Division of Environmental Studies

Department of Human and Engineered Environmental Studies

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Multi-Scenario Simulation Laboratory (Okuda-Hashimoto Lab.)	Dr. Hiroshi OKUDA Dr. Gaku HASHIMOTO	Using advanced computational environments such as post-peta scale supercomputer, CPU-GPU hybrid system etc., elucidation of various complicated phenomena inevitable to industrial design and manufacturing and development of efficient simulation techniques and software have been done. Specifically, following three areas are focused on: [Area 1] Research on HPC (High-Performance Computing) middleware for post-peta scale parallel computer system 1-1 Common function libraries for parallel FEM (finite element method) 1-2 Parallel iterative and/or direct solvers suitable on multicore, hierarchical and heterogeneous computer environments 1-3 Cloud CAE system for parallel FEM structural analysis [Area 2] Research on parallel structural FEM software “FrontISTR” and its applications to industrial problems 2-1 Numerical methods for nonlinear and/or coupled problems in industrial design and manufacturing 2-2 Joint research projects with industries: Static analysis of aneurysm imposed by pressure, Dynamic rolling contact analysis of wheel and rail, Large-deformation analysis of filled rubber, Seismic wave propagation in large ground area with faults, Analysis of warp at reflow soldering of print circuit board, Thermal stress analysis of pressure vessel, etc. [Area 3] Research on environmental agents for the simulation of	High Performance Computing, Parallel Finite Element Method, Linear Equation Solver, Computer-Aided Engineering, Structural Analysis	Title : Parallel Computing and Practical Finite Element Structural Analysis (1-2 weeks) Parallel computing is learned from both sides of hardware and software. Basis of Linux computer and network is learned and a PC-cluster (a trial parallel computer) connecting several PCs is built. Parallel computation using MPI (Message Passing Interface) is experienced using the built PC-cluster. (1-2 weeks) Introduction of continuum mechanics, structural analysis and FEM. These basic knowledge are necessary for doing the final stage of the project below. (1-2 weeks) Do parallel finite element structural analysis, which is widely used as a simulation tool in CAE field. Besides the parallel FEM by “FrontISTR”, CAD modeling, mesh generation, setting analysis conditions and visualization of results are also learned. Participants are given work spaces and computational environments in our laboratory. Schedule is flexible depending on participants’ background and the progress of works. Contents of projects are not limited to the above depending on the participants.

		building low-carbon society 3-1 Common function middleware “MADS/SAGS” for multi agent simulation 3-2 Diffusion simulation of low-carbon energy technologies e.g. fuel cell vehicle, building of hydrogen society 3-3 Hybrid methods of CFD (Computational Fluid Analysis) and SOM (Self Organization Map) knowledge base for controlling temperature of molten steel		
Simulation of Complex Systems Laboratory	Dr. Yu CHEN	In our lab, fields of research range from social-economic, complex fluid, to biological systems. There are three research directions: (1) Multi-agent cooperative evolutionary games for modeling and simulations of financial markets; (2) Discrete kinetic models for the simulation of complex fluids; (3) Cellular automata and heterogeneous stochastic agent models for the simulation of cancers.	Complex Systems, Agent-based modeling, Financial Markets, Soft-condensed Matters, Cancer	In the program, a small project will be assigned to the visiting student, basically relating to model construction and computer simulations. The specific complex system for study depends on student’s interest. It could be a financial market, a solution including colloid, or a growing tumorous tissue. Apart from the research activity, visits of the supercomputer center, scenic sites surrounding Tokyo, etc. are also being scheduled.
Human and Environment Informatics Laboratory	Dr. Shin’ichi WARISAWA	At Human and Environment Informatics Laboratory, we are doing research about both sensor devices based on new detection principals, and daily life habit and environment monitoring system, aiming at contributing to the realization of a safe, secure, and comfortable society. Sensor device development researches are currently conducting respiratory gas sensing devices which are realized by nano/micro mechanical resonator, graphene, and plasmonic devices based on nano/micro fabrication technologies. Daily life habit and environment monitoring systems are researched for wearable blood pressure monitoring, human behavior recognition, stress monitoring, and emotion recognition.	Wearable sensor, Human behavior recognition, Machine learning, Java, Matlab	The project that our laboratory provides is to recognize human behaviors such as walking, running, laying, sitting, etc. by means of acceleration, angular velocity, and other sensor information. The recognition technique is one of key issues to realize wearable health monitoring systems such as continuous wearable blood pressure monitoring systems that our laboratory has developed. The necessary information can be collected by small units of motion sensors or latest smart phone. Especially, the project focuses on how to deal with individual differences. For this purpose, machine learning techniques are fully

				applied, and thus such knowledge and programing skills are very important.