



Workshop on surface theory and harmonic maps

Conference Handbook

School of Mathematics and Statistics, Fujian Normal University
Key Laboratory of Analytical Mathematics and Applications (Ministry of
Education)
Fujian Key Laboratory of Analytical Mathematics and Applications
(FJKLAMA)

Fuzhou

November 22- November 25, 2024



Conference Notice

The organizing committee invites you to attend this conference to collaboratively promote and strengthen academic exchange and advance the development of geometry and related fields. Accommodation will be provided for participants. If needed, we also offer airport pickup services.

The details of the conference are as follows:

1. Academic Committee: Changping Wang (FJNU)
2. Organizing Committee: Hezi Lin, Lili Wang, Peng Wang, Xiaozhen Wang
3. Conference Schedule:

Conference Location: Qi Shan Plum Garden Hotel (旗山梅园酒店), address: 350 Guobin Road, Shangjie Town, Minhou County, Fuzhou City (福州市闽侯县上街镇国宾大道 350 号).

Registration Location: First Floor, Qi Shan Plum Garden Hotel (旗山梅园酒店一楼)

Registration Date: November 22, 2024 (Friday)

Presentation Dates: November 23 and 24, 2024 (Saturday and Sunday)

Departure Date: November 25, 2024 (Monday)

4. Host Institution:

School of Mathematics and Statistics, Fujian Normal University;

Key Laboratory of Analytical Mathematics and Applications (Ministry of Education);

Fujian Key Laboratory of Analytical Mathematics and Applications (FJKLAMA).

5. Funding Projects: National Natural Science Foundation

6. Contact Person: Peng Wang, 15021713887

Sincerely,

The Organizing Committee of the Workshop on Surface Theory and Harmonic Maps

School of Mathematics and Statistics, Fujian Normal University

November 13, 2024



Schedule

Time: November 23

Address: Multi-Function Hall, Floor F

Time	Title	Speaker	chair
8:50-9:00	Welcome Speech		Peng Wang
9:00-9:45	New Minimal Lagrangian Surfaces in $\mathbb{C}P^2$	Sebastian Heller (BIMSA)	Changping Wang
9:45-10:30	On the zero mass conjecture	Xiaowei Xu (USTC)	
10:30-11:15	Coffee Break & Group photo		
11:15-12:00	Optimal rigidity estimates of varifolds almost minimizing the Willmore energy	Jie Zhou(CNU)	Er Xiao Wang
12:00-14:00	Lunch (Multimedia Hall B, Floor F)		
14:00-14:45	TBA	Brander (DTU)	Ying Lv
14:45-15:15	Coffee Break		
15:15-16:00	Geometrical correspondence of the Miura transformation	Zhiwei Wu (SYU)	Yuping Song
16:00-16:45	Minimal immersions of flat n-tori into spheres	Zhenxiao Xie (BUAA)	Yuping Song
16:45-18:00	Free discussion		Peng Wang
18:00	Dinner (Multimedia Hall B, Floor F)		



Time: November 24

Address: Multi-Function Hall, Floor F

Time	Title	Speaker	Chair
9:00-9:45	TBA	Lynn Heller (BIMSA)	Peng Wang
9:45-10:30	Gluing construction of maxfaces	Hao Chen (Shanghai Tech)	Hezi Lin
10:30-11:15	Coffee Break		
11:15-12:00	The $A_2^{(2)}$ Toda Equations, Affine Spheres, Minimal Surfaces, and Ruh–Vilms Type Theorems	Shimpei Kobayashi (Hokkaido U)	Lili Wang
12:00-14:00	Lunch (Multimedia Hall B, Floor F)		
14:00-14:50	Free discussions		Peng Wang
14:50-15:10	Coffee Break		
15:10-18:00	Free discussions		Peng Wang
18:00	Dinner (Multimedia Hall B, Floor F)		



Titles and Abstracts

Sebastian Heller(Beijing Institute of Mathematical Sciences and Applications)

Title: New Minimal Lagrangian Surfaces in $\mathbb{C}P^2$

Abstract: An immersion $f:\Sigma\rightarrow\mathbb{C}P^2$ is called a minimal Lagrangian surface if it is minimal with respect to the Fubini study metric and Lagrangian with respect to the Kähler form. Besides the real projective plane and minimal Lagrangian tori, which can all be constructed via integrable systems methods, the only known compact examples have been obtained by Haskins and Kapouleas for odd genera. In this talk, we explain the construction of new compact minimal Lagrangian surfaces of genus $g=(k-2)(k-1)/2$ for large $k\in\mathbb{N}$ using gauge theoretic and loop group factorization methods. These surfaces are analogous to Lawson's minimal surfaces in the 3-sphere and coincide with the projective plane and the Clifford torus for $k=2,3$, respectively. We determine their symmetry groups and show that the underlying Riemann surfaces are the Fermat curves. We also discuss further geometric properties such as their area and Willmore energy. This talk is based on joint work with Charles Ouyang and Franz Pedit.

Xiaowei Xu(University of Science and Technology of China)

Title: On the zero mass conjecture

Abstract: In this talk we study the residual Monge-Ampere mass of PSH functions with S^1 -symmetry, and we give a partial answer to zero mass conjecture raised by Guedj and Rashkovski. This is a joint work with Long



Li and Weiyong He.

Jie Zhou (Capital Normal University)

Title: Optimal rigidity estimates of varifolds almost minimizing the Willmore energy

Abstract: In this presentation, we talk about the stability of the Willmore functional. For an integral 2-varifold $V = \nu(\Sigma, \theta \geq 1)$ in \mathbb{R}^n with square integrable generalized mean curvature and finite mass, if its Willmore energy is smaller than $4\pi(1 + \delta^2)$ and the mass is normalized to be 4π , we show that Σ is $W^{2,2}$ and bi-Lipschitz close to the standard embedding of the round sphere in a quantitative way when $\delta < \delta_0 \ll 1$. For $n = 3$, we prove that the sharp constant is $\delta_0^2 = 2\pi$. This is a joint work with Dr. Yuchen Bi.

Brander (Technical University of Denmark)

Title: TBA

Abstract: TBA

Zhiwei Wu (Sun Yat-sen University)

Title: Geometrical correspondence of the Miura transformation

Abstract: The Miura transformation is introduced first by R. Miura to relate solutions of the KdV equation with those of the modified KdV



(mKdV) equation and to construct an infinite number of conservation laws of the KdV equation. In this talk, we will discuss curve flows whose invariants are solutions to the KdV and mKdV type equations. The generalized Miura transformations will be induced from the correspondence between different sets of geometric invariants. This talk is based on joint works with Qu, Changzheng.

Zhenxiao Xie (Beihang University of Aeronautics and Astronautics)

Title: Minimal immersions of flat n -tori into spheres

Abstract: In this talk, I will show the following two results. First, we demonstrate that every flat rational n -torus admits a minimal immersion into some sphere, extending Bryant's result on 2-tori. Second, we show that every minimal flat n -torus in a sphere can be minimally and isometrically immersed in $S^{\{n(n+1)-1\}}$. As a corollary, this implies that every minimal flat 2-torus can be minimally and isometrically immersed in S^5 . This is a joint work with Ying Lv and Peng Wang.

Lynn Heller(Beijing Institute of Mathematical Sciences and Applications)

Title: TBA

Abstract: TBA



Hao Chen(Shanghai Tech University)

Title: Gluing construction of maxfaces

Abstract: The gluing method has been a powerful tool for constructing minimal surfaces. Recently, we applied this method to construct maxfaces in Lorentz space that look like space-like planes connected by Lorentzian catenoids. We obtained a large amount of