List of Dissertation Abstract　(Department of Information Environment)			
Name	Supervisor	Title	Abstract
Nao AKAHORI	Atsushi NOMA	The relation between Newton polygon and resolution graph of the plane curve singularities.	We hypothesized that the resolution graph of the plane curve singularities defined by the set of zeros of the polynomial also coincides with the polynomial having same Newton polygon and studied whether it holds for any polynomial. Newton polygon has only one face, and two complex coefficient polynomials with Newton polygon whose face is defined only at the two end points have the same resolution graph of the plane curve singularities defined by their zero set. Similar results were obtained when there were multiple faces and each face was defined by two endpoints.

Eiichi ASAKAWA	Shinichi SHIRAKAWA	Text-to-Gesture Generation with Deep Learning	This study develops a method of gesture generation from utterance texts, which is applicable to human-agent interaction, including both humanoid robots and virtual agents. The proposed model takes an utterance text as the input and generates a sequence of 2D joint coordinates as the output representing the gesture. In the experimental evaluation, based on the deep learning technique, the gesture generation models are trained using utterance-gesture datasets of nine speakers. To evaluate the generated gestures by the proposed method, we evaluate the generated gestures by the accuracy and variance of the joint coordinates and the qualitative evaluation. From the experimental result, we find that the proposed method can generate natural gestures from text information, and the quality of the generated gestures is competitive with the existing speech-to-gesture generation method.

Jotaro ABE	Tatsunori MORI	Improvement of method for organizing documents in automated curation-map generation	A curation map is an information complex that efficiently presents to users texts in a set of documents grouped by viewpoint. we improved the division-by-viewpoint F-measure which is a task in a method for automatically generating a curation map by introducing three processes: sentence unitization, merging by pinching and merging text fragments link-ing to the same document. In addition, we proposed a UI that allows users to browse a curation map. In comparison with a search engine, it was found that the UI was superior in that various information could be presented in detail.

Hideyuki ANJO	Tomohiro FUJII	On the Relationship Between the Availability of Null Adjunct Readings and Predicate Morphology in Japanese	My work is the psycho-linguistic experiment on the analysis about the Japanese phenomenon about object ellipsis with adjunct. I concretely verified the following generalizations. (1) Funakoshi's (2016) generalization Null adjuncts are possible only when clause-mate objects are omitted. (2) Hayashi & Fujii s' (2015) generalization In verbal noun clause, null adjuncts are possible only when verbal nouns as well as clause-mate objects are omitted. As a reault, I found the above generalizations are true.

Hayao ANDO	Tatsunori MORI	A study on a Multi-agent Chat Dialogue System Reducing Users' Load of Utterance	The purpose of this study is to reduce users' load of utterance by solving the problem that conventional chat dialogue systems, in which one on one dialogues were the mainstream, cannot continue conversation unless the user actively speaking. For that purpose, we examined a Multi-agent chat dialogue system and aimed to obtain the feeling of being in the circle of conversation without the user actively speaking. It was confirmed that the proposed system reduced the users' load and contributed to the improvement of satisfaction.

Takuya ISHIDA	Takashi TOMII	Demonstration experiment of EV dynamic charge / discharge plan using energy life log DB	As a previous study, we proposed a "dynamic charging / discharging plan" that dynamically changes the starting charge and charging / discharging timing of an EV in a smart grid every day. In this study, a smart grid is constructed in a real environment, and a demonstration experiment of a dynamic charge / discharge plan is performed. The environment of one room and one EV was implemented as the micro cell of the smallest constituent unit of the grid, and the experimental results showed the difference between the simulation and the real environment, and the usefulness of the dynamic charge / discharge plan from the viewpoint of energy balance showed that.

