Division of Mechanical Science and Engineering	Research field	Bio-Innovative Design	Lab. ID MS22
Laboratory web site	http://bios.w3.kanazawa-u.ac.jp/engineering/		

Research subjects

Biomechanics of human body for medical treatment, welfare and health technology by using CAE (Computer Aided Engineering) are studied in this study group. Furthermore, biomechanics of animal and plant for considering mechanical adaptation of nature and "Bionic Design" (bio-inspired design) to apply engineering design are studied. We analyze mechanical stress and strain condition on the inside of human body to approach clinical problem involved biomechanics by using CAE such as finite-element method and simulation procedure of musculoskeletal system. We also analyze stress and deformation of animal and plant, which have special structure, tissue and function, to get inspiration for mechanical engineering design.

Master/Doctor course: Education policy, curriculum, typical activity in the laboratory

Graduate students have a seminar about biomechanics and bionic design by all the members as well as standard tuition. In the seminar, students give presentation about current results of own research subject, or review related papers, and have a free discussion with exchanging their ideas. All of the presentation, review and discussion is held by English.

Daily life in the laboratory, etc.

We study collaborating with the nursing laboratory and the orthopedic laboratory of medical science school, so students have chance to interchange with researchers of the different fields. There are unusual materials and equipment in the laboratory as the mechanical engineering, such as a hospital bed, dummy models of human body, skeletal preparations, etc.

Message or comments by the laboratory faculty staffs

We think "learning by yourself" is a basis for graduate student's research. Graduate students should work on their research subjects while deepening the understanding by their pace. A different field exchange can make new idea and technology, therefore discussion between the students who work on a different subject is important to rise their knowledge and capacity.

Recent Master theses in these 3 years (+ more if appropriate)

year.month	Thesis title (including English translation of Japanese thesis title)
2021.9	A study on mechanical evaluation of spinal fixation structure using the PEEK cage with pedicle screws
2021.3	Structural optimization by bio innovative design applying bone shapes
2021.3	Mechanical engineering considerations by computational mechanics analysis of ancient Egyptian chariots
2021.3	Development of calibration method between multiple sensors in self-driving cars
2021.3	Deceleration control of autonomous car reflecting passengers' discomfort using reinforcement learning
2020.3	Estimation of exerted force in manual lifting task using wearable device
2020.3	A study on mechanical evaluation of crab's chela
2020.3	Evaluation of mental workload during automobile driving based on eye-movement measurement
2020.3	Evaluation of the influence of sit-standing posture on muscle load by experiment and simulation
2019.3	Development of thermal deformation analysis model of multitasking machine tool with turrets considering bed
2019.3	Optimum design of thin walled structure using evolutional computation and buckling analysis considering compression and bending load
2019.3	A study on musculoskeletal analysis of giraffe neck in swing motion and its mechanical adaptation
2018.3	The mechanical evaluation of body pressure dispersion mattresses by numerical analysis and understanding the characteristic
2018.3	A study of optimum design for prosthetic socket
2018.3	A study on seed ejection function of Orixa Japonica by finite element analysis
2017.3	Development of the bio-innovative design technology using bone shape and its applications
2017.3	A study on finite-element analysis of curved folding structure and its application
2017.3	A study on efficiency of the bedsore prevention mattress by using musculoskeletal models
2017.3	A study on optimum design of stiffeners layout of thin-walled structures considering buckling
2016.3	Development of Design Optimization Technique of Cross-Sectional Shape of Thin Walled Structure by Evolutionary Computation Considering Buckling

2016.3	The Development of a Hip Dummy Model for Mechanical Evaluation of Body Pressure Disperssion Mattresses
2015.3	Development of a finite-element model of the buttocks for using mechanical evaluation of body pressure dispersion mattress
2014.3	A study on the orthodontic force by using the orthodontics simulation based on a stress of a periodontal ligament
2014.3	Mechanical analysis of giraffe neck by using musculoskeletal model
2013.3	Finite element analysis of bone stress and muscle force in the musculoskeletal system of spine
2013.3	Development of a finite-element model of the human finger and its application for injury risk assessment
2013.3	Optimization of cooling channel of a plastic injection molding die by using a topology optimization method
2013.3	A study on a rocking mechanism of curved folding plastic sheet
2012.9	The optimization design of cooling fin of LED heat sink
2012.9	A study on the risk evaluation of the wrist bone fracture due to fall down
Recent Doctoral theses in these 3 years (+ more if appropriate)	
year.month	Thesis title (including English translation of Japanese thesis title)
2019.3	A Study on Development of Evaluation Method for Thermal Deformation of Multi-tasking Machine and Its Applications
2012.9	Optimum design of HGV front structure for pedestrian safety
2010.9	A study on the residual stress of the autochory plant fruits
2006.3	Development of an individual mechanical analysis method of bone based on medical images and its application
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