List of Dissertation Abstract

（Information Media and Environment Sciences　Environmental Mathematical Analysis Course）

Name	Supervisor	Title	Abstract
Ririe UNOTSU	Naoko ARIMITSU	Multifractal Analysis of ULF Geomagnetic Variations before Earthquakes	The detection of seismo-electromagnetic abnormal phenomena before earthquakes is one of earthquake prediction techniques. In this paper, we show the multifractal characteristics of detrended fluctuations of ULF(Ultra-Low-Frequency) noise data before the Guam(1993) earthquake by using Multifractal Probability Density Function Analysis. In addition, the seismo-electromagnetic signature of the earthquake was successfully detected.
Toshiki ABE	Atsuhiro NAKAMOTO	The signature of edge-colorings and list-edge-colorings of regular graphs on the projective plane	An edge-coloring of a graph is an assignment of a color to each edge of the graph with adjacent edges distinct colors. As an open problem, list-edge-coloring conjecture is known and partially solved by using the signature of edge-colorings. Moreover, the signature of planar graphs has already obtained in another thesis. In this paper, we obtain the signature of edge-colorings on the projective plane and have an application to the list-coloring conjecture.
Takahiro ISHII	Atsushi NOMA	Resolution of singularity points using to two-dimension nomal Toric vareities and Newton diagram	From the process of blow-up of the curve C_ (a, b): (x ^ a + y ^ b = 0) (a and b are natural numbers) having a singular point on the affine plane, it is determined by the curve C_ (a, b) We showed that a dual Newton diagram of a Newton diagram can be made into a nonsingular fan by Euclid's algorithm.
Kengo ENAMI	Seiya NEGAMI	Re-embedding Structures of 3-connected 3-regular planar graphs into the torus	It is well-known that every 3-connected planar graph is uniquely embeddable on the sphere, but it is not uniquely embeddable on any surface other than the sphere. In this paper, we classify structures of embeddings of 3-connected 3-regular planar graphs on the torus. This enables us to determine whether a 3-connected 3-regular graph embedded on the torus is planar or not. Moreover, we can establish a polynomial delay algorithm for enumerating all the inequivalent embeddings of a given 3-connected 3-regular planar graph on the torus.

Keita KONDOU	Junji NUKATA	The influence of high school students' preference for schooling and course selection on career formation process	This paper considers the influence of high school students' preschool propensity and career selection on career formation process and aims to obtain knowledge about the influence of mathematics on career formation. In addition to the findings obtained from related studies such as those earning basic mathematical power gains higher income over the lifetime, it is clear that mathematics has influenced the career formation process such as not only the income but also the desired work, among other students who are good at mathematics and poor mathematics, there is a difference in the process of forming a career.
Ayako SASAKI	Atsushi NOMA	The Classification of Singular Fibres of the Double Covering of Curves Which Have Six Branch Points on Projective Line	The family of curves which I studied is defined by y^2-g(x,t)=0(g(x,t) is an expression of degree 5 of x). I introduced (i)the curve defined by g(x,t)=0 is nonsingular, (ii)the curve has a double point and (iii) two double points.
Saaya TOKITA	Atsuhiro NAKAMOTO	The number of diagonal flip in triangulations on the projective plane	I proved that any two triangulations on the projective plane with n vertices can be transformed into each other by at most $19n-106$ diagonal flips, up to isotopy. This problem was considered by Nakamoto and Mori in 2005, but they had given a wrong proof to the problem. So I decided to correct it and succeeded in giving a correct proof.
Takuya NAGATSUKA	Minoru SHIRAZAKI	Numerical Analysis of the Motion of the Multiple Connected Objects in Multiphase Flow.	CFD analysis of the motion of a Japanese traditional rain chain gutter in multiphase flow has been performed. This paper mainly discusses the relationship between the motion of the chain gutter and mass, water discharge, connecting method (constraint condition), or the number of the connections. It is found that properties of the motion depend on water discharge, and there is water discharge in which the chain gutter is hardly moved. The influence of inertia is large when the water discharge is small, and the influence of the fluid force becomes large when the water discharge is large.
Junki HIGA	Atsuhiro NAKAMOTO		Caccetta-Haggkvist conjecture says that every digraph with n vertices and minimum out-degree r contains a cycle of length at most ⌈n/r⌉. To solve the special case of conjecture, Seymour proposed the second neighborhood conjecture. It says that every antisymmetric digraph has a vertex whose second neighborhood is not smaller than the first one. This conjecture is still open, but it was partly solved by assuming certain conditions. Especially, the second neighborhood conjecture was solved for digraphs with r-out-regular and connectivity r-1. In this paper, we improve the former result for connectivity by adding a certain condition.