Ryota ITAGAKI	Kazumi MATSUI	Automatic generation of geometric models of membrane-containing organs by differential equations	Currently, surgical simulators are being developed. When we generate an organ model of a patient from a CT image in a surgical simulator, tissues like membranes are not detected from the CT and we cannot generate them automatically. In this paper, we propose an automatic algorithm to generate geometric models of patient-specific organs including membranes. In this paper, we generate patient-specific models including membranes automatically by solving an equation representing the interface movement and deforming the standard models to the shape of the patient-specific model. The standard models represent the shape of the organs including the membranes as function of the field.

Shunsuke ITO	Tatsunori MORI	A extraction method of dissatisfied information in review texts based on expressions of reviewers' evaluation criterion	In recent years, EC sites have become widespread and used by many people. Reviews written in the past are stored on the EC site and can be viewed by anyone. Some review texts have product dissatisfied information, and they are useful information for those who use EC sites. Therefore, this study analyzed how dissatisfied information appears and defined dissatisfied information. Based on this definition, we examined the extraction method dissatisfied information and carried out experiments to extract dissatisfied information.

Yuya INOUE	Tsutomu MATSUMOTO	A Study on Instrumentation Security of Ultrasonic Range Finder	ToF type ultrasonic range finders are used in various fields such as automobiles and factory automation. If the output of the ultrasonic range finder is disturbed or an attack that stops the operation is performed, the system will not operate properly and there is a risk that a serious accident may occur. Therefore, the research to improve the measurement security of the ToF ultrasonic range finder has social significance. In this paper, we investigate attacks that can be a threat to the ToF ultrasonic range finder, and examine security enhancement measures against those attacks, as well as verification experiments.

Shuhei IWATA	Atsuhiro NAKAMOTO	An improper DP-coloring of planar graphs with large girth	An improper coloring of a graph is an assignment of a color to each vertex of the graph such that some pairs of adjacent vertices are allowed to have the same color. An improper list coloring is an extention of an improper coloring, and an improper DP-coloring is a further extention of an improper list coloring. It is known that every planar graph with large girth has improper list colorings with bounded number of colors, where the girth is the length of the shortest cycle. In this thesis, we improve those results to improper DP-colorings.
Keisuke UCHIDA	Katsunari YOSHIOKA	Discovery of IoT Devices by Internet-wide Scan	In recent years, the introduction of IoT to remote monitoring and control system of important facilities has been advanced. It has been reported that the facility name etc. is displayed on Web management UI of devices, and anyone can access them. However, it is not clear how many similar devices exist, and investigation for such devices is urgently needed. In this research, we propose a method to discover such devices on the Internet semi-automatically using Internet-wide scan and clustering.

Kento UCHIDA	Shinichi SHIRAKAWA	Analysis of Information Geometric Optimization with Gaussian Distribution Under Finite Samples	In this study, the information geometric optimization (IGO), a unified framework of black-box optimization algorithms, is theoretically analyzed. We consider the algorithms derived from IGO by applying the family of isotropic Gaussian distributions and the family of multivariate Gaussian distributions with diagonal covariance matrixes and analyze their behavior on convex quadratic functions. Differently from the previous studies assuming some unrealistic settings such as an infinite sample size, the expected improvements of the IGO algorithms with a finite sample size are analyzed. The numerical simulations show that our theoretical results coincide with the actual behavior of the IGO algorithms compared to the existing theoretical result assuming the infinite sample size.

Kent OGUSHI	Ozeki KENTA	On domination number for k-trees	Let G be a graph. A vertex set S of G is a dominating set of G if $S \cup N(S) = V(G)$, where N (S) denotes the set of vertices adjacent to a vertex of S. The size of the minimum dominating set of G is called the domination number of G. Campos and Wakabayashi, Tokunaga proved that the domination number of a maximal outer planar graph G is at most $(n + t) / 4$, where n is the number of vertices in G, and t is the number of vertices of degree 2 in G. In this thesis, we extend this result to graphs so-called 2-trees, and further proved that the domination number of a k-tree G is at most $(n + t) / (k + 2)$, where n is the number of vertices in G, and t is the number of vertices of degree k in G.

