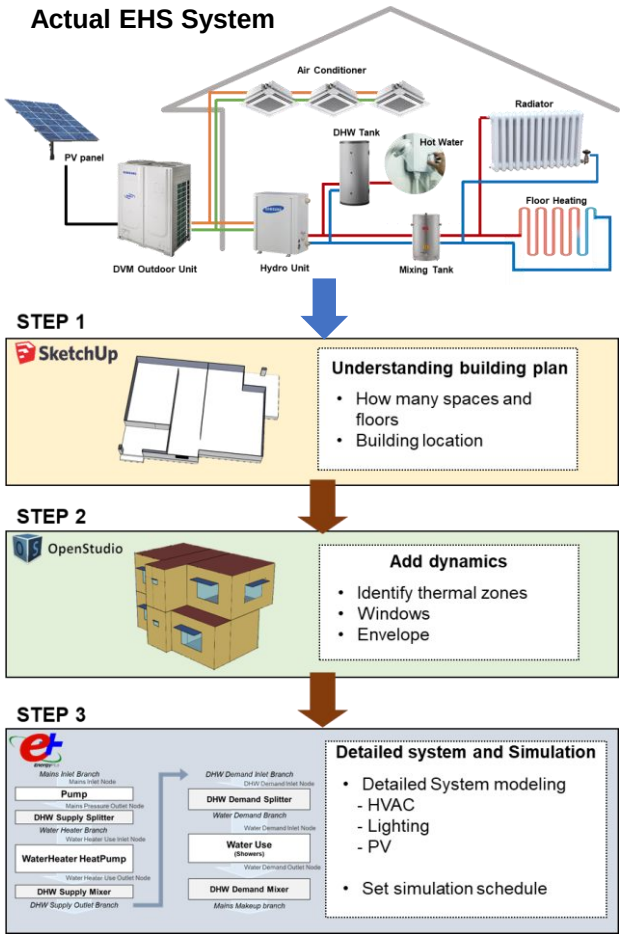
B-SMART Lab.

Artificial Intelligence based energy efficient control for eco heating system

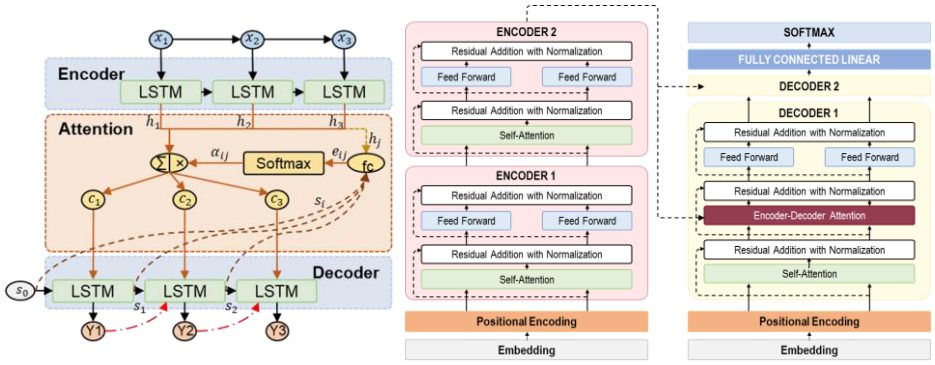
전남대학교 CHONNAM NATIONAL UNIVERSITY

SAMSUNG 삼성전자

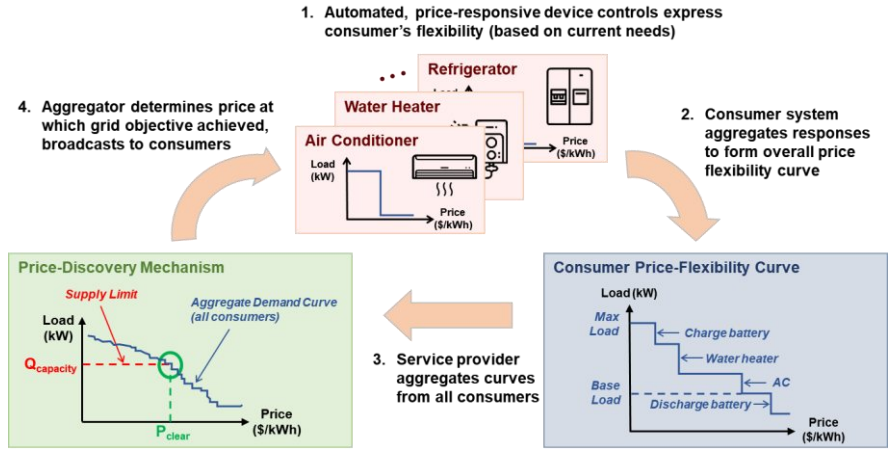
Building energy modeling



Development of prediction model based on AI



Market-based optimal control



Building Self-monitoring, Analysis & Reporting Technologies Lab.

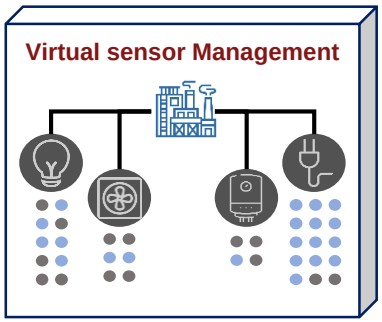
B-SMART Lab.

Development of virtual sensor framework technology to solve sensor shading zones in digital twin environment