Nobuhiro HIGUCHI	Shushi HARASHITA	On the codimension-one specializations of minimal p-divisible groups	In algebraic geometry and number theory, p-divisible groups are important research objects. In this paper, we study specializations of minimal p-divisible groups, which play an important role in the theory of p-divisible groups. A minimal p-divisible group is associated with a line graph called Newton polygon. We classify codimension-one specializations (the most generic specializations) of a minimal p-divisible group, when its Newton polygon consists of two segments, and in a special case we determine the Newton polygons of these specializations.
Suguru HIRANUMA	Atsuhiro NAKAMOTO	On domatically full graph	A dominating set of a graph G =(V, E) is a subset D of V such that every vertex not in D is adjacent to some vertex in D. The domatic number d(G) of G is the maximum positive integer k such that V can be partitioned into k pairwise disjoint dominating sets. By the definition, the domatic number is less than and equal to the minimum degree plus one, and a graph is domatically full if G attain the equality. In my master thesis, I characterize the Cartesian product between path and tree that is domatically full.
Masayuki FUJITA	Seiya NEGAMI	Distinguishing 3-colorings of 3-connected 3-regular maps on the sphere	A graph is said to be distinguishing k-colorable if it has a proper k-coloring such that no automorphism other than the identity map preserves the colors. Such a coloring is called a distinguishing k-coloring. It has been already known that almost all 3-regular maps on the surface have distinguishing 4-colorings with color 4 used at most once. In this paper, we shall show any truncated 3-regular connected graphs, any truncated polyhedrons and any fullerene graphs have a distinguishing coloring without color 4.
Yusuke MASUDA	Atsushi NOMA	Classification of normal singularity of dimension 2 by the maximal ideal cycle and the fundamental cycle	In affine space of dimension 3, I've researched about correspondence of coefficients of the maximal ideal cycle and the fundamental cycle obtained from resolution of the singularity at origin on curved surface defined by some equation. In particular, I supposed that if the equation was specific form, the singularity would be classified a fixed type, so I calculated the coefficients of the cycles and classified the singularities concretely through changing the orders of the monomials in the equation and so on.
Yuki MATSUSHITA	Minoru SHIRAZAKI	Three Dimensional Numerical Analysis of Efficient Swimming and Jumping of Fish near Water Surface	Three dimensional CFD (Computational Fluid Dynamics) analysis of self-propelled fish swimming near water surface and jumping has been performed. The present studies showed mainly two things. One is that behavior of swimming near water surface is classified into three patterns, (1) slightly slower, (2) slower, (3) finally slightly faster, than swimming in the water and the behavior can be expected with the Froude number defined as the ratio of the flow inertia to gravity. The other is that power consumption required for swimming with jumping is totally less than for swimming without jumping.

Yuri MANAGO	Atsuhiro NAKAMOTO	Flipping Edges in Quadrangulations of even polygons	It is known that any polygon on the plane can be triangulated by straight line segment and any two triangulations of a polygon can be transformed each other by flipping edges. In this thesis, we consider the same problem for quadrangulations. A k-spiral polygon is an even polygon on the plane such that the number of intervals of consecutive concave vertices is at most k. We proved that any 1-spiral polygon can be quadrangulated by straight line segments and any two quadrangulations of a 1-spiral polygon can be transformed each other by flipping edges.