East Asian Symplectic Conference 2013
KAGOSHIMA

September 18 - 21, 2013
Room 101, Faculty of Science, Kagoshima University

September 18, Wednesday
11:00 - 12:00 Ziming Nikolas Ma (Chinese University of Hong Kong)
Witten deformation and Morse category
13:30 - 14:30 Chung-Jun Tsai (National Taiwan University)
Dirac spectral flow on contact 3-manifolds
14:45 - 15:45 Changzheng Li (University of Tokyo, Kavli IPMU)
Primitive forms via polyvector fields
16:00 - 17:00 Kwokwai Chan (Chinese University of Hong Kong)
HMS via SYZ for toric CY manifolds

September 19, Thursday
09:45 - 10:45 Rui Wang (Pohang University of Science and Technology, IBS)
The Analysis of Pseudo-holomorphic Curves in Contact Manifolds
11:00 - 12:00 Jungsoo Kang (Seoul National University)
Global surfaces of section and symmetry
13:30 - 14:30 Toru Yoshiyasu (University of Tokyo)
On Lagrangian submanifolds in the Euclidean spaces
14:45 - 15:45 Guangcun Lu (Beijing Normal University)
Morse theory for a class of nonsmooth functional and applications
16:00 - 17:00 Kei Irie (Kyoto University, RIMS)
Symplectic homology of disk cotangent bundles of domains in Euclidian space

September 20, Friday
09:45 - 10:45 Garrett Alston (Chinese University of Hong Kong)
Floer Cohomology for Immersed Exact Lagrangians
11:00 - 12:00 Morimichi Kawasaki (University of Tokyo)
Superheavy Lagrangian immersions in the torus
13:30 - 14:30 Ki-Heon Yun (Sungshin Woman's University)
Lefschetz fibration and knot surgery 4-manifolds
14:45 - 15:45 Hyunjoo Cho (National Tsing Hua University, NCTS)
Almost contact structures and G_2 structures
16:00 - 17:00 Yi-Jen Lee (Chinese University of Hong Kong)
Invariants from Seiberg-Witten and Heegaard Floer theory

September 21, Saturday
09:45 - 10:45 Youngjin Bae (Pohang University of Science and Technology, IBS)
Dynamics on virtually contact structures
11:00 - 12:00 Yuichi Nohara (Kagawa University)
Integrable systems on Grassmannians and potential functions
13:30 -   Free discussion

Abstracts

Ziming Nikolas Ma (Chinese University of Hong Kong)
Title: Witten deformation and Morse category
Abstract: We study the Witten deformation of de Rham category on a compact oriented Riemannian manifold, and show that it limits to the Morse category. This generalize the result on Witten complexes by incorporating the wedge product structure. The proof is obtained by using homological perturbation lemma and semiclassical analysis. It is a joint work with Naichung Conan Leung and Kaileung Chan.

Chung-Jun Tsai (National Taiwan University)
Title: Dirac spectral flow on contact 3-manifolds
Abstract: In Taubes's proof of the Weinstein conjecture, a key ingredient is the spectral flow estimate of a one parameter family of Dirac operators, which is used to obtain the energy bound. When the perturbation term is a contact form, much evidence suggests that its spectral flow has better asymptotic behavior and is related to the geometry of the contact form. In this talk, I will explain how to study the Dirac spectral flow based on an open book decomposition

Changzheng Li (University of Tokyo, Kavli IPMU)
Title: Primitive forms via polyvector fields
Abstract: The theory of primitive forms was introduced by Kyoji Saito in early 1980s, which was first known in singularity theory and has attracted much attention in mirror symmetry recently. In this talk, we will introduce a complex differential geometric approach to primitive forms, using compactly supported polyvector fields. We will see some surprising applications of this new approach. This is my joint work with Si Li and Kyoji Saito.

Kwokwai Chan (Chinese University of Hong Kong)
Title: HMS via SYZ for toric CY manifolds
Abstract: In this talk, I will explain my recent joint works with Daniel Pomerleano and Kazushi Ueda on the study of homological mirror symmetry (HMS) for certain toric Calabi-Yau (CY) manifolds from the viewpoint of the Strominger-Yau-Zaslow (SYZ) conjecture.

Rui Wang (Pohang University of Science and Technology, IBS)
Title: The Analysis of Pseudo-holomorphic Curves in Contact Manifolds
Abstract: Pseudo-holomorphic curves in the symplectization of a contact manifold introduced by Hofer is an effective tool in the study of contact topology. In this talk, we will revisit the analysis of such pseudo-holomorphic curves in a tensorial method with introducing a new connection, named the contact triad connection, for every contact triad (Q, ξ, λ). Energy density estimates and the asymptotic behaviour (under nondegerate contact forms) will be given under such analysis. Such analysis indicates a possible generalization, which we call contact instantons, of pseudo-holomorphic curves living in the contact manifold itself without involving the symplectization. I will mention some current results of people related to this topic and some undergoing projects of ours . This is a joint work with Yong-Geun Oh.

Jungsoo Kang (Seoul National University)
Title: Global surfaces of section and symmetry
Abstract: Global surfaces of section are major tools to understand low dimensional dynamical systems such as the planar restricted 3-body problem. Dynamical systems often admit symmetries but a global surface of section does not see symmetry features. I will explain how to construct a disk-like global surface of section which is invariant under the symmetry. This is joint work with Urs Frauenfelder.