전남대학교 CHONNAM NATIONAL UNIVERSITY

ETRI Electronics and Telecommunications Research Institute

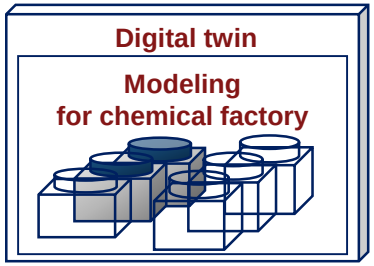
Virtual sensor Framework



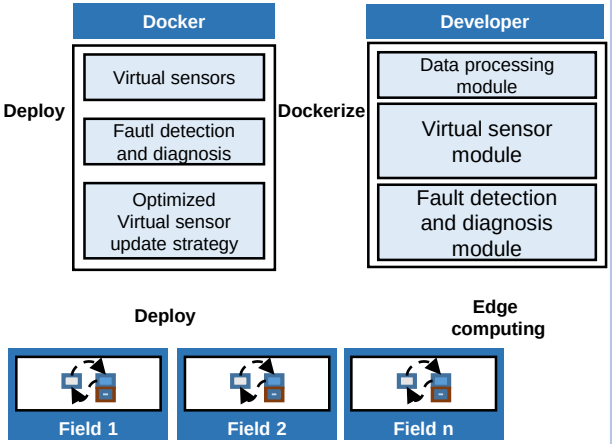
Virtual sensor

Factory data

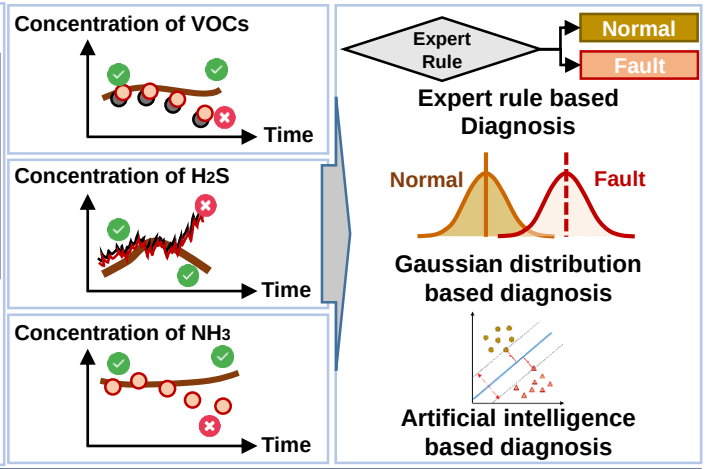
Application



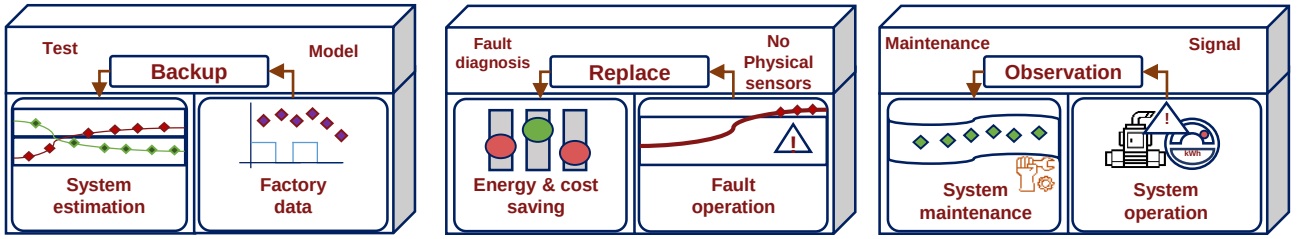
Development of virtual sensor deployment strategy



Fault detection and diagnosis based on system level virtual sensor



Development of virtual sensors



Building Self-monitoring, Analysis & Reporting Technologies Lab.

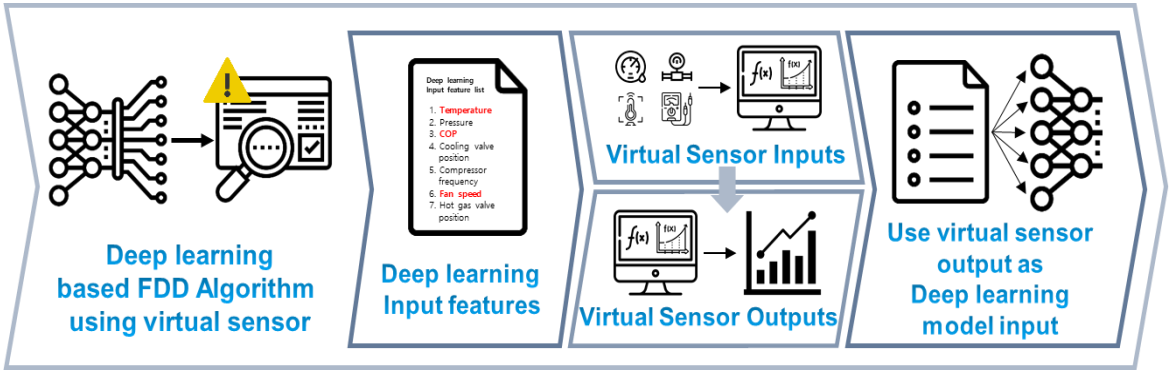
B-SMART Lab.

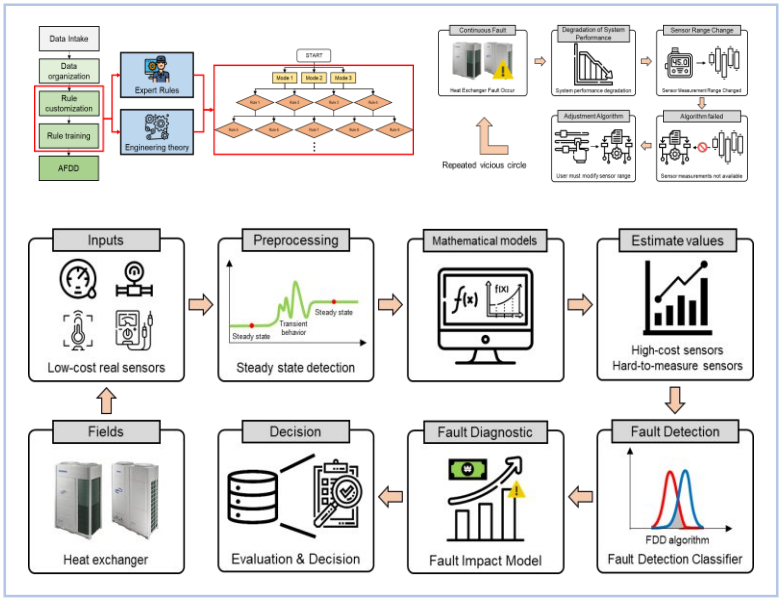
Development of Virtual sensor and deep learning based fault detection and diagnosis for fouling fault

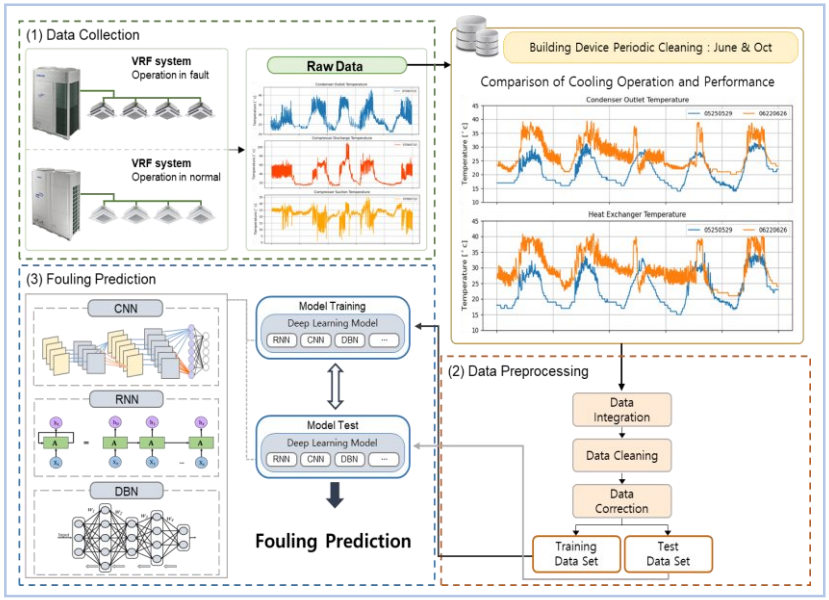
전남대학교 CHONNAM NATIONAL UNIVERSITY

SAMSUNG 삼성전자

Virtual sensor and AI based Fault detection and diagnosis for air-conditioners







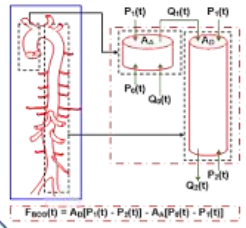
Aims and Scope

We are developing integrated dynamics and control technologies of robotics and automation in the areas of industrial, medical, and academia.

