2017年度創造工房セミナーについて
AY2017 Plans of Creative Factory Seminar

Evaluation of the Seminar will be implemented at Poster Session * (Scheduled in September 26, 2017)

No.	Code	Theme	Field of Study	Instructors
1	CFS01	立体形状デザインと造形のための手法と技術：触覚モデリングとラピッドプロトタイピング Methods, Tools, & Devices to Design and Produce 3D Objects: Haptic Modeling and Rapid Prototyping ("3D Printing")	IT	COHEN, M., YOSHIOKA, R.
2	CFS02	深層学習による医療画像からのガン検出 Cancer detection from medical images based on deep learning	IT	ZHU, X.
3	CFS03	Field Programmable Gate Arrayボードによる集積回路設計 Design of an integrated circuit using a field programmable gate array board	SY	SAITO, H., KOHIRA, Y., TOMIOKA, Y.
4	CFS04	How our emotions affect decision-making in reinforcement-learning: Modeling and computer simulation under Python	CS	LUBASHEVSKIY, I.
5	CFS05	Fundamental Tutorial of Wondering Engine: Full-body Control of Humanoid Robots in Four Days	CN	JING, L.
6	CFS06	Development of microcomputer sensor board from scratch	SY	OKUYAMA, Y., SUZUKI, T., BEN, A.
7	CFS07	IoT Device Access and Control by JavaScript	SE	NAKAMURA, A.

※ 今年度の創造工房セミナーでは、全工房合同のポスターセッションにて授業の取り組みと成果を発表します。研究棟内で実施されるポスターセッションには、学部生及び大学院生が参加し、できるだけ多くの教員に各工房の評価に携わっていただく予定です。

* For Creative Factory Seminar of AY2016, all of factories will meet for Poster Session at once, and results and achievement of each factory will be presented. The session will be held in the Research Quadrangle and both Undergraduate students and Graduate students will attend it. Professors are encouraged to participate to the session to evaluate each factory.

CFS01 **Methods, Tools, & Devices to Design and Produce 3D Objects: Haptic Modeling and Rapid Prototyping ("3D Printing")**

立体形状デザインと造形のための手法と技術: 触覚モデリングとラピッドプロトタイピング

[COHEN, M., YOSHIOKA, R.]

<Duration>

September 4-8, 2017

<Seminar Abstract>

この講義ではハプティックモデリングについて学ぶとともに、Geomagic 製 Phantom Omni 触覚デバイスとモデリングソフト Freeform / Claytools による 3 次元触覚モデリング、constructive solid geometry などについて学びます。大部分をしめる演習では受講者が実際に上記ツールでモデリングを行い、技術への理解を深めると共にこれら技術の特徴を生かした造形物の創造プロセスを体験します。

この技術で作成される造形物には多様な用途があり、印鑑、フォント、彫刻、様々な装飾や土産物などへの応用がこれまでに試みられています。また、モデリングソフトで作成したモデルは、ラピッドプロトタイピング用3D プリンター（Z コーポレーション製 ZPrinter 310 または Ultimaker 製 Ultimaker2）を利用して造形を行います。

The lectures will include a review of haptic modeling, including CAD authoring tool "Freeform / Claytools" for Geomagic Phantom Omni force-display interface, and suggestions for advanced techniques, including constructive solid geometry (CSG).

There will also be "hands-on" sessions, in which each participant uses the described software to make their own creation.

These objects can be applicable in many applications as new hankos, fonts, sculptures, decorations, and souvenirs. Models created by the participants will be printed using a 3D printer (ZPrinter 310 or Ultimaker2) for rapid prototyping.

Relevant links:

Rapid prototyping (E & J):
http://en.wikipedia.org/wiki/Rapid_prototyping
http://ja.wikipedia.org/wiki/%E3%83%A9%E3%83%94%E3%83%83%E3%83%89%E3%8
3%97%E3%83%AD%E3%83%88%E3%82%BF%E3%82%A4%E3%83%94%E3%83%B3%E3%82%B0

Home page of publisher of main CAD software:
http://www.geomagic.com/en/products-landing-pages/3d-design/
http://www.geomagic.com/ja/products/freeform/overview/

CFS02 Cancer detection from medical images based on deep learning

深層学習による医療画像からのガン検出

[ZHU, X.]

<Duration>

Mid-June to end of September

<Seminar abstract>

Cancer is Japanese first cause of death. Medical images are the most important tools for the diagnosis and therapy of cancer. With the development and popularity of medical imaging devices, huge quantities of medical images have been produced and wait for the interpretation of doctors. However, a doctor usually needs about 5-10 years to accumulate enough experiences in the accurate interpretation of medical images. Recent progress of artificial intelligence (AI) technology, such as deep learning, may promote the computer-aided diagnosis (CAD) of cancer using medical images.

In this seminar, the basic knowledge and algorithms of deep learning will be taught and a CAD platform based on the Caffe system will be built. The most advanced object detection algorithms such as faster RCNN and R-FCN will be implemented for the detection of cancer in medical images.

An invited lecturer from Muroran Technology University will give a lecture on AI.

After this seminar, the students will know how to build a system for deep learning and use it for medical applications.

CFS03 Design of an integrated circuit using a field programmable gate array board

Field Programmable Gate Array ボードによる集積回路設計

[SAIHO, H., KOHIRA, Y., TOMIOKA, Y.]

<Duration>

Mid-June to end of September

< Seminar abstract >

Objective:

The main objective of this seminar is to implement an integrated circuit on a field programmable gate array (FPGA) board. Through this experiment, students learn integrated circuit design and hardware execution. Moreover, students learn how to use an Electronic Design Automation (EDA) tool for their design.

