# List of Dissertation Abstract （Information Media and Environment Sciences　Information Media Course）

| Name | Supervisor | Title | Abstract |
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| Shuta MORISHIMA | Katsunari YOSHIOKA | A Study on Gathering Intelligence for Targeted Email Attack | In recent years, targeted e-mail attack in which attackers send a malware disguised as a document file to a targeted organization and steal confidential information has become a serious threat. The malware used in the attack displays a decoy document that has relevant information to a targeted organization in order to conceal the fact of intrusion. In this research, we propose a method to collect and analyze the decoy documents, which contain valuable information for understanding the nature of the attacks. |
| Ling TENG | Tomoharu NAGAO | Shipping Index Forecasting Using Numeric and Textual Data | The shipping index is an important economic indicator in the dry bulk shipping market. In this paper, we propose a novel method using numeric and textual data to shipping index forcasting. In our method, we construct an FM&Deep model to learn numeric and textual data with an approach combining a wide component and a deep component. The proposed model is applied to hipping index forcasting problem and the result shows how the proposed model deals with these tasks. |
| YANG DI | Katsunari YOSHIOKA | A Study on Observation of DDoS Attacks from IoT Malware using Dynamic Analysis | In recent years, DDoS attacks by IoT malware are rapidly increasing. However, the detailed mechanism of DDoS attacks from IoT malware is not fully understood, so we investigate the attacks by dynamic analysis. First, for observing attacks in the wild, we execute in-the-wild IoT malware samples in the sandbox and let them receive commands from attackers to observe frequency and target of attacks. Second, for analyzing the details of attacks, we reproduce the attacks by the samples using dummy commands and victim servers. By analyzing 4093 malware samples, we could observe 552 C&C servers, 10 different kinds of DoS attacks. |
| Kou ISHII | Katsunari YOSHIOKA | Evaluation of Sandbox Against Evasive Malware | Recently, several studies have revealed that some malware authors are trying to detect and evade malware sandboxes. Although some researcher study countermeasures against these evasive malware, there is a possibility that attackers will use new tricks to evade sandboxes.　In this thesis, we collected information from real operation sandboxes and user machines to find out the characteristics of sandboxes. Moreover, we propose the method to evaluate sandbox products using evasive test samples to see if these sandboxes have tolerance for evasive malware. |

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| Miho ISHIKAWA | Junji SHIKATA | Information-Theoretically Secure Authentication System with Non-Uniformly Random Keys | Information- theoretically secure cryptography uses secret keys distributed at uniformly random. However, it is not easy to realize uniformly random secret keys. Authentication codes(A-codes) is proposed the construction used non-uniformly random secret keys, but Authentication codes with arbitration(A^2-codes) and Algebraic Manipulation Detection codes(AMD codes) did not have such construction. We propose construction of them using non-uniformly random keys. |
| Toshiaki UEMURA | Takashi TOMII | Visualization and Accuracy Evaluation of EV Energy Life Log Based on Normalized Road Data | We propose Energy Consumption Log (ECOLOG) System. To use this system, users only mount their smartphone on their vehicle. The system accumulates EV Energy Consumption Log estimated from the smartphone's sensor data. In this paper, we define road data normalized by distance: "Road Segment." We use Road Segment for spatial aggregation of data. Also, we visualize ECOLOG data using Road Segment and evaluate the accuracy of ECOLOG data estimation because indicating the effectiveness of Road Segment will be needed. |
| Yuta EZAWA | Katsunari YOSHIOKA | An Analysis of Attacks Targeting WebUI of IoT Devices by Bare-metal Honeypot | Recently, many IoT devices are targeted and compromised due to their vulnerabilities and/or weak credentials. In this research, we propose a method to analyze attacks on IoT devices via their Web UI. We show design of honeypots using bare-metal machines, and propose indicators to detect targeted attacks for specific devices, as well as automated attacks. Our observation and analysis show that attacks on WebUI of IoT devices, such as stealing and altering the device config, are widely conducted and often automated. |
| Koshi ONUMA | Junji SHIKATA | Lattice-based Multiple Encryption | Multiple encryption is a simple yet powerful scheme which can be used both to improve security as well as to provide additional functionality. However, the construction of lattice-based multiple encryption have only been known using generic constructions. In this paper, we show the new efficient construction of lattice-based multiple encryption. Moreover, we compare the our scheme with the existing scheme and show that the our scheme has a shorter secret key and ciphertext. |