Medical Robot

Wireless actuation
Capsule endoscope
Magnetic catheter

System Physiology



BCG, KCG, ECG, PPG, ...
Unobtrusive monitoring
Model-based estimation

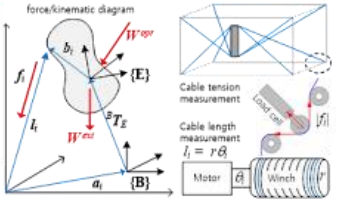
PROBLEM

Dynamics & Control

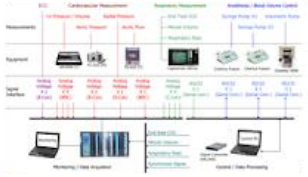
SOLUTION

Industrial Robot

Cable-driven robot
Logistics robot
Novel mechanism



Instrument & Automation



Sensors and actuators
Controlled devices
Automated systems

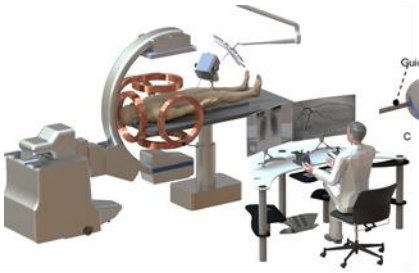
Visit us @
Lab #1: 1A219-1, School of Mechanical Engineering, Chonnam National University
Lab #2: 1A213, School of Mechanical Engineering, Chonnam National University

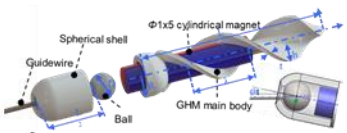
https://sites.google.com/view/csalab2022/home

Research Highlights

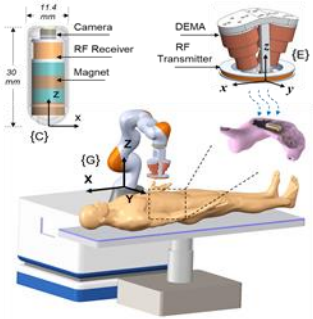
[Wireless Medical Robot]

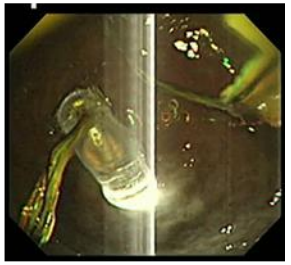
Catheterization (IEEE TBME, 2020)





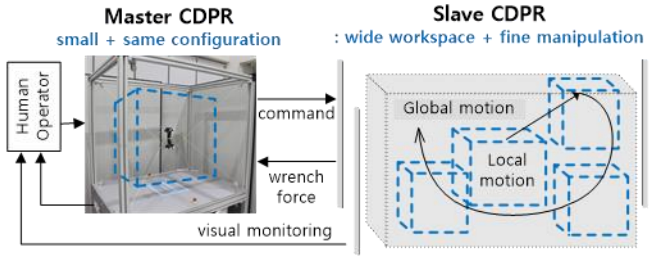
Capsule Endoscopy

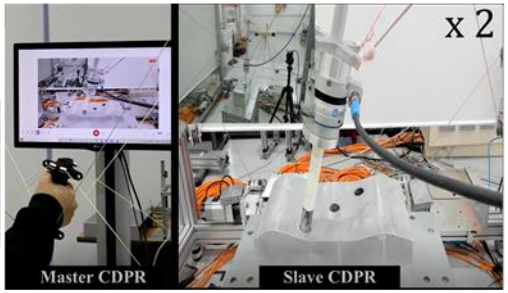




[Cable-Driven Parallel Robot]

Remote Peg-in-Hole CDPR (IEEE/ASME TMECH, 2022)

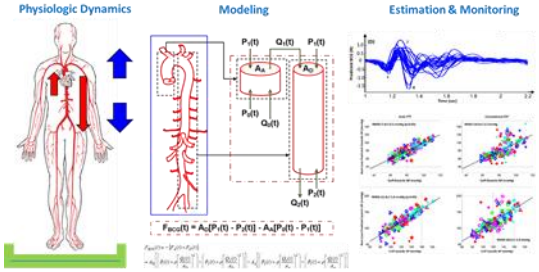




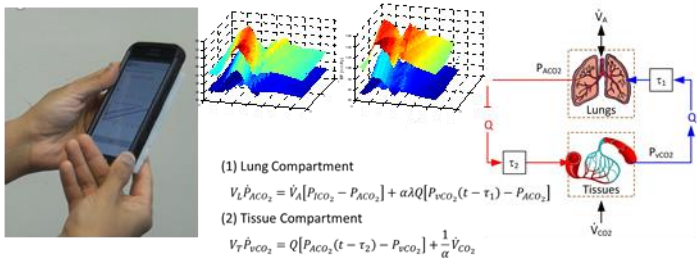
Automated Logistics

[System Physiology]

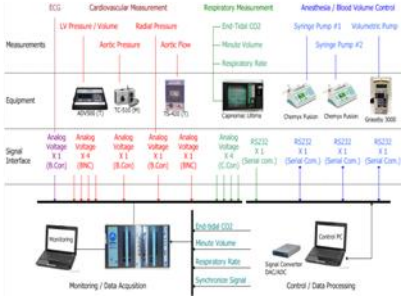
Ballistocardiogram (Sci.Rep. 2016)



Unobtrusive Healthcare & Estimation (Science Translational Medicine, 2018)



Biomedical Instrumentation



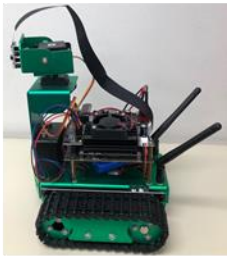
Facility & Equipment

[Robot System]
Articulated Robot Arm
Parallel Robot (Stewart Platform)
Cable-Driven Parallel Robot
X-Y Stage

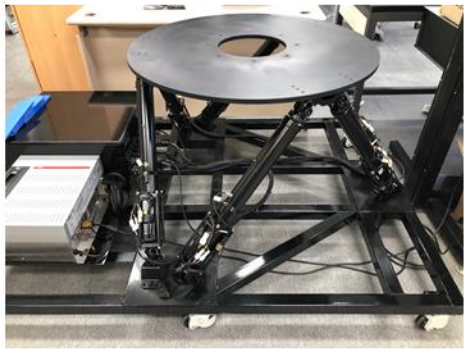
[Devices]
Biopac and Accessories
Electromagnets
3D Printer
Linear actuator
Motors and Drivers
Sensors

[Controllers]
PLC (+Beckhoff+Twincat)
Customized 8-axis controller
Microprocessors






Intelligent Robotics and Vehicle Lab.