Currently, in industry such as LSI designs, embedded systems, and data centers, FPGA and its EDA tool are getting to be widely used because of its reconfigurability. Therefore, this experiment may be very useful when students work at companies related to LSI designs, embedded systems, and data centers.

Through the seminar, students can understand

1. How to model an application using Verilog HDL
2. How to use an EDA tool
3. How the synthesized circuit works on the FPGA board
4. Evaluation of the designed circuit

Method:

1. Selection of an application such as a video controller or an image compression algorithm
2. Modeling of the application using Verilog HDL
3. Synthesis of an integrated circuit using Altera Quartus Prime or Xilinx Vivado
4. Simulation of the synthesized circuit using ModelSim-Altera or ISim
5. Execution of the synthesized circuit on the FPGA board

CFS04 How our emotions affect decision-making in reinforcement-learning: Modeling and computer simulation under Python

[LUBASHEVSKIY, I.]

<Duration>

Mid-June to end of September

<Seminar abstract>

The goal of seminar is to acquaint participants with:

1. The basic concepts of how humans can learn, adapt, and explore unknown environments within the paradigm of reinforcement-learning (trial-and-error strategy).
2. Different mental processes affecting decision-making under uncertainty and perception threshold, the role of rational and irrational factors.
3. Mathematical concepts used in describing various emotions.
4. Programming language Python and its applications to simulating probabilistic phenomena and statistical analysis.

The course will be finished by a creating a Python program and numerical investigation of a particular problem related to reinforcement-learning affected by irrational factors in human behavior.

CFS05 Fundamental Tutorial of Wondering Engine: Full-body Control of Humanoid Robots in Four Days

[JING, L.]

<Duration>

4 days (July 18 – 21, 2017)

<Seminar abstract>

Wearable computing is a new trend of future computing paradigm. As a very exciting and promising realm, most of students have the strong curiosity on it. If they can get proper help, many creative ideas could be taken into practice. But currently, there are no available learning materials like tutorials, textbooks, no matter the experiment kit. In this seminar, we give an introduction on the wearable computing. Then, all students are provided with our original wearable development platform named WonderEngine for the project based learning practice. This time, we highlight an exciting project: to use the wearable sensors to control the humanoid robots by full-body gestures. We will use the WondeSense1.0 to control the humanoid robot. The students will experience the software development process under the help of teacher. At last, we will take a demo video on the robot control.

Seminar Schedule: Jul. 18~21 (4 days)

1st day: Recognition of Human Action

9:00~10:30 Lecture 1-1: Course introduction

10:40~12:10 Lecture 1-2: Introduction to WonderEngine

1:10~2:40 Lecture 1-3: Action Recognition Method using WE

2:50~4:20 Exercise 1-1: Human action recognition

4:30~6:00 Exercise 1-2: Human action recognition

2nd day: Modeling of Human Body

9:00~10:30 Lecture 2-1: Kinematics method

10:40~12:10 Lecture 2-2: A new method

1:10~2:40 Exercise 2-1: study the sample code of the human body modeling

2:50~4:20 Exercise 2-2: study the sample code of the human body modeling

4:30~6:00 Exercise 2-3: study the sample code of the human body modeling

3rd day: Project based Learning

10:40~12:10 Lecture 3-1: Project Development

1:10~2:40 Lecture 3-2: Project Development

2:50~4:20 Exercise 3-1: Project Development

4:30~6:00 Exercise 3-2: Project Development

4th day: Project based Learning

10:40~12:10 Exercise 3-1: Project Development

1:10~2:40 Exercise 3-2: Project Development

2:50~4:20 Presentation on project outcome

(7) Participant limit

Maximum 18

CFS06 Development of microcomputer sensor board from scratch

[OKUYAMA, Y., SUZUKI, T., BEN, A.]

<Duration>

From Mid-June to end of September

<Seminar abstract>

Internet of things (IoT) devices is most permissible product in a current market. There is many sensors gathering information from the world. The most of the devices are attached to a microprocessor and Bluetooth or WiFi modules to manipulate obtained data. Sensors connected to a device will be selected by users depend on the purpose. A system gathering information must be small and low-power consumption. In the development of IoT, engineers must understand embedded systems design, data communication data visualization, and PCB layout/implementation.

Participants will learn the basis of sensor manipulation with C language. Besides, lectures to visualize sensor data also given in this class to make a complete sensor system. In the project, participants will design their original Arduino compatible board including a microprocessor, Bluetooth module and sensors and attach the device to the host computer.

In this class, participants will obtain knowledge for

1 Programming for Arduino devices
- 1.1 Reading sensors connected to Arduino
- 1.2 Data transmission to host computer (PC)

2 Programming with Processing
- 2.1 Visualization of sensor data on the host computer.
- 2.2 Serial communication with Arduino devices

3 Development of PCB board.
- 3.1 Arduino hardware basis
- 3.2 Schematic entry/Layout
- 3.3 Manufacturing PCB
- 3.4 Assembly

4 Running together with your own devices and host computers.

Required software will be

- Arduino IDE
- Fabo rapid prototype devices
- Processing (Java based visualization language)
- Eagle (PCB design tools)

CFS07 IoT Device Access and Control by JavaScript

[NAKAMURA, A.]

<Duration>

From July to September

<Seminar abstract>

JavaScript (JS) is one of the most popular programming language for Web client-side.
Recently, it becomes possible to be used for server-side scripting, i.e. Node.js.
As a result, JS could be an unified language for Web development.
In this seminar, we pursue possibility of JS to access and control IoT devices using modern Web browsers.
Participants will learn and acquire the practical technique via prototyping and application development.
The expected case studies include vehicles' Controller Area Network (CAN) bus, ONVIF (Open Network Video Interface Forum) network video products, and Bluetooth Low Energy (BLE) sensors.