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| Haruka KASUGA | Tomoharu NAGAO | Renovation support system based on automatic generation of floorplans | In recent years, home renovation, remodeling used home's layout which reflects customer's lifestyles have been conducted widely. At the same time, it is said that generating a floorplan is time-consuming. In this paper, we aim to reduce the time cost of the process by generating customer's ideal floorplans automatically. When generating a floorplan, two conditions must be satisfied. One is the constraint conditions such as Building Standards Law, and the other is the conditions arisen from customer's preference. To fulfill these conditions, our approach considers floorplans as a constraint optimization problem which has many constraints and generates floorplans using evolutionary computation. Our proposed method generates a customer's ideal floorplan by modifying floorplans multiple times during the optimization. |
| Kenta KITAMURA | Tsutomu MATUMOTO | A Study on the Vulnerability of In - Vehicle Body Network | Modern automobiles are controlled by many of electronic control units, and have realized more advanced control by communication of ECUs through the in-vehicle network. In this paper, we point out the threat of a new attack against the in-vehicle body network that controls door lock etc. In particular, I pay attention to the Wakeup / Sleep function which is a feature of the in-vehicle body network, and by sending a special frame called Sleep frame by an attacker, it’s the attack that stops transmission and reception of legitimate messages. I also propose the measures against this attack. |
| Takahito KIIYOKAWA | Tsutomu MATSUMOTO | In-Vehicle Real-Time Electrical Data Forgery and Its Security Countermeasure | Recently, the possibility increases that vehicles become the targets of cyber-attack, because they are connected to the Internet. Therefore, automotive security is needed. In recent years, the threat of Real-Time Electrical Data Forgery was pointed out in CAN which is widely used as an in - vehicle network. This paper shows the effect of this attack on the actual car. In addition, this paper summarizes about this attack and points out a new method to improve attack success probability. Then, this paper shows the importance of multilayered security countermeasures against this attack and propose a unique method to detect attacks. |
| Masato KUDO | Tomoharu NAGAO | Location Prediction of Cargos Using Hierarchical Automatically Defined Groups | It is important to predict locations and distribution of cargos for acquiring profits of the shipping companies in the shipping industry. In this thesis, a location prediction of each cargo as macro level is performed based on behavior rules of cargos as micro level. Automatically Defined Groups (ADG) is used to divide cargos into several groups. And we propose hierarchical ADG extended to a hierarchical structure. We assume that the behavior rules of each group can approximate the behavior pattern of cargos worldwide by ADG, and aim to predict locations and analyze behavior rules of cargos. |

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| Masayuki KOBAYASHI | Tomoharu NAGAO | Visualizing Convolutional Networks by using Generative Adversarial Networks | Convolutional neural networks (CNNs) have demonstrated outstanding performance in a variety of computer vision tasks. Despite their success, their models are often considered as black-box predictors, and their uninterpretable natures are major problems. In this paper, we introduce a new visualization framework based on generative adversarial networks (GAN) to provide an insight into how CNNs work. Following the standard GAN training, we train the generator and the discriminator to produce natural images that activate a particular unit in the pre-trained CNN. We apply our method to the pre-trained AlexNet and visualize the neuron activations. Our method is simple, yet produces comparatively recognizable visualizations. We also attempt to use our visualization as indications of models trust and verify the potential of our visualizations. |
| Tomoka SHINMURA | Junji SHIKATA | A Study on Keyless Authnetication Protocol over Noisy Channel | The theory of message authentication protocol of unconditionally secure has developed in 1980s. Adversary can watch information over noise-free channels and the model needs secret keys. In this study, we consider a model with no secret keys focusing on physical layer. In this model, adversary can access information with noise. Particularly, we propose a construction using secret sharing scheme and error-correcting code under such a model. |
| Kazuki SOMA | Tsutomu MATSUMOTO | Instrumentation Security of Ranging Pulse LIDAR | LIDAR plays an important role in automobile emergency braking and automatic driving technology. Therefore, malicious attacks on LIDAR can lead to serious accidents. In this paper, to develop a secure LIDAR against malicious attacks, we examined the attack method which can be done against LIDAR and its effect, and carried out a demonstration experiment. We also examined the evaluation of security of LIDAR based on the attack method. |
| Tomofumi TAKAHASHI | Katsunori OKAJIMA | Effects of Skewness Adaptation and Structure Information on Glossiness | An adaptation experiment and an evaluation experiments on gloss perception were conducted to clarify the effect of image skewness. Results of the adapting and evaluation experiment showed no significant correlation between skewness and gloss perception. And I defined a new glossiness index G which was considered the effect of roughness of the surface, and found that gloss perception can be explained by a linear model as functions of SD and G. These results suggest that SD is a more critical factor than skewness on gloss perception, and the surface structure may be important for evaluating the glossiness. |