Professor

Prof. Moon, Chang-bae

Contact

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Tel: +82-62-530-1664
H.P.+82-10-9029-0818
Email: cbmoon@jnu.ac.kr

Education

Ph. D. School of Mechanical Engineering, Korea University, Seoul, Korea, 2012
Thesis: Coordination of Multiple Controllers and Kinodynamic Trajectory Planning for Indoor Mobile Service Robots

M.S. School of Mechanical Engineering, Korea University, Seoul, Korea, 2008
Thesis: Robust localization and navigation behavior selection of the autonomous mobile robot

B.S. School of Mechanical Engineering, Korea University, Seoul, Korea, 2006

Job experiences

2019. 03 ~ : Associated Professor, Chonnam National University
2016. 03 ~ 2019. 02 : Assistant Professor, Chonnam National University
2014. 07 ~ 2016. 02 : Principal Research Engineer, Hyundai Mobis Co., Ltd.
2012. 09 ~ 2014. 06 : Research Professor in Korea University (Funded by Korea University)

Research Interest

Motion control and path planning
Mobile robot localization / SLAM
Discrete Event System (DES)
Control architecture design
Autonomous Navigation of Vehicles / AGVS / Tractors

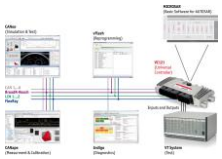
Awards

Outstanding Paper Award in Dynamic and Control Section, Korean Society Mechanical Engineering Conference 2013.
Outstanding Graduate Student Award in School of mechanical Engineering, Korea University, 2011.
Outstanding Paper Award in IT Convergence Section, Korean Society Mechanical Engineering Conference 2016.

Intelligent Robotics and Vehicle Lab.

Research Topics

(1) Mobile Robot and Autonomous Vehicle Path Planning and Motion Control
(2) Simultaneous Localization and Mapping
(3) Mobile Manipulation Path Planning and Motion Control

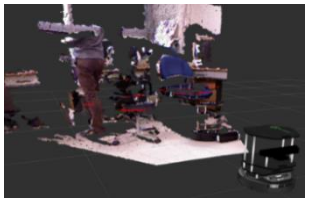


Planning

Localization

Navigation

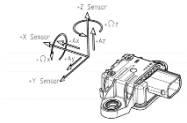
Mobility

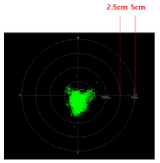
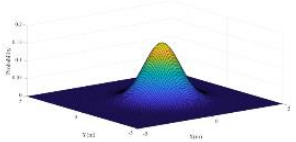


Intelligent Robotics and Vehicle Lab.

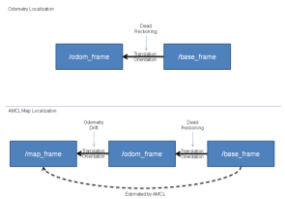
RESEARCH AREA

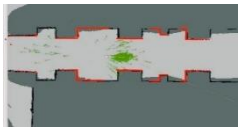
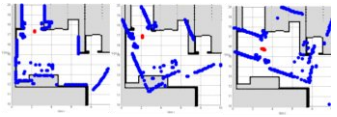
Localization

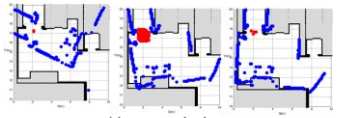


<Sensor-based localization>

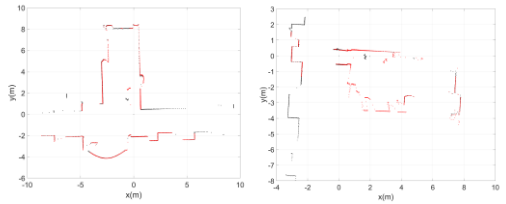
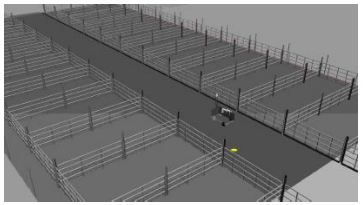
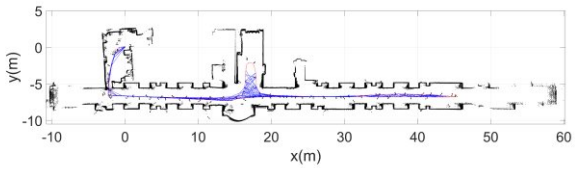




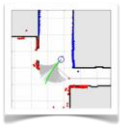
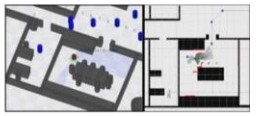
<Pose estimation of mobile robot>

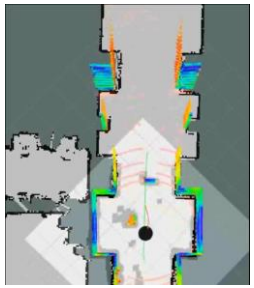
SLAM

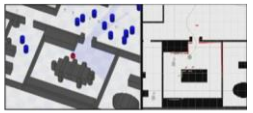
Planning

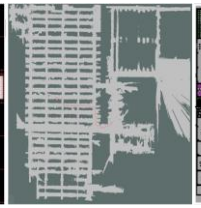
Sensor-based :: DWA

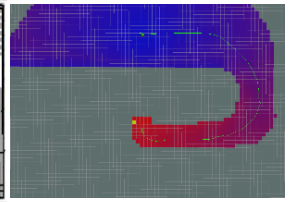





Model-based :: Tracking

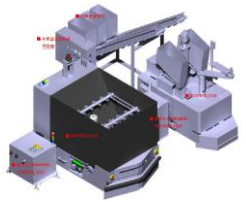





Mobility

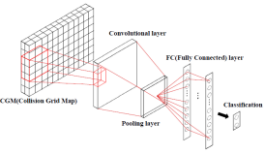


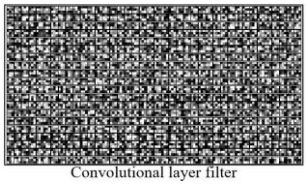


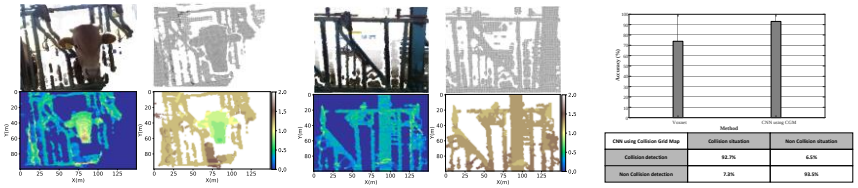

Intelligent Robotics and Vehicle Lab.

