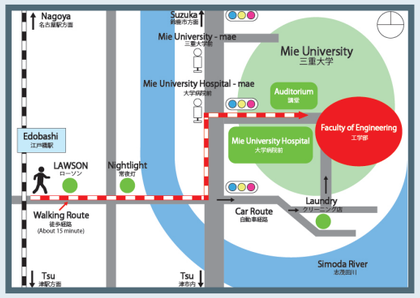
Publications

1. M.Katsumura, S.Obayashi, K.Yano, A.Hamada, T.Nakao and K.Torii, “Retractor-Type Robotic Knee Prosthesis to Prevent Fall”, Proc. of IEEE/RAS BioRob, pp.101-106, 2020
2. S.Qi, Y.Takagi, K.Yano, T.Kondoh, N.Murakami and T.Ishikawa, “Optimization of Plunger Injection Input for Die Casting Process”, Proc. of ASME IMECE, Paper No. IMECE2020-23722, 2020
3. M.Katsumura, K.Yano, T.Nakao, A.Hamada and K.Torii, Involuntary Movement Suppression Filter for Electric Wheelchair with Athetosis-Type Cerebral Palsy, Proc. of IEEE ICDL-EpiRob, 2020
4. R.Tsuzuki, T.Itami, K.Yano, T.Aoki and Y.Nishimoto, “Robotic Knee Orthosis for Hemiplegic Patients to Prevent Falls during Walking Rehabilitation, Proc. of ASME IMECE, Paper No. IMECE2019-10382, 2019
5. M.Katsumura, S.Obayashi, K.Yano, A.Hamada, T.Nakao and K.Torii, “Robotic Prosthesis that Maintains Flexion Posture”, Proc. of IEEE EMBC, pp.6652-6656, 2019
6. Y.Ogata, M.Katsumura, K.Yano, T.Nakao, A.Hamada and K.Torii, “Joystick Grip for Electric Wheelchair for Tension-Athetosis-Type Cerebral Palsy”, Proc. of IEEE EMBC, pp.1666-1669, 2019
7. T.Itami, K.Yano, I.Mori, K.Kameda, T.Aoki, N.Matsui, M.Sugawara, N.Shinoda and N.Hayashi, “Mechanical Orthosis with Rotation Induction to Lower Leg for Patients with Knee Osteoarthritis”, Proc. of IEEE ICORR, 2019
8. N.Mizutani, H.Matsui, K.Yano and T.Takahashi, “Vehicle Speed Control by a Robotic Driver Considering Vehicle Dynamics for Continuously Variable Transmissions”, Journal of Robotics and Mechatronics, Vol.30, No.2, pp.300-310, 2018
9. M.Katsumura, T.Shimodaira, K.Yano, A.Hamada, T.Nakao and K.Torii, “Multiple Linkage Type Robot Prosthesis to Prevent Trip and Fall”, Proc. of IEEE/RAS BioRob, pp.744-749, 2018
10. T.Itami, K.Yano I.Mori, K.Kameda, T.Aoki, N.Matsui, M.Sugawara, N.Shinoda, T.Kishida and N.Hayashi, “Walking Support Orthosis with an Lower Thigh Rotation Mechanism for Patients with Knee Osteoarthritis”, Proc. of IEEE AIM, Paper No.102, 2018

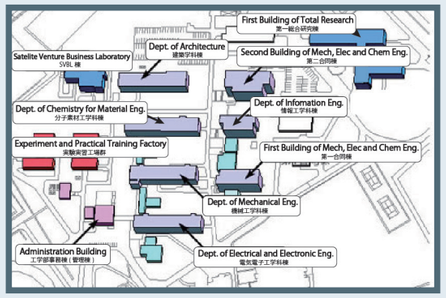
(Excerpt from 2018-2020 Research Papers. For other publications, please visit our website.)

