List of Dissertation Abstract （Environment and System Sciences　System Design Course）

Name	Supervisor	Title	Abstract
Tomoki HIRAKAWA	Toshihiko SHIRAISHI	A Study on Generation Mechanism of Vibration and Noise in Wet Clutch	In this paper, vibration and noise in wet clutches in automatic transmissions were experimentally investigated. The experimental setup was composed of clutch plates, dram, and shaft. I measured the vibration of one of the plate and the noise around the frictional surface. As a result, I suggest the generation mechanism of vibration and noise.
Satoru AKAO	Shin Morishita	Development and Experimental Investigation of an Energy-Regenerative MR Damper	Magneto-rheological (MR) Grease is known as smart materials which can change rheological property by magnetic field. MR damper uses MR Grease as working oil and it can change damping property. In this study, an Energy-Regenerative MR damper was fabricated and investigated experimentally.
Taiki IKENOUE	Seiya UENO	Study on Optimal Guidance Law with Constraint on Controller Input for Space Transportation System	This paper discusses onboard guidance trajectory generation for Reusable Launch Vehicle (RLV) at Terminal Area Energy Management (TAEM). RLV is expected to play an important role as a future space transportation system. The paper proposes optimal guidance law with a constraint on a lift for a stall avoidance at a mission requiring a sharp turn. Optimal guidance law is calculated by homotopy method whose calculation costs are low. Consequently, the optimal guidance law suggests that a lower altitude trajectory enables a winged-rocket to track the guidance trajectory more easily because the rocket gets a larger available lift.

Takahiro ISHIKURA	Kazumi MATSUI	Finite Element Analysis of Particular Model with Membranes for Surgical Simulators	In this paper,we discuss finite element analysis of soft tissue with membranes for surgical simulators.We propose a method to keep from membranes turning inward of soft tissue.We discuss validity of finite element model used retrospective study in view of mechanical behaviors.
Takuya Endo	Takahiro Yamada	Multi-Scale Simulation for Anisotropic Ductile Failures	In this paper, the microscopic process of ductile failure is studied by using the multi-scale simulation. Especially, the void growing in their microstructures are simulated without any special models for ductile failures. By virtue of the multi-scale modeling method, the micro-structures give typical macroscopic ductile failures, such as softening behavior and its dependency on the macroscopic stress triaxiality and Lode angles.

Chie SAKAKURA	Takahiro YAMADA	Research of reinforcing rods in concrete position estimation by response surface method	It is necessary to detect reinforcing rods in concrete to ensure the earthquake resistance. As a method that they detect reinforcingrods are nondestructive inspections,is nondestructive inspections by using electromagnetic wave.Currently,a study of reinforcing rods in concrete position estimation by inverse analysis of using simulation results is done.In this study,I estimate a reinforcing rod in concrete position accurately by using Finite Difference Time Domain method and Response Surface Method.I evaluated the coordinate that the fitness by using Response Surface Method is minimum value,thereby confirmed that I estimate reinforcing rods in concrete
Kyohei SHINOMOTO	Seiya UENO	Online Trajectory Optimization using Receding Horizon Guidance Control for Unmanned Vehicle	It is confirmed that receding horizon guidance control (RHGC) and waypoint generation algorithm proposed in this study are useful for the development of the autonomous UAV. The RHGC is developed for guidance control with the real-time trajectory optimization. The waypoint generation algorithm is developed for collision avoidance. The experiment of rover is conducted to evaluate the usability of the real-time trajectory optimization, and the simulations are held to evaluate the usability of the RHGC and the waypoint generation algorithm in this study.

Kentaro SUDA	Seiya UENO	Study on Guidance and Control Law during Powered Descending Phase for a Lunar Lander with Modelling Error	SLIM Project plans to achieve high precise and high accurate landing and exploring with less as possible the cost. This study focus on powered descent phase witch starts from an orbit around the moon and arrives over the target point. Descent trajectory and control input value are decided by the EOM assumed before launching. However, real EOM is different from assumed EOM and the difference influence guidance and control. This paper shows result of simulation that is applied estimation result to guidance law and effect of navigation error that is caused by characteristics of sensor.
Kensaku TAKAHASHI	Motohiko MURAI	An investigation of electric generation efficiency of semi-submersible type floating offshore wind farm based on spatial distribution of dynamic responses in waves	Currently, the number of research on floating offshore wind turbine is increasing. The high demand for renewable energy gives wind energy an opportunity to become most heavily used energy resources in the near future. In this study, using an existing program, I calculate whole of motions of each turbine in a wind farm and analyze the relative velocity between pitch motion velocity and wind speed. In addition, I draw the spatial distribution of wind farm capacity factor and electric-generating capacity due to the velocity. From that in waters close to japan, moreover, I also investigated the installation system of Semi-Submersible type wind farm that effects for capacity factor.

