

List of Dissertation Abstract (Information Media and Environment Sciences)

Name	Supervisor	Title	Abstract
Harumi SAITO	Katsunori OKAJIMA	Modeling of higher-level color perception in different color vision characteristics	This study explores higher-level color perceptions of color-vision deficiencies, utilizing psychophysical methods and experiments. The experiment results show that color impressions of dichromats are similar to that of trichromats, whereas the performance of dichromats are totally different from that of trichromats with their color naming task. Here, note that “color impression” stands for warmness or meaning of colors. Deliverables of the study provides useful guidelines for upcoming color design considering the diversity of color vision characteristics.

Kosaku FUJITA	Tomoharu NAGAO	A study on automatic construction of training images by using Evolutionary Image Processing	<p>In the machine learning community, data augmentation techniques have been widely used to make deep neural networks invariant to object transition. However, less attention has been paid to data augmentation in traditional classification methods. In this paper, we take a closer look at traditional classification methods and introduce a new data augmentation technique based on the concept of image transformation. Starting with a few existing examples, we add noise and generate new data points to reduce sparseness in a given feature space. Then, we generate images corresponding to the new data points, although this is usually an ill-posed problem. Herein, the novelty is in constructing an image transformation tree and generating new data from a small number of instances. This allows us to reduce sparseness in the feature space and build more robust classifiers. We evaluate our method on the Caltech-101 dataset to verify its potential. In the context of the situation where the amount of training data is limited, we demonstrate that the support vector machine-based classifiers trained with an augmented dataset using our</p>
------------------	-------------------	---	--

			method outperform classifiers trained with the original dataset in most cases.
Yoshihiro ASAYAMA	Atsuhiro NAKAMOTO	Coloring and reductions of graphs on surfaces	A generating theorem for a graph class C on a closed surface is to determine minimal graphs D and transformations X such that every graph in C can be generated from D by X . In this paper, I deal with the generation theorems of triangulations on closed surfaces and prove the generating theorem of even triangulations on the Klein bottle and show that it can be applied to various coloring problems. We also introduce a result for the "dynamic coloring" of triangulations on the plane by using the generating theorem.

CHUN-JUNG WU	Tsutomu MATSUMOTO	A Study on Observation, Analysis, and Countermeasure of Cyber Attacks in IoT	Recently, cyber attacks in IoT become increasingly rampant. Mirai Botnets executed the massive distributed denial of service (DDoS) attack since 2016. IoT malware plays a significant role, and therefore countermeasures are required. When thinking of malware countermeasures, it is essential to understand their behavior. Machine learning-based analysis, in which analyzing malware attack vectors, has been widely used. In this dissertation, we propose a machine learning-based classification/clustering method against IoT malware and a whitelisting-based countermeasure for low-cost IoT devices.
-----------------	----------------------	--	---

Hisao OGATA	Tsutomu MATSUMOTO	A Study on ATM Security Measures by Command Verification	Recently, criminals frequently carry out logical attacks on ATMs (Automated Teller Machines) systems to steal cash from ATMs in more than 30 countries. In order to effectively prevent the logical attacks, we proposed Command Verification that the cash handling module in the ATM itself validates the cash dispensing command sent from the PC in the ATM, which is the control unit of the ATM, instead of protecting the PC. In addition, we also proposed that a general application scheme of Command Verification which is applicable to multiple ATM systems and transactions. (Updated summary)
Yumiko OHNO	Seiya NEGAMI	Facially-constrained colorings of triangulations on closed surfaces	A facially-constrained coloring is a coloring of a graph on a closed surface with additional conditions of vertices on boundaries of each face. A triangulation is a graph on a closed surface such that any face is triangular. In this study, we consider a facially-constrained coloring of a triangulation such that three vertices on the boundary of each face receive three consecutive colors when we define the set of n colors as a cyclic group. Moreover, we consider a facially-constrained coloring of a triangulation

			G such that any triple of colors appears on vertices of the boundaries of faces in G.
Junichi SAKAMOTO	Tsutomu MATSUMOTO	A Study on Laser Fault Attacks and Countermeasures in Embedded Processors	This paper shows a new attack that is caused by laser irradiation onto a flash memory. We call this attack "instruction manipulation". Defeating an existing anti-fault countermeasure scheme by the instruction manipulation presents the necessity of a new countermeasure against the instruction manipulation. We model the ability of the instruction manipulation from obtained experimental results, and propose a software countermeasure against the instruction manipulation. Moreover, this paper proposes a program extraction method to ease instruction manipulation.

Shingo SATO	Junji SHIKATA	A Study on Cryptography Resistant to Quantum Computing	<p>In recent years, the development of quantum computers has been progressed, and the performance has been improved. If sufficiently large-scale quantum computers are built in the future, current widely used cryptosystems are broken theoretically. Thus, it is important to design constructions of cryptography resistant to quantum computing (post-quantum cryptography). In this thesis, we focus on post-quantum cryptography with confidentiality or integrity, in security models in which many users can use quantum computers. We propose constructions of encryption and authentication, and prove that these satisfy confidentiality or integrity in the security models.</p>
----------------	------------------	---	---

Kazuki TAKADA	Tsutomu MATSUMOTO	A Study on Analysis and Countermeasure against MITB Attack based on Long-term Observation of Financial Malware	Fraudulent financial transfer via MITB attack have become major threats. This research aims to develop MITB attack countermeasures. I propose analysis method of MITB attack based on long-term observation for financial malwares. In addition, in general, cyber attacks and countermeasures have the problem that attackers and defenders compete with each other and fall into the ``Attack and defense infinite loop". Therefore, I propose MITB attack countermeasure ecosystem that can mitigate MITB attacks by updating the countermeasures appropriately and can finally end the Attack and defense infinite loop with defender advantage.
------------------	----------------------	--	--