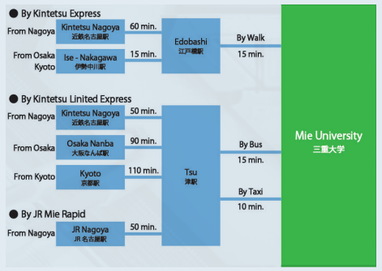
Access

Campus Map of Mie University & Access Routes to Mie University



Campus Map of Intelligent Robotics Laboratory





Contact

1577 Kurimamachiya-cho, Tsu City, Mie 514-8507, Japan
Intelligent Robotics Laboratory,
Department of Mechanical Engineering,
Faculty of Engineering, Mie University
yanolab@robot.mach.mie-u.ac.jp

Websites

Intelligent RoboticsLaboratory
http://www.robot.mach.mie-u.ac.jp/

Faculty of Engineering, Mie University
http://www.eng.mie-u.ac.jp/

Information

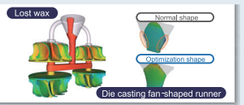
Now we introduce a new service, system analysis and design

Development of the optimization system to solve design problems of liquids

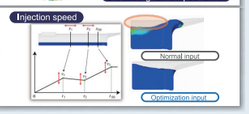
☐Original optimization design algorithm with a high degree of freedom and high efficiency
☐Flow, heat transfer and solidification analysis ☐Multi-objective optimization ☐Automatic control

Examples of application

■ Proposition of casting plans



■ Injection input design for die casting



■ Trajectory design for liquid transfer

■ Shape input design for gravity casting

■Shape design of flow path, vibration control and positioning control etc. ※For more information, visit our website.

We can solve any design problem involving liquids. Please feel free to contact us.

Intelligent Robotics Laboratory

Robotics/Mechatronics Area, Mechanical Engineering Course,
Faculty of Engineering, Mie University

MIE UNIVERSITY

Robotics/Mechatronics Area, Mechanical Engineering Course,
Faculty of Engineering, Mie University

Creation of Social Support System for Human- Machine Coexistence

1 Creation of Intelligent Mechanical Systems
Autonomous and Intelligent of Mechanical Systems

2 Creation of Human Support Technologies
Development of Human Support Technologies

3 Creation of Functional Innovation Systems
Elucidation and Innovation Human Functions

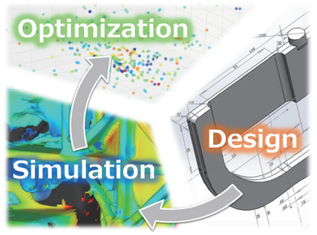
System and Control Engineering
- Robust control
- Fluid behavior control
- CFD shape optimization
- Vibration control and motion control
- Remote control systems

Information and Communication
- Navigation systems
- Development of AI systems
- CFD simulations
- Operation support systems
- Haptic devices

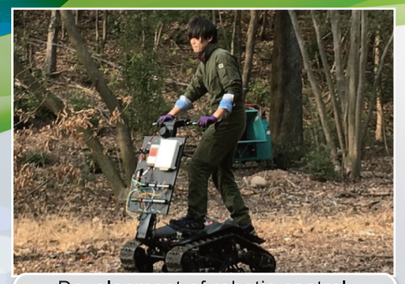
Robotics and Mechatronics
- DX technology using AI
- Hard work support robots
- Development of decarbonization technologies
- Control of casting process
- Driving support system

Life, Medicine and Welfare
- Robotic prosthetic limb and orthoses
- Life support robots
- Rehabilitation systems
- Nursing care support systems
- Diagnostic imaging system

Development of rehabilitation robots for the best usage of residual muscle strength



Optimal design technology that combines CFD optimization and AI system to maximize quality



Development of robotic control systems for the support of hard and dangerous works

Research Targets

Intelligent robots exist that have the human abilities of "judgment" and "learning". Human support robots provide backup in dangerous and difficult work environments with machine that realize symbiosis between humans and machines. In Intelligent Robotics laboratory, we aim to develop human-centric robot-control technologies that achieve human-machine cooperation, as well as to create machine systems and intelligent robots that contribute to society. Our research ranges from basic to practical studies. Basic studies include development of human-machine interfaces using biological signals and haptic systems that improve the force-sensing and touch-sensing abilities of humans. Practical studies include medical and welfare robots that aim to enable self-support and functional recovery for people with disabilities. Moreover, in order to support the super-aging society, we develop nursing care support systems and support robots to assist heavy labor work in factories. We especially focus our efforts on industry-academia collaborative research. We study optimization in producing processes of Sokeizai such as auto parts and human support robots in the field of medical services and welfare by forming collaborative project teams with companies. In the future, we will further focus our efforts on: in the medical field, development of medical service and welfare robot technologies to overcome the challenges of the aging society that we will soon face; in the field of production, development of support technologies that provide world-class quality and performance. To achieve the goal of creating new industry, we will particularly focus on expanding our original technologies for the optimization of fluid behavior into the field of life and medical sciences, such as regenerative medicine and drug discovery process, as well as into the field of design optimization of molds and products, which are the core of manufacturing technology.