Kazuho TAKESHIMA	Ken NAKANO	Changes in dynamic characteristics of elastic contact due to sliding	Focusing on the sliding friction of elastomer, an experimental apparatus has been developed, which measures the dynamic characteristics of the contact in the sliding friction. The effect of the sliding on the contact stiffness and contact damping was measured, and was considered from the viewpoint of the change in the contact area due to the sliding.
Ryusuke TANIGUCHI	Shin MORISHITA	Prediction of Customer Behavior in a Store as a Complex System	Simulation of customer behavior in a store was conducted. Customers move and purchase items depending on the store layout, so the store layout have large effect on amount of sales. But it is difficult for retailers to design the best layout, because there are large amount of items which influence customers. Customer behavior can be considered as one of Complex Systems. Cellular Automata (CA) is an useful modeling method for Complex Systems. By using CA, the relationships between customer and items in a store was modeled. As a result, the customer behavior depending on the store layout was predicted.

Yoshito TSUJIMOTO	Seiya UENO	Study on Relative Relation Analysis and Control of Debris Capture with Super Multi-link Space Manipulator	There are some plans of debris capture systems under study because Active Debris Removal is one of the most important issues in future space development. We treat a debris capture system with super multi-link manipulator, which has unique, flexible arms. This paper focuses on the state transition of the debris capture on basis of Extended Resolved Motion Rate Control. The state transition realizes to avoid the undesirable state to capture debris and to improve the criterion “Controllable Time” with a singular passage method. This paper shows the simulation results under limited conditions and the suggestion of the structure and control design.
Tomohiro FUKUNO	Toshihiko SHIRAISHI	A Study on Effects of Local Dynamic Mechanical Stimulation on Cell Migration	Cells have mechanosensors that convert mechanical forces into biochemical signals. According to recent reports, one of mechanosensors is focal adhesions. Here I apply dynamic stimulation to a single cell through focal adhesions and investigate the effects of the mechanical stimulation on cell migration.

Atsushi HORIGUCHI	Toshihiko SHIRAISHI	A Study on a Mechanosensing System of a Cultured Osteobalast Considering Deformation Distribution	This study shows a novel method to investigate a cell mechanosensing system and the quantitative relationship between the deformation distribution of cytoskeletal structure and the change of intracellular calcium ion concentration as biochemical response in a living cell stimulated by a micropipette.
Takanori MATSUOKA	Kazumi MATSUI	Powder Packing Simulation Considering Particle Shape	In this study, we propose a numerical simulation based on Distinct Element Method (DEM) considering the effect of particle shape in powder packing. We employ spherical elements with the interaction between particles to simulate behavior of powder material. The interaction consists of rolling friction and cohesion to reproduce the property of maintaining packing structure. Therefore, we estimate appropriate cohesive force. In comparison to the packing structure of characteristic shape, we microscopically consider the packing structure of our proposal powder model. To validate a numerical simulation packing in a mold with complex shape, we perform analysis of toothed-wheel model evaluate packing ratio.

Hioraki MIURA	Kazumi MATUI	Implementation of self-contact model in Isogeometric analysis	In order to simulate the self-contacting which occurs in axial compression test for the wave-shaped shells by Isogeometric analysis, the self-contact algorithm based on the Knot-to-Surface contact is implemented in this research. Defining a contact functional with penalty method, discretized equilibrium equation and its linearized one are derived in the context of Isogeometric analysis. Furthermore pairing algorithm which are different from the usual two-bodies contacting are developed to setup the simulation models. Representative numerical simulations show their validity in small strain and large deformation problems.
Hirataka MISAKI	Toshihiko SHIRAISHI	A study on Vibration Control of a Structures by a Shear Type Semi-active Damper using Magnetorheological Grease	Magnetorheological (MR) fluid is known as a kind of functional fluid which changes rheological property when external magnetic field is applied. However, there is a problem with the sedimentation of the dispersed particles. To prevent the sedimentation, MR grease was developed. In this study, I verified the performance of the developed shear type semi-active damper using MR grease. The performance test demonstrated that the proposed damper has wide dynamic range of damping force and that it keep the performance after keeping it in static state for nine days. The vibration control test demonstrated that the vibration response was reduced by a simplified skyhook algorithm.

Jun YAMANOI	Motohiko MURAI	A study on dynamic response characteristic of underwater platfom in waves	Recently, renewable energy is getting a lot of attention in Japan. Underwater platform that is a system to connect multi-FOWT under water was proposed for the purpose of enhancing productivity of Floating Offshore Wind Turbines. The underwater platform can decrease responses in waves and keep relative distance of each turbines. The underwater platform is long and large structure, so we cannot ignore the effects of elastic responses. In this thesis, the response characteristic was considered by the tank test and the calculation. The underwater platform of large draft can decrease responses in waves.
Keisuke YONEDA	Kazumi MATSUI	Applicability of Homogenization Method for Unsteady Problems	In this paper, the applicability of a space-time homogenization method is discussed for unsteady state heat transfer problems. Changing the relative dimensions of small parameters for time and space, various set of two scale boundary value problems are studied from mathematical and physical points of views. Three different type of two scale boundary value problems are validated, in each of which, only the macroscopic or the microscopic changes can be described. Representative numerical simulations are introduced to show their differences in simplified one-dimensional problems.