Ryo OHASHI	Shushi HARASHITA	Differential forms on the curves associated to Appell-Lauricella hypergeometric series	In algebraic geometry and number theory, elliptic curves are important research objects. In this paper, we study the curves associated to Appell-Lauricella hypergeometric series, which are certain generalizations of elliptic curves. In the main results, we succeeded in describing an explicit basis of the module of regular differential forms on the curves above. In addition, we consider the desingularizations of the curves above only at the infinity, and we obtained a similar result. As an application, we will study the superspeciality of the curves above for some special cases.
Kosuke OYA	Tatsunori MORI	A new method to find zero pronouns referring to entry words and estimate their surface cases in the context of a world history glossary and its descriptions	A new method to find zero pronouns referring to entry words and estimate their surface cases in the context of a world history glossary and its descriptions. In this paper, we focus on the usage of a world history glossary as one of the knowledge sources for automated answer generation of essay-type questions.

Kodai OYU	Atsushi NOMA	Resolution of Singularities of Algebraic Surface Using Double Covering	Resolution of singularities of the surface defined by z^n=f(x,y) has been studied. Based on the study, I find an easier way to calculate the resolution of singularities of the surface defined by z^2=f(x,y) which is a special case of z^n=f(x,y) and summarize the algorithm of calculation of the resolution. In this algorithm, I only use blowing up of affine plane and normalization. Furthermore, I calculate the resolution of Du Val Singlarities using the algorithm and summarize all the process of the calculation of resolution.

Kai OKADA	Shinichi SHIRAKAWA	Auto-Berthing with Hierarchical Reinforcement Learning	Since the amount of ocean transportation is increasing, developing autonomous ships are desired for dealing with the running short of sailors and troubles caused by a human error. Reinforcement learning, one of the machine learning approach, is promising to realize the autonomous ships. In this study, we attempt to obtain a control rule for automatic berthing, a key component to realize the autonomous ships, by applying hierarchical reinforcement learning. The hierarchical reinforcement learning is suitable for tasks which need to obtain the action rule achieving a long-term goal. The numerical experiments show that the control rule obtained by the proposed method can smoothly navigate the ship to the spot from the various starting positions.

Shinji KATO	Nagao TOMOHARU	Improvement Mehtod using Transfer Learning in Genetic Programming	Genetic programming (GP) has been applied in various problems, and many derived methods have been proposed. In GP, one of the meta-heuristic methods, it is necessary to follow the No Free Lunch (NFL) theorem in order to improve accuracy. NFL theorem states the importance of using problem knowledge. The knowledge available is Transfer Learning, but Transfer Learning requires source problem selection. In this paper, we propose a method of extracting knowledge from multiple source problems and selecting appropriate knowledge. This method uses an island model to extract and select knowledge. The advantage of this approach is that it does not require souce problem selection because it automatically uses knowledge. In addition, proposal method is an end-to-end method, consisting of three independent steps. In the experiment, the proposed method higher the accuracy of the test data by 12.7% than simple GP in average of 70 regression problems.

Jun KAWAKITA	Takashi NISHIMURA	A study on isoperimetric inequality	Isoperimetric inequality is the inequality which was often learned about from the past which showed a relation between the area it's possible to surround with the rope with the fixed length and the length of the rope. And various proof method is found by present. There is previous study about isoperimetric inequality which expanded an original inequality by adding the concept of a new figure that is born from a plane closed curve. In my study,I aimed about 2 previous studies to get novelty about isoperimetric inequality.
Daishi KUDO	Takahiro YAMADA	Bifurcation Analysis for Thin Plate by change of supporting state	If peripheral parts of thin plate are supported at several points, unstable mode may be occurred. However, the mechanism of this phenomenon has not been elucidated yet. In this study, based on the hypothesis that this phenomenon is bifurcation of thin plate, instead of conventional bifurcation analysis which the incremental load is perturbed, we suggest a method what extract a bifurcation point by applying a perturbation load in a different direction against fundamental path.