RESEARCH AREA

Tracking & Obstacle detection

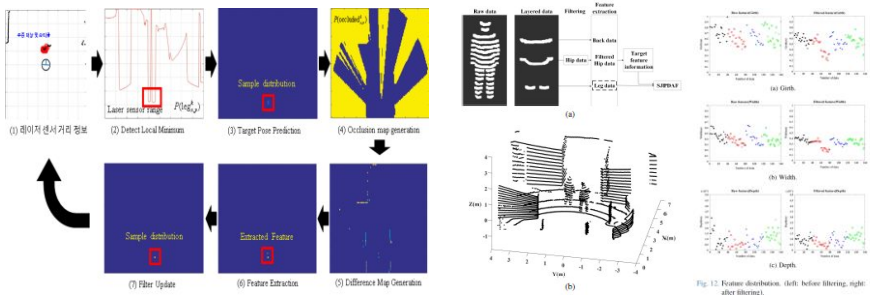



Convolutional layer filter



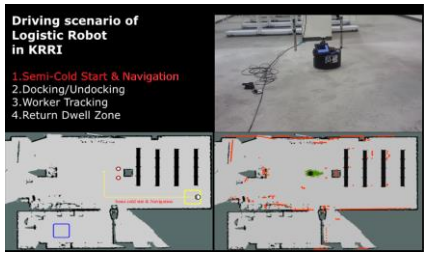
CNN using Collision Grid Map	Collision situation	Non Collision situation
Collision detection	92.7%	6.5%
Non Collision detection	7.3%	93.5%

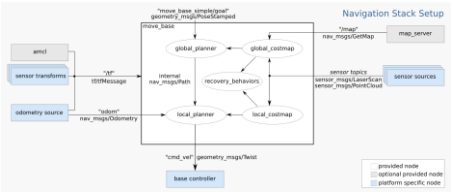
<Obstacle Detection>

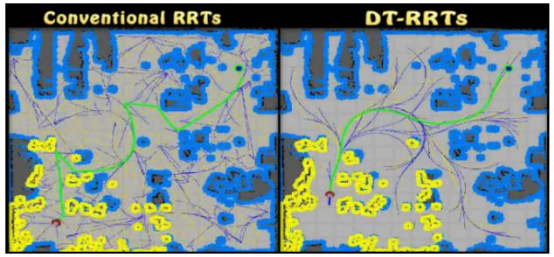


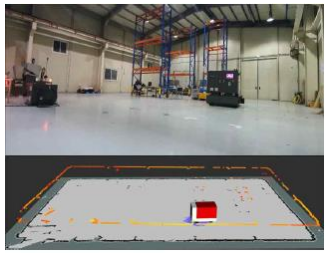
<Target Tracking>

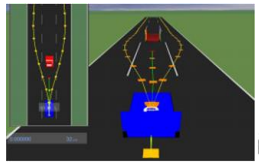
Navigation

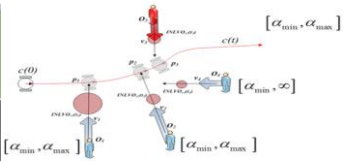




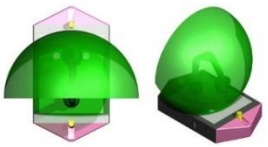


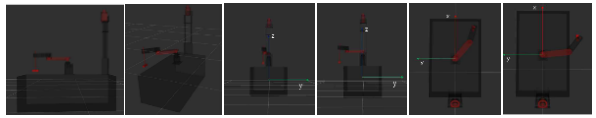






Manipulation





박규해 교수

- 소음/진동, 구조건전성검사 (SHM), 비파괴검사(NDE)
- Virginia Tech. 기계공학박사

ASDL ACTIVE STRUCTURES & DYNAMICS LABORATORY

주요경력

- 전남대학교 기계공학부 교수(2012 ~ 현재)
- Los Alamos National Laboratory(LANL) Technical Staff (2002 ~ 2012)
- 미국 기계학회(ASME) Fellow (2017 ~ 현재)
- 미국 국제건전성검사 학회 올해의 인물상(2007) – 한국인 최초 선정
- 8편의 SCI 급 Journal 편집 위원 역임

주요과제 수행이력

- [한국에너지기술평가원] 수소충전소 고장예지 및 안전관리 상용화 기술개발 (2020~2024)
- [국방과학연구소] 손상탐지 무선센서와 비행체 통합기술 (2020~2024)
- [한국전력공사] 이미지 모션증폭 기반 발전설비 구조물 결함탐지 자동화기법 개발 (2020 ~ 2021)
- [한국차량공업] 특수목적차량용(7~12톤급) 확장성 있는 다목적 샤시 구동 플랫폼 개발 (2017 ~ 2021)
- [현대자동차 능동형 제동 소음제거기술 특화개발 (2016 ~ 2018)
- [한국원자력연구원] 진동신호의 통계적 분석을 토한 펌프회전 시스템의 상태 진단 및 예단 알고리즘 개발 (2015 ~ 2017)
- [기아자동차] 501차량 내구해석 입력하중 최적화 개발(2016~2017) 외 다수

졸업생 진로

- 현대 제철, 삼성 전자, SK 등 주요 대기업 품질 및 생산 관리, R&D 직
- 한국자동차연구원, 한국광기술원 등 연구직
- 전남대학교, KAIST 박사 진학

Active Structures & Dynamics Lab.

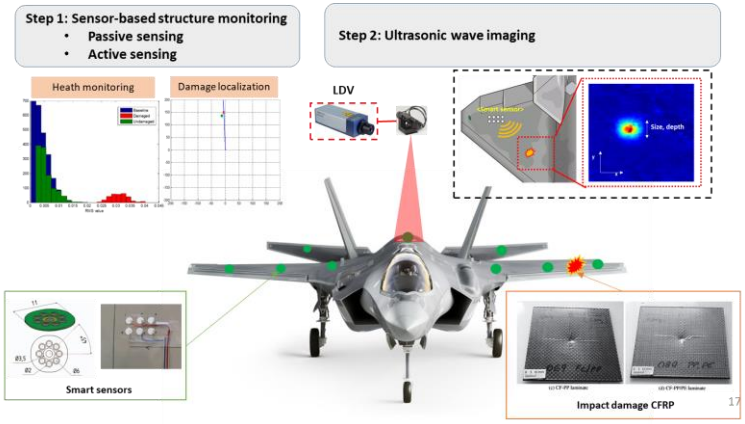
박규해 교수

연구분야 소개: SHM & NDE

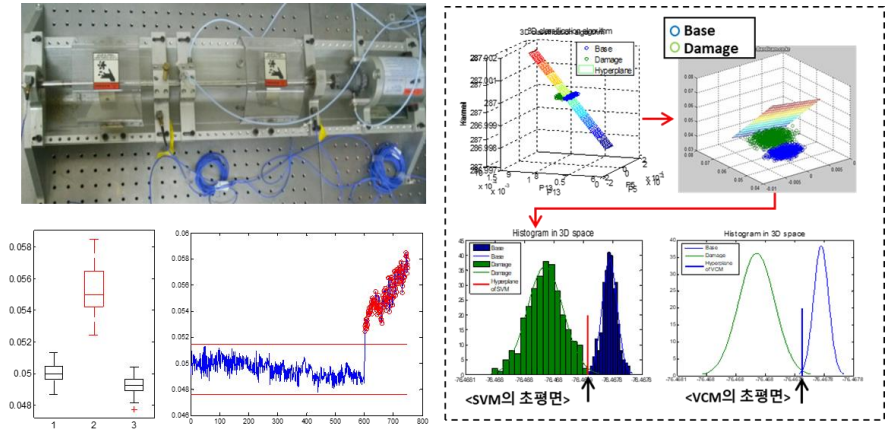
- 구조건전성 모니터링 (SHM): 센서 네트워크와 신호처리를 통한 실시간 구조물 상태 진단 기술
- 비파괴검사 기술(NDE) : 레이저, 카메라 등을 활용하여 재료의 변형 및 상태 변화 없이 구조물의 결함 탐지
- 상태 진단, 회전체 진단 기술 : 상태 진단 정보에 기반한 회전체 시스템 진단, 결함 분류 및 예측 진단
- 구조물 상태 기반 기기 운용을 통한 구조물 유지보수의 효율성 향상