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| Tomoaki TANAKA | Takashi TOMII | Construction of the Kosode Byobu Database to enable search based on motifs' combination on fashion cultural property | In recent years, it has become possible to access data of individual cultural assets at any time by publishing digital archives on cultural properties. On the other hand, background knowledge is necessary to deepen the understanding of cultural properties. For example, in the "Kosode Byobu" which is the cultural asset of clothing, auspicious and poetry are expressed by the combination of motifs. However, data on cultural properties are diverse and scattered in digital archives, books, images, and so on. Therefore, in this research, we constructed a database integrating various information sources of "Kosode Byobu." |
| Yuya TANAKA | Takashi TOMII | Construction of an Energy Life-Log Database capable of Decision Support for User's Behavior Modifications | It became easy to acquire and accumulate all the events occurred in the real world as data. In this research, we try to apply this acquired log (life log) to the energy field. We designed an integrated database which accumulated life-logs related to energy use, and opendata such as weather logs and social electricity demand logs. We also used this database to present information that can decision support for appropriate power management to multiple users. |
| Ritsuko DAIMON | Takashi TOMII | System with two rectangular axes for Browsing Kosode Byobu Construction and Estimation | Recently, many digital archives are published to preserve and share valuable cultural properties. Nevertheless, these archives are often composed by a search box and viewers of each cultural properties. Sets of these keys and values are important to appreciate Kosode Byobu collection. Therefore, it is preferable to construct a browsing system to help ordinary people browse cultural properties focusing on the sets of keys and values. Accordingly, we constructed a system with two rectangular axes for browsing the Kosode Byobu collection to visualize pairs of keys and values in cultural properties at a glance. Focusing on diviation of the number of kosode, the system can present change by period, compatibility, and wellness of assortment to ordinary people. |
| Yuna NAKANISHI | Katsunori OKAJIMA | Facial Skin Appearance Analysis Based on Colorimetry and Skin Structure | I confirmed the consistency between numerical values of the skin transparency obtained using a magnitude estimation and a paired comparison method. In addition, it was found that the skin transparency was estimated by the equation with the mean luminance and the color difference. Next, I examined the effect on skin appearance evaluation by manipulating the reflection and the scattering component. It was shown that there was individual differences of cues for in evaluations existed. |

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| Hiroki NAKANO | Katsunari YOSHIOKA | A study on Understanding Security Impact of Code Reuse and Obfuscation on Android Applications | In recent years, Android is becoming the most popular OS for smartphones. On the other hand, increase of malware targeting devices running Android has become a widely known problem. Additionally, vulnerabilities specific to Android apps have been affected smartphone user's privacies. In this paper, we investigate the correspondence between the vulnerable code snippets on Q&A websites and vulnerable apps on multiple Android markets. Moreover we also investigate an actual situation of code obfuscation of Android markets and Android malwares. |
| Mitsuhiro NAKAMURA | Tatsunori MORI | Development of paper-survey supporting system based on extracting important points and shared points | We proposed NLP paper-survey supporting system based on using part of chapter role. Introduction clustering result good outcome compared to baseline system. The method using decision tree couldn't make useful structure. It is necessary to revise verification method and scoring. |
| Sou NAKAYAMA | Katsunari YOSHIOKA | A Study on Analysis of Cyber Attacks in Internet of Things | With the spread of IoT, cyber attacks on IoT devices are increasing, and large attacks conducted by malware infected devices have also been confirmed. In this research, we analyze the trends of cyber attacks on IoT devices. Especially, we focus on analyzing and detecting most widely used attack vector, telnet. In addition, we will also work on new attack vectors for various devices. |
| Yusuke NAGAHAMA | Tsutomu MATSUMOTO | A Study on Pairing Hardware Accelerator Built up of Pipeline Type Modular Multipliers | This study implemented pairing calculation hardware to compose of a Pipeline Type Modular Multipliers and an inverter using the expansion Euclid algorithm .The cycle of the pairing calculation can be 18,151 cycles by optimizing algorithm, pairing calculation time in 75[μs]. |