Fuki KOIKE	Takashi TOMII	Matching simulation of renewable energy using EV and evaluation by actual data	With the development of IoT technology, it has become possible to easily obtain energy-related records (energy life log) such as renewable energy power generation logs, building power demand, and automobile driving logs. In this study, we construct an energy life log database that stores these life logs, and perform a renewable energy matching simulation by charging and discharging an electric vehicle (EV). In addition, a simulation is performed in the same way, assuming the use of a stationary battery as an EV assistance. By using real data for evaluation, detailed analysis on a daily or yearly basis was made possible. As a result, it was shown that charging and feeding of EVs contributed to load leveling.
Masakazu KOBAYASHI	Katsunori OKAJIMA	Evaluation of In-car Interface Considering External Environment Visibility	We developed a drive simulator using a head mounted display, and conducted experiments to evaluate the visibility of both in-car interface and external environment while driving. Based on the results of the experiments, we discussed the safety of in-car interface in terms of compatibility between the recognition of in-vehicle information and external environment.

Akio GOHDA	Tamura NAOYOSHI	Detection and Correction of error sentences in Elementary school composition focusing on case consistency.	Error sentence correction is one of the tasks in elementary school guidance. The purpose of this study is to detect and correct error sentences. In the detection, an error sentence could be detected at an F value of 0.86. The correction yielded almost the same sentence as the original sentence. In terms of detecting and correcting error sentences in student composition, it can be said that it is important in essay guidance.
Miori SAITO	Katsunari YOSHIOKA	A study on finding contact points for security notification	With the evolving threat of cyber attacks, the importance of security notifications is increasing. In general, information provided by services such as WHOIS are used as contact points for notification. However, in some services, contact information may not be updated frequently. In this study, we propose collecting contact points for notification via various sources besides WHOIS. We conducted a classification and notification experiment on the collected contacts, and showed that they were appropriate as notification destinations.

Kazuhiro SAHODA	Nagao TOMOHARU	Sensibility Evaluation of Virtual Reality Space by Walking Device	The head-mounted display is a common device when we experience Virtual Reality (VR). In recent years, some devices have been developed that allow users to experience the actual movement in the VR space by taking action such as walking. These devices give the user a sense of reality and enable advanced simulations. However, the effect of the type of simulation on VR sickness and immersion has not been clarified. This paper evaluates the usefulness and the VR sickness and immersion by performing a simulation using a walking device.

Tatsunori SHIOMOTO	Shinichi SHIRAKAWA	Improvement of Binary Hashing-Based Image Retrieval Using Class Information	Binary hashing is a method that transforms data into binary hash codes and is applicable to large-scale content-based image retrieval because it can reduce the data size and accelerate the distance calculation between data. Particularly, various machine learning-based binary hashing methods that learn the binary hash function from data have been proposed. In the case that the class information of data is given, the binary hash function should assign the same hash codes for the data in the same class and the different hash codes for the data in the different classes. In this study, we define representative points for each class based on the class information and develop a loss function to learn the appropriate binary hash function using the representative points. The experimental result using the face image dataset shows that the proposed method can achieve higher recall values than the existing methods.

Wataru SHIBAYAMA	Shinichi SHIRAKAWA	Efficient Redirected Walking in Virtual Environment Using Reinforcement Learning	Redirected walking (RDW) is a locomotion technique used in virtual reality. It enables users to explore a large virtual environment in a small real environment. This study develops a method for improving RDW efficiency using reinforcement learning. In the experiments, we evaluate the proposed method on the real environments of the four-meter square with obstacle and the two-meter square. The experimental results on simulation show that the proposed method can achieve higher performance than the existing method in terms of the evaluation measures that cause irritation or VR sickness in all real environment settings. Also, in the user experiment, the proposed method can improve the efficiency of RDW in the two-meter square setting.