Research Projects

Robotic Orthosis and Rehabilitation Systems

We develop a wearable robot(active cast) that transmits residual muscle force to the hands for people who have upper limb function disabilities. Apart from daily living assists, it is also expected to have a functional recovery effect. We also develop shoulder, knee, and ankle mounted robots to support rehabilitation and daily life by expanding the scope of our research to include walking support for hemiplegic patients.

【Support for operating wheelchair by active cast】

Process Control Systems to Improve Product Quality and Productivity

We analyze thermo-fluid phenomena in medical product manufacturing processes and heat treatment processes, and develop process control systems to improve product quality and productivity. In addition, we develop decarbonization technology for large plants and DX technology for production systems.

【Heat treatment control system】

Assistive Robots and Nursing Care Systems

We develop welfare robots and nursing care systems to support the independence of people with severe disability. We also develop a robotic prosthesis to consider fall prevention, transfer assist robot for the purpose of restoring bodily functions, as well as assistive devices for watching over dementia patients to prevent falls.

【Robotic prosthesis to prevent fall】

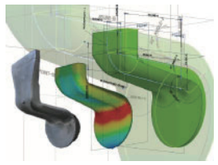
Wheelchair-Mounted Robot Arm System

We develop electric wheelchair-mounted robot arms which could help the patients with upper limb dysfunction to perform daily activit ies.We also develop control systems for patients of muscular dystrophy to avoid obstacles by using minute movements of the thumb.

【Robot arm for electric wheelchair】

Automation and Optimization of Casting Process

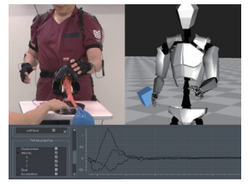
We develop optimization systems using computation fluid dynamics (CFD) and study the casting process to realize high-quality, high-functionary and high durability products. We also study shape optimization ofmolding process.



【Optimum shape of die-cast product】

Advanced Medical Systems in Cooperation with University Hospital

Under the medical and engineering cooperation system with the Mie University Hospital, we develop advanced medical systems such asdesigning a delirium prediction model using machine learning and respiratory rehabilitation effect measurement system.



【Technique analysis by motion capture】

Autonomous Mobile Robot for Hazardous Work

We develop autonomous mobile robots that enables people to work safely in dangerous and adverse environments using remote control or automatic control.We also develop work support systems to prevent industrial accidents and reduce the workload of workers.

【Vacuum work robot for hazardous work】

Driving Support Systems to Estimate Driver's Intentions

We develop system that estimate driving intentions and suppor driver by learning various drivers' operational sequences under various situations. In addition, we develop personal mobility for next generation.

【Driving support systems】

Members

Professor: Dr. Ken'ichi Yano

Associate Professor: Dr. Norihiko Kato

Assistant Professor: Dr. Hirokazu Matsui
Dr. Ryota Sakamoto

Technical staff:
Yuto Takagi

Research fellow:
Ryusei Kawatani, Yukiko Nishinohira, Naoaki Tsuda

Research support personnel:
Takeshi Oishi,Takanori Kiryu,Eiji Hayashi

Secretary:
Kayo Ichimura

PhD Students

Yuto Takagi (3rd year) Shen Tian (3rd year) Motoyu Katsumura (3rd year)
Lai Jun Yang(3rd year) Yota Oppata (2st year) Rei Ito (1st year) Song Qi (1st year)

Graduate Students (2nd year)

Haru Ando Go Katsube Yuuki Taniguchi Takuma Nagaoka
Kohei Yada Kasumi Yamaguchi Tsubasa Yamatogawa

Graduate Students (1st year)

Kazuma Kubota Riku Shibahara Rio Takeuchi Yuuki Nakagawa
Yoshimasa Nakano Takumi Nakahama Itsuki Hirahata Daichi Minamide

Undergraduate Students (4th year)

Akihisa Adachi Kazuki Abe Reijiro Kusunoki Ryoma Koizumi
Sayfullayev Sardorbek Masaki Senzaki Ayuri Takitani
Naoya Tanizawa Hikaru Nakaseko Itsuki Hamada Kaito Yamamoto

(October 2021)