기술 소개: 센서 기반 SHM & NDE

- 구조물 충격 및 결함 위치 탐지를 위한 PZT 스마트 센서 기반 능동/수동 센싱 기법 개발
- 최소한의 센서 수로 거대 구조물 충격/결함 위치 탐지를 위한 L-형상, T-형상 등 스마트 센서 배열 개발
- 회전체 시스템의 초기이상상태 감지를 위한 머신러닝 기반 진단 및 결함 분류 알고리즘 개발



<스마트 센서 배열 기반 구조물 충격/결함 탐지 시스템>



<머신러닝 기반 회전체 진단 알고리즘>

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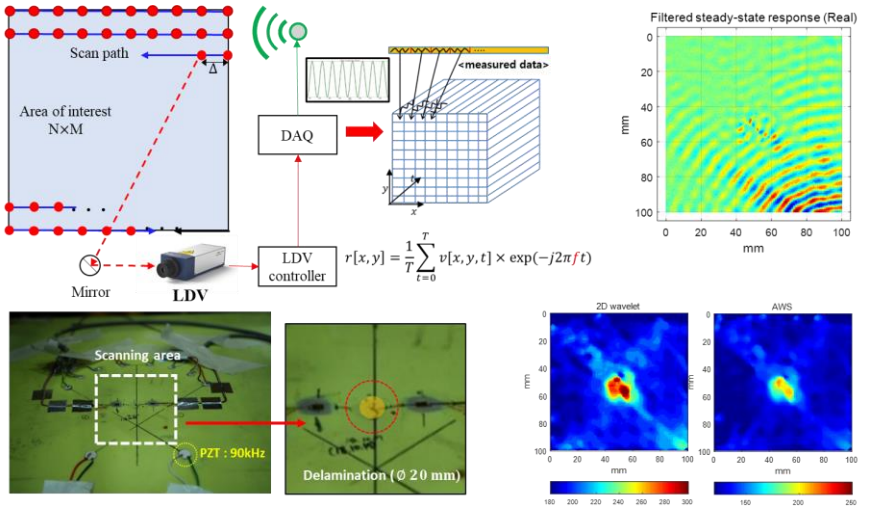
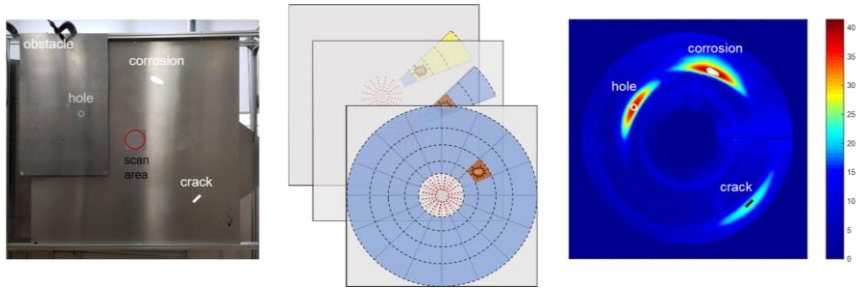
박규해 교수

기술 소개: 비접촉식 SHM & NDE

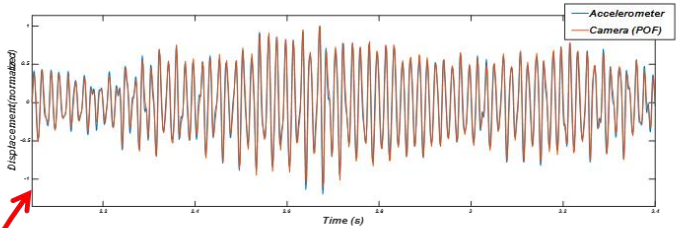
- 거대 구조물에 효과적인 구조건전성 모니터링 및 비파괴검사를 위한 레이저, 카메라를 이용한 비접촉식 센싱/ 진단 기법 개발
- 레이저 스캐닝 활용, 파수 변화 추적 기반 결함 탐지/형상 정량화 기술 및 유도초음파 빔포밍 영상화 기법기반 진단 기술 개발
- 카메라 활용, POF 및 모션 증폭기반 영상 내 미소 진동 모션 측정 및 SHM 프로세스를 통한 구조물 진단 기술 개발



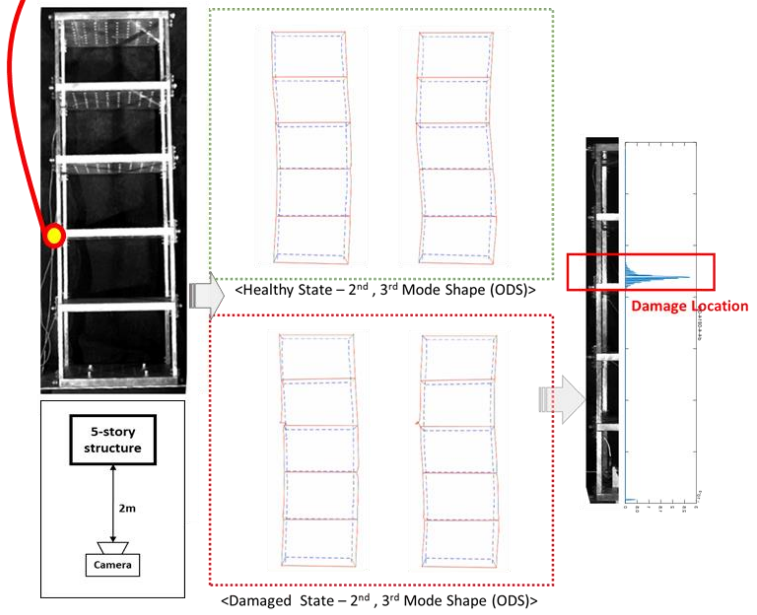
<레이저 스캐닝 기반 항공기 날개 구조물의 결함 탐지>



<유도초음파 빔포밍 영상화 기법을 통한 거대 구조물 결함 탐지>



<카메라 영상 기반 vs 센서 기반 진동 측정 결과>



<카메라 영상 기반 미소 진동 구조물의 상태 진단 기술>

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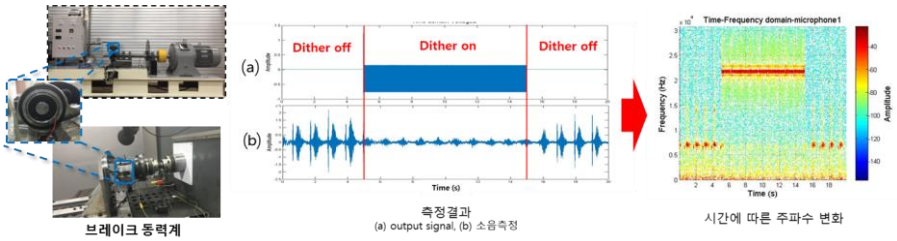
박규해 교수