Hiroaki SHIMA	Atsuhiro NAKAMOTO	Book embedding of toroidal regular graphs	A book embedding of a graph is an arrangement of the vertices along the spine of a book and each edge on a single page (a half-plane with the spine as its boundary) so that no two edges intersect transversely in the same page. The pagenumber of a graph G is the minimum k such that G is k-page embeddable and so we are interested in bounding the pagenumber. In this thesis, we prove that every toroidal 4-regular quadrangulation has a book embedding with at most four pages and the pagenumber of toroidal 3-regular triangulation is four.
Kazuki SHIRAI	Matsumoto TSUTOMU	Detailed Analysis of Real-Time Electrical Data Forgery in In-Vehicle Networks and Its Security Countermeasure	Recently, IT technology has been actively used in automobiles, and automatic driving technology has been attracting attention. On the other hand, the danger of automobiles being subject to cyber attacks is increasing, and the need for information security technologies for automobiles is increasing. In this paper, we point out the threat of electrical data tampering, which is an attack in the physical layer of the in-vehicle network. We also consider a method to protect cars from this attack.

Nagi SONOBE	Minoru SHIRAZAKI	Large-scale CFD analysis of motion of liquid film with two free interfaces	Large-scale CFD analysis of motion of a soap bubble by blowing air has been performed. Non-dimensional analysis was performed to discuss the effects of viscous force and surface tension for its motion more systematically. It was found that the shape change of the liquid film was dependent on the effect of the surface tension. On the other hand, it was found that the larger the effect of viscous force, the shorter the period of the soap bubble expanding alternately in the inflow direction and the perpendicular direction, and the smaller the difference between the two directions.

Kazuki TAKAISHI	Tomoharu NAGAO	Understanding Reasons for Time Series Prediction	In the prediction of time-series data using a machine learning model, it is important to present the prediction basis in order to use the prediction results for decision making. In this paper, we propose a trend-based method for presenting prediction basis by combining a local approximation method, SHAP, with a trend filter for an arbitrary time-series prediction model. In the proposed method, the input value is multiplied by the absolute value of the contribution obtained by applying SHAP to the original prediction model, and the result is applied to a trend filter to present a trend-based basis of prediction that considers the contribution. In experiments, it was confirmed that the proposed method was applied to the shipping index and oil price prediction problems, and that the prediction basis reflecting actual trends was presented.

Yuta TAKANASHI	Tomoharu NAGAO	Pruning Optimization of Deep Learning Model Using Evolutionary Computation	It is necessary to compress in order to use deep learning model on devices with less computer resources directly, however it is difficult to maintain high accuracy with previous pruning method under a high compression ratio. In this paper, we propose a method for optimizing parameters removed by pruning using GA. In the proposed method, we modified the GA operation to fix the compression ratio of the individual, and used the surrogate model to predict the test accuracy after fine-tuning in order to reduce the computation cost, and optimized the pruning using GA. In experiments, we applied proposed method to CNN trained on CIFAR-10 dataset and confirmed that the test accuracy was improved compared to the previous method.

Takayoshi TAMURA	Junji SHIKATA	Key Dependent Message security of hybrid encryption	Several transformations have been suggested that turn weakly secure scheme into strongly secure PKE or KEM. HHK transformation is one of these, and it is used for many NIST's post-quantum cryptographies. Meanwhile KDM security which guarantees confi dentiality even in the situation of encrypting secret keys has been studied. In this thesis, I analyzed KDM security of hybrid encryptions which use HHK transformation and proved these satisfy KDM security.
Takuya DAIYO	Katsunori OKAJIMA	Taste of modulation and its quantification using crossmodal effect in augmented reality	First, we quantitatively verified a crossmodal effect which can modulate saltiness by changing food appearances with Augmented Reality. As a result, saltiness can be enhanced and we converted this effect the amount of salt. Next, we verified whether different haptic information could modulate umami by giving them, and it was found that some participants were affected. We expressed the haptic information in physical quantities and formulated the relationship with umami. In addition, the results of verifying how participants felt by converting the appearance of food to other types of food was that only some of the participants were affected.