Toru Yoshiyasu (University of Tokyo)
Title: On Lagrangian submanifolds in the Euclidean spaces
Abstract: The topology of a closed Lagrangian submanifold of the Euclidean space with the standard symplectic structure is restricted in a certain condition. In this talk, we explain that almost all the closed parallelizable manifolds can be embedded in the Euclidean space with a certain symplectic structure as Lagrangian submanifolds. Additionally, we note a relation between Lagrangian submanifolds of the Euclidean spaces and totally real submanifolds of the complex spaces. This is a joint work with Naohiko Kasuya (University of Tokyo).

Guangcun Lu (Beijing Normal University)
Title: Morse theory for a class of nonsmooth functional and applications
Abstract: In this talk we shall survey my work on Morse theory for nonsmooth functional and some applications to Lagrangian systems, Finsler geometry and Morse homology etc.

Kei Irie (Kyoto University, RIMS)
Title: Symplectic homology of disk cotangent bundles of domains in Euclidian space
Abstract: For any closed manifold Q, Floer homology of its disk cotangent bundle D^*Q is isomorphic to homology of the loop space of Q, and the action filtration on the Floer homology corresponds to the length filtration on the loop space homology. This is a classical result, due to Viterbo, Salamon-Weber, and Abbondandolo-Schwarz. In this talk, we try to extend this result when Q has nonempty boundary. For technical reasons, we only discuss the case when Q is a domain in Euclidean space. We show that filtered Floer homology, or symplectic homology, of D^*Q is isomorphic to relative homology of a certain pair of loop spaces on Q. If time permits, we present some applications on periodic billiard trajectories.

Garrett Alston (Chinese University of Hong Kong)
Title: Floer Cohomology for Immersed Exact Lagrangians
Abstract: Biran and Cornea have a variant of Floer cohomology that they call Lagrangian Quantum cohomology. Their theory applies to monotone Lagrangians, and it involves a mixture of Morse theory and holomorphic discs (so called pearly moduli spaces). I will explain some first steps towards adapting their theory to apply to immersed exact graded Lagrangians. As an example, I will show how to calculate the Floer cohomology of an immersed sphere in T^*S^2.

Morimichi Kawasaki (University of Tokyo)
Title: Superheavy Lagrangian immersions in the torus
Abstract: The problem of displaceability of Lagrangian submanifolds is one of the important problem in the symplectic topology. M. Entov and L. Polterovich defined heaviness and superheaviness of closed subsets in closed symplectic manifolds to solve this problem. To define heaviness and superheaviness, they used the Oh-Schwarz spectral invariants which are from the Hamitonian Floer theory. We explain our method to give superheavy subsets by using noncontractible Hamitonian circle actions. One of our examples is the sum of the meridian curve and the longitude curve in the 2-torus. By this example, we give the non-trivial result about displaceability.

Ki-Heon Yun (Sungshin Woman's University)
Title: Lefschetz fibration and knot surgery 4-manifolds
Abstract: It is known that a lot of smooth four manifolds have infinitely many exotic smooth structures with the help of Seiberg-Witten invariants. One of main technique to construct such examples is the knot surgery which was introduced by Fintushel and Stern. If we perform a knot surgery along a generic elliptic fiber of elliptic surface $E(2)$ by using a fibered knot K in S^3, then we obtain a symplectic four manifold $E(2)_K$. Since symplectic four manifolds are characterized

by Lefschetz pencil/Lefschetz fibration, it is natural to ask how to find an explicit Lefschetz fibration structure on a given knot surgery four manifold $E(2)_K$. In the talk, we will describe how to consider $E(2)_K$ as a Lefschetz fibration. After that, we will give a method how to identify or distinguish a pair of knot surgery 4-manifolds with the same Seiberg-Witten invariants as a Lefschetz fibration and as a smooth 4-manifold. Most results in the talk are jointed work with Prof. Jongil Park.

Hyunjoo Cho (National Tsing Hua University, NCTS)
Title: Almost contact structures and G_2 structures
Abstract: This talk is devoted to some results on almost contact structures and contact structures on manifolds with G_2 structures. We will give an introductory talk about G_2 structures, and show that almost contact structures exist on manifolds with G_2 structures. This is a joint work with Firat Arikan and Sema Salur.

Yi-Jen Lee (Chinese University of Hong Kong)
Title: Invariants from Seiberg-Witten and Heegaard Floer theory
Abstract: TBA

Youngjin Bae (Pohang University of Science and Technology, IBS)
Title: Dynamics on virtually contact structures
Abstract: In this talk, virtually contact structure(VCS) will be discussed as a dynamical generalization of contact structures. More precisely, VCS appear naturally in the study of energy hypersurface of Hamiltonian dynamical systems with magnetic effects. I will explain some examples of VCS and show the existence of periodic Reeb orbit on it by using Rabinowitz Floer homology and the finite energy plane method.

Yuichi Nohara (Kagawa University)
Title: Integrable systems on Grassmannians and potential functions
Abstract: We introduce a completely integrable system on the Grassmannian of 2-planes in an n-space associated with any triangulation of a polygon with n sides, and compute the potential function for its Lagrangian torus fiber. We also study (non-torus) Lagrangian fibers on the boudary of the "moment polytope". This is based on a joint work with K. Ueda.