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| Yuta HASUNUMA | Tomoharu NAGAO | Non-parallel Voice Conversion Using Generative Adversarial Networks | Voice conversion is a technique that converts the identity of a speaker of speech into that of the other. In this thesis, we propose a voice conversion method using non-parallel corpora with generative adversarial networks. In our method, spectral envelopes and mel-cepstrums are simultaneously converted and integrated. So advantages of each acoustic feature are made use of for the converted voices. In addition, the learning for conversion is unsupervised because of using generative adversarial networks. As a result of experiments, we confirmed that our method improved the quality of converted voices compared to the conventional method. |
| Takahito HATA | Tomoharu NAGAO | An Evolutionary Computation Having Plasticity on Search Characteristics | An evolutionary computation is an optimization algorithm inspired by evolutional processes or creatures' behaviors. It is widely acknowledged that there is no universal optimization algorithm for all the problems. That means no matter how powerful an algorithm is, it has its advantages and disadvantages. However, in this study, we propose an evolutionary computation which is able to change its own characteristics on the basis of the problem it faces to. Two search operators whose names are moving search and children generation search are combined in proposed model. Because of the combination, this method can achieve better search features. Moreover, in order to adjust the ratio between moving search and children generation search, life span is allocated to each individual. In the experiments, parameters are optimized for each function to gain suitable parameters. Experiments showed that our method has more plasticity than DE and PSO in search features. Also, our method has equivalent or greater performance comparing to existent DEPSO hybrid method. |
| Yuya HIRONO | Katsunori OKAJIMA | Formulation of melanopsin and rod contributions to color perception | Melanopsin expressing ganglion cells (ipRGCs) involve in brightness and rods contribute to the color perception, but these are still unclear. In the present study, we clarified the influence of ipRGCs and rods in human color perception by using a multi-spectral lightsource. As a result, I proposed a new color vision model as functions of ipRGCs, rods and LMS cones for explaining the experimental results quantitatively. |

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| Yoshimi MAEHARA | Tomoharu NAGAO | Video sonification using interactive evolutionary computation for strange detection | Monitoring surveillance video is a heavy burden on us. However, if we can perceive the strangeness of video without visual information, the burden can be reduced. In this paper, we focused on surveillance video sonification. Using interactive evolutionary computation, we will optimize sound mapping rules so that the generated sounds are suitable to hear for a long time and able to detect video strangeness. We asked subjects to hear the generated sound and verified whether it was possible to notice the strangeness of videos. |
| Atsushi MORIWAKI | Katsunori OKAJIMA | Formulation of Color Aging by Sunlight and Mechanism of Oldness Perception | The colorimetric values of aging objects by sunlight were measured, and I developed a system that can generate aged objects within any images. The results of an experiment showed that the oldness of the simulated images increases with aging time whereas the unnaturalness of them remains at a low level. Moreover, it was confirmed that oldness was modulated by modulating the average saturation, entropy of color distribution and skewness of lightness on the objects within images. It suggests that oldness can be estimated by a linear sum model as functions of these image statistics of the object image. |
| Yuya YONEDA | Tomoharu NAGAO | Classi cation System of Leukemia by Bone Marrow Image | Diagnosis of leukemia is time consuming and burdensome to the doctor, and there is a problem that the result of the diagnosis varies depending on the doctor, overlooking abnormal blood cells, and so on. Therefore, it is now required to reduce burdens on doctors by manual diagnosis, to reduce abnormal blood cell missing. In this paper, we propose a method of classifying cases of leukemia from bone marrow images by using evolutionary image processing that automatically constructs image processing processes using evolutionary computing, which has been shown to be effective in various fields. |
| Kazuya WATANABE | Katsunari YOSHIOKA | Analyzing Victim Organizations of DRDoS Attacks Observed by Honeypots | In recent years, Distributed Reflection Denial-of-Service (DRDoS) attacks are increasing. We have observed DRDoS attacks using a decoy system called DRDoS honeypot. However, it is difficult to identify what kind of organizations are targeted with the information obtained from DRDoS honeypot. Therefore, in this paper, we first analyze the victim IP addresses of attacks against Japan observed by DRDoS honeypots using a passive DNS database. We also categorize target organizations based on the domain names and analyze the trends and report the results along with concrete examples. |

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| QiJun WU | Katsunori OKAJIMA | Omnidirectional Recording And Three-dimensional Reproduction Of Texture Using Two Robot Arms | When observing a three-dimensional object, the texture of the object may appear to differ greatly depending on the relative observation position with the object and the kind and direction of the illumination. Therefore, using two robot arms, we developed a texture information acquisition system that can collect image information of objects while automatically changing camera and lighting position with automatic control. The bidirectional reflectance distribution function (XYZ - BRDF etc.) is calculated on a pixel basis, and it is shown that the texture information depending on the observation direction, illumination direction, etc. of the three - dimensional object can be three - dimensionally reproduced. |
| Hanxiao LI | katsunori OKAJIMA | Influences of Conflicting Visual Information on Body Schema and Haptic Perception of Hands | We conducted experiments to confirm whether conflicting visual information modify the body schema where the visual movement was quantitatively incoherent with the actual hand movement in a VR environment. As a result, we showed that we can adapt to such a conflicting visual environment in a short time and build a new body schema of the finger joint. The new body schema can also influence the tactile perception. The results suggest that comfortable VR content or new VR interface can be developed by using the plasticity of the body schema. |