연구분야 소개: 차량 동역학 및 소음/진동

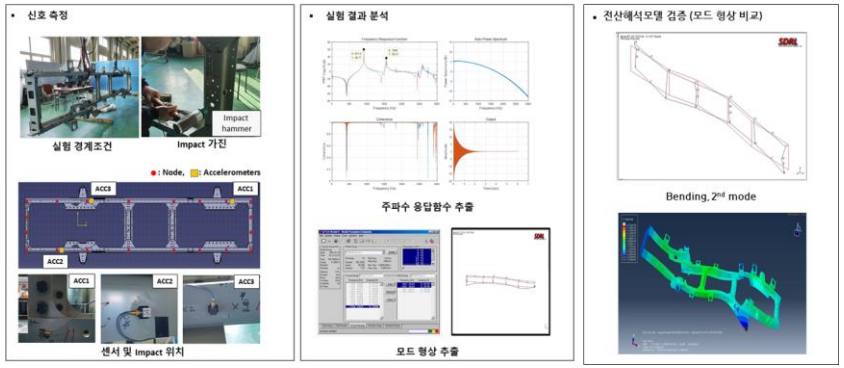
- 소음/진동 분석 및 제어
- 차량 동역학 및 구조 해석: 전산해석모델 기반 차량 주행 안정성 및 내구성 평가

기술 소개: 차량 동역학 및 소음/진동 분석

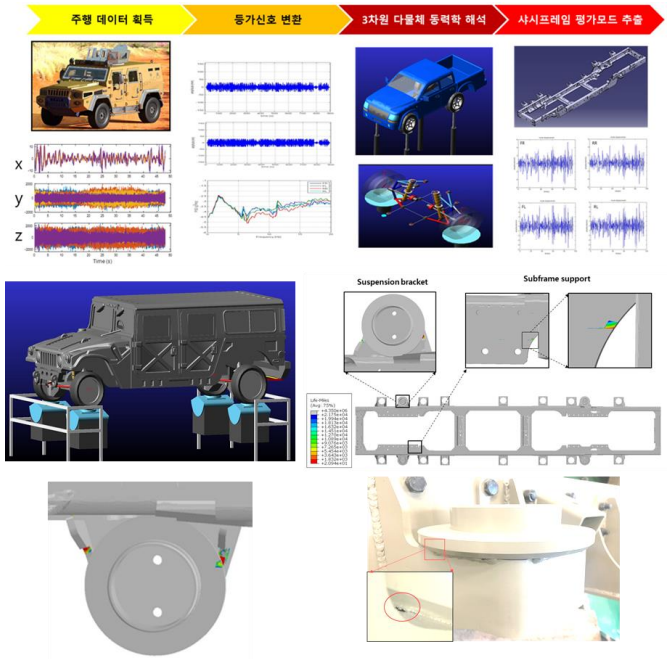
- 실구조물 모달 시험 및 전산해석 모델 기반 검증 수행
- 디더를 통한 차량 브레이크 스퀼 소음 제어 기법 개발
- 차량 전산해석 모델을 통한 내구성 평가 모델 개발 및 취약부 예측 결과에 따른 개선 모델 개발



<차량 브레이크 Dynamometer 에서 디더 제어를 통한 스퀼 소음 저감>



<실제 차량 프레임 대상 모달 시험 및 검증>



<차량 전산해석 모델 을 통한 내구성 평가 및 파단부 예측>

Multiscale Flow Control Lab

Department of Mechanical Engineering, Chonnam National University

Principal Investigator Prof. Jinsoo Park, Ph.D.

Education

Ph.D. KAIST (2019)

M.S. KAIST (2015)

B.S. KAIST (2013)

Research Fields

Fluid Mechanics, Microfluidics, Rheology,

Biomedical Engineering, Thermal Engineering

Flow Visualization and Image Processing

Work Experiences

Assistant Professor, Chonnam National University (2019.9. ~ present)

Visiting Professor, Technical University of Munich, Germany (2022.7. ~ 2022.9.)

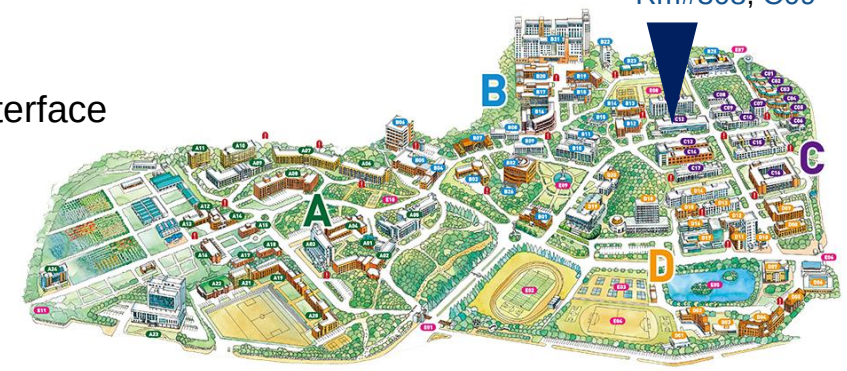
Research Professor, KAIST (2019.3. ~ 2019.8.)

MFCL website https://sites.google.com/view/mfclab

Contact Office: Eng Bdg 1A-212 (+82-62-530-1672) / Email: jinsoopark@jnu.ac.kr

Lab Location

Rm#308, C09



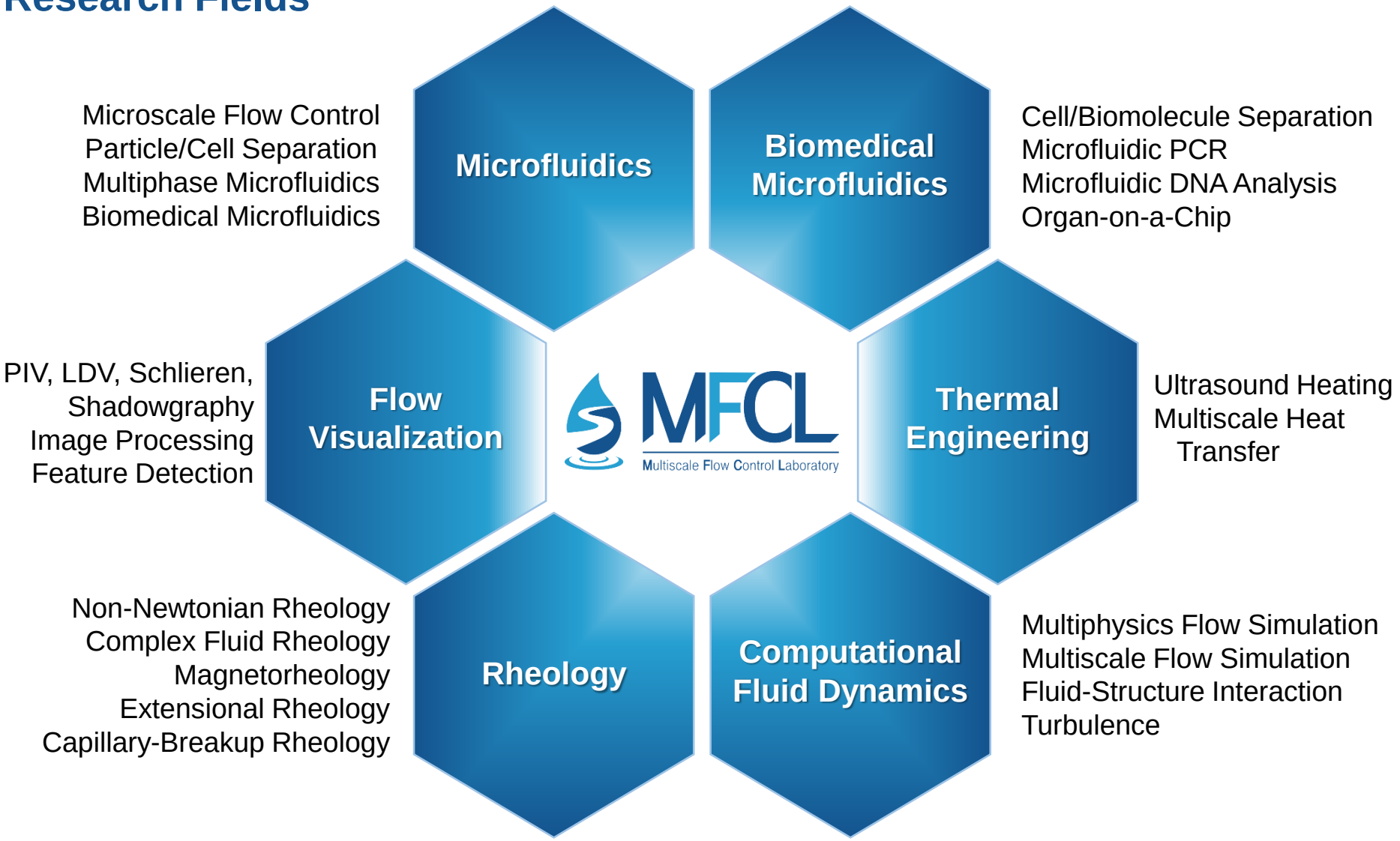
MFCL was found in 2019 by **Prof. Jinsoo Park**.