Yutaro DOYO	Atsushi NOMA	The Computer Program of Resolution of Singularities of Algebraic Curves only with Blowing-ups	Resolutions of singularities is one of the most important issues not only in algebraic geometry but also statistics and information science. In this research, we develop computer algorithms to reduce the amount of time to calculate a blowing-up, a way of resolution. This program outputs the results of calculation of blowing-ups as translation of polynomials so that is easy to understand even for beginners of algebraic geometry and we can apply the theory of resolutions to various field with this program.
Shoji NAGAYAMA	Tatsunori MORI	Strategies for an Autonomous Agent Playing the ``Werewolf game''	In this paper, we research with the aim of "constructing a werewolf agent considering strategy and tactics". In particular, we considered the werewolf tactics and analyzed the actual dialogues between the humans in the werewolf game to realize the tactics. Although there are several analyzed viewpoints, in order to realize the “wolf stealth wolf” and “line cutting”, We focused on “utterance and winning rate”, “cooperation between werewolf” and “utterance and action “.

Yuki HAYASHI	Fujii TOMOHIRO	Where wh-phrase are base-generated in child Japanese: Evidence from natural speech data	This study investigates how frequently wh-phrases co-occur with negative words in Japanese children's naturalistic speech and their mothers' by using statistical analysis. Speech corpora of four child-mother pairs were studied. Each speaker's wh-questions were classified in terms of two factors: whether a given wh-question contains 'why' and whether a given wh-question involves negation. The analysis revealed that the distribution of 'why' and negation in a child's corpus is almost always similar to that in her mother's corpus. Therefore, this study shows the possibility that children haven't acquired the grammar, but just imitate the patterns found in their mothers' speech.

Taichiro HAYASE	Nakamoto ATSUHIRO	Signed chromatic number and modulo chromatic number of plane graphs	Proper coloring is an operation of coloring all vertices of the graph so that adjacent vertices have different colors. It is known that proper coloring of a planar graph requires a maximum of 4 colors. The number of colors increases in the coloring which generalizes the proper coloring. For example, a list coloring of a planar graph may require a maximum of 5 colors, but by performing an appropriate operation on the graph, the number of colors can be reduced to 4. I showed a similar theorem with a more generalized version of list coloring.
Takuya FUKANO	Tomii TAKASHI	Redefining Energy Life-Log Database and information presentation for peak shaving	In our previous research, we have built an energy life log DB (ELLDB), a database system that can search information on life logs related to energy use, and have accumulated many applications. In this paper, we redefined ELLDB as a database system that can provide information for peak shaving to suppress sudden fluctuations in power demand. Then, it was shown that peak shaving was achieved by power consumption management and battery management.

Yui FUJITA	Kazumi MATSUI	Modeling and Simulation of sutures	surgical techniques quantitatively need to be developed. In this study, we focus on the sutures, and assume that there is no friction between suture thread and soft tissue when modeling the sutures. the purpose of this study is to visualize the mechanical state of the suture from engineering knowledge. In our approach, soft tissue and suture thread are approximately by solid and rod elements respectively, and a method was proposed in which sutures were represented as contact problems.

Daiki MUNETO	Tomoharu NAGAO	Tsume-Shogi problem composition using evolutionary computation	With the development of artificial intelligence, the ability to solve various logic puzzle problems without human knowledge is improving year by year. However, creating puzzle problems is a more difficult task than answering because there is no single solution and it is difficult to evaluate the created problem. In this paper, we focus on the chess shogi, which is thought to be difficult to create due to the nature of the puzzles problem. The expert uses the information on shorter-move mates or incomplete mates in composition. Based on this idea, we propose a method to compose longer-move mates by optimizing the board conversion by using a genetic algorithm, which is one of the evolutionary computation methods. As a result of the experiment, it was confirmed that 33-move mate can be generated.

Shun MORISHITA	Katsunari YOSHIOKA	Threat analysis based on a survey of target devices for cyber attacks	Recently, cyber-attacks targeting devices operated on the Internet have been increasing. In order to investigate the prevalence of the devices, Internet-wide scanning has been developed. In this research, we investigate the prevalence of honeypots based on the difference between the response of the honeypot and the actual device. Also, we investigate the prevalence of IoT devices based on the state of Telnet and IoT malware infection.
Teppei YAMAOKA	Kenta OZEKI	Hamiltonian number for connected cubic graphs	The Hamiltonian number of a connected graph is the length of a shortest spanning closed walk. A graph with all vertices of degree k is said to be k-regular. Some researchers gave upper bounds for the Hamiltonian number of connected 3-regular graphs with assuming high edge connectivity. However, those without assuming edge connectivity were unknown, except for trivial ones. In this thesis, we give the best possible upper bound for the Hamiltonian number of connected 3-regular graphs. Furthermore, we characterize all graphs that attain the bound with equality.

Yota OKUAKI	Tsutomu MATSUMOTO	A Study on FPGA Implementation of Pairing-Based Cryptography with Pipelined Modular Multiplier	Expectations for "Advanced Cryptography" are increasing in order to enhance the security of cyber physical systems and cloud computing. "Searchable encryption", which can perform database search while encrypted, and "Aggregate signature", which can perform signature verification on multiple messages collectively, are specific examples of Advanced Cryptography. A major component to realize Advanced Cryptography is pairing calculations. A high-speed hardware-based pairing implementation using a pipelined Montgomery modular multiplier is available. This paper shows that the record latency 61.0 μs and 153 μs on FPGA board VCU118 and ML605 for calculation of Optimal Ate pairing over BN curve on 254 bit prime field was achieved by improving the pairing implementation, respectively. In addition to pairing, it is also essential to speed up the implementation of MapToPoint function, which maps arbitrary data to points on elliptic curves. This study shows verification process for aggregate signature can be executed faster than software implementation by calculating MapToPoint function on multiple input signed messages on FPGA using pipelined modular multiplier.

Chuwei XU	Katsunori OKAJIMA	A study on crowd guidance method using immersive people flow simulation	In this study, a virtual crowd system is generated using the agent-based model in the simulated shopping mall of Yokohama, where real experiment participants entered the virtual space and become one of the crowds. This experiment is designed to evaluate the behavior contagion phenomenon in virtual space and investigate whether a virtual crowd can consciously guide the gaze of the experiment participants immersed in the virtual reality. As a result, it shows that the gaze of the participant can be guided by the virtual crowd and the guidance effect can be influenced by the number of people of the virtual crowd. By using the virtual crowd system, different behavior guidance methods and scenarios can be examined and verified.

Lu CAO	Junji SHIKATA	Implementation and Analysis of Aggregate Message Authentication Codes with Improved Memory-size	In this paper, we provide consideration from various angles for improving an aggregate message authentication code with detecting functionality (AMAD). In particular, we consider improvements of AMAD so that AMAD can be used for a real situation of networks where IoT devices are dynamically increased or decreased. We show the compression of disjunct matrices by tensor products present matricesstore with improved memory-size. That makes AMAD especially suited for resource-constrained devices.

Lu LUO	Tamura NAOYOSHI	Chinese POP Song Lyrics Sentiment Analysis based on Neural Network combined with Chorus Information	In order to make users quickly select their favorite music, these websites usually classify the music from different perspectives, such as emotion, theme and so on. But these music websites provide a large variety of music, so automatically classifying music is necessary. Compared to other music content, classifying the music sentiment by lyrics is convenient, the lyrics data is rich and the size of it is small. Chinese pop song's structure is verse-chorus, chorus expresses the emotion of a song, it is the most emotional part of a song. In this research, a chorus information combined neural network method is proposed. Extracting the chorus by the self -similarity matrix, and construct the chorus embedding after the extraction. Then use the chorus embedding combined word2vec and neural network to do the sentiment classification. In the experiment, the result of the proposed method has improved 4%-6% than the result of a simple neural network model.