Based on fluid mechanics, his research interests are at the interface of engineering, physics, biomedicine, and chemistry. He has authored and co-authored over 30 peer-reviewed journal publications in these fields.

Multiscale Flow Control Lab

Department of Mechanical Engineering, Chonnam National University

Research Fields



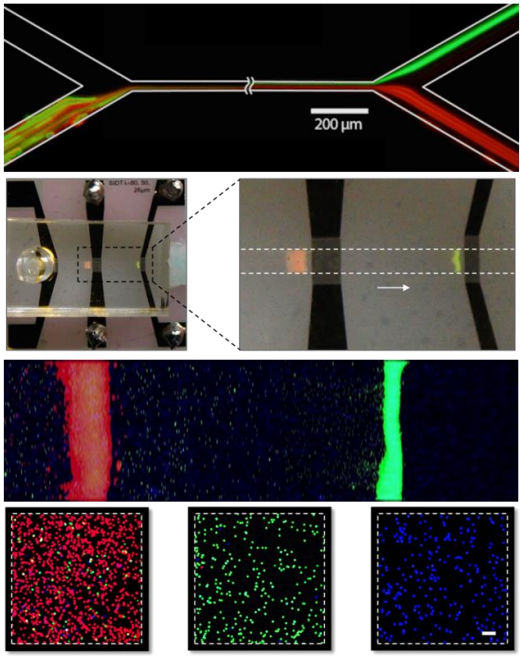
Multiscale Flow Control Lab

Department of Mechanical Engineering, Chonnam National University

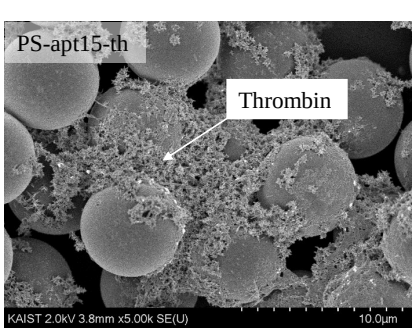
MFCL
Multiscale Flow Control Laboratory

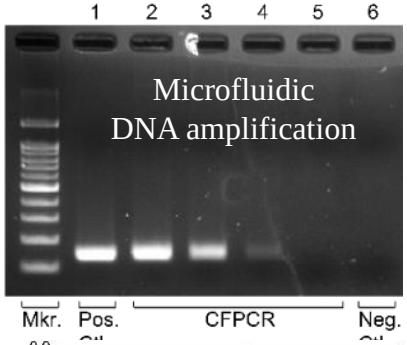
Research Highlights

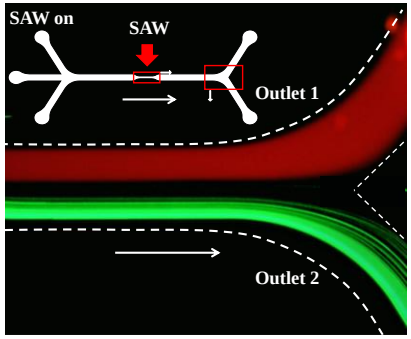
Micro-/Nanofluidics

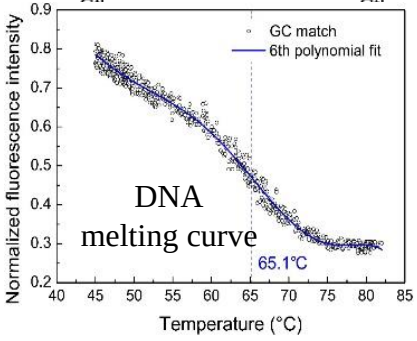


Biomedical Fluid Engineering

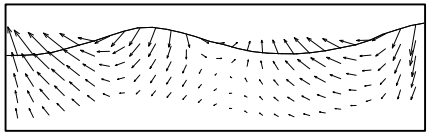


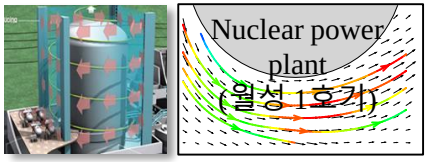




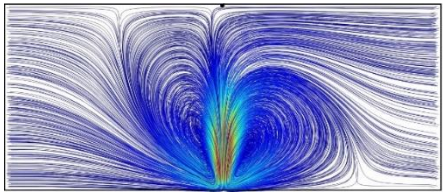


Flow Visualization





Multiphysics CFD



Multiscale Flow Control Lab

Department of Mechanical Engineering, Chonnam National University

R&D Projects

- **심혈관 환자맞춤형 차세대 정밀의료기술 개발** (한국연구재단 지역혁신 선도연구센터, 2020-2027)
- **하이드로겔 액적 기반 음향미세유체역학 원천기술 개발 및 생의학적 응용** (한국연구재단 기본연구, 2020-2023)
- **차세대 디스플레이 불량률 저감을 위한 미세유체역학 기술 개발** (삼성디스플레이, 2021-2023)
- **초음파 기반 나노메디컬디바이스 개발** (나노종합기술원, 2021-2023)
- **표면파 유도 분무 기반 전자담배/인헤일러 개발** (KT&G, 2022)
- **전산열유동해석 기반 제철소 내 소결 베드 누풍 저감 분석** (포스코/포항산업과학연구원, 2022-2023)
- **마이크로의료로봇 실용화 공통기반 기술개발 센터** (보건복지부, 2022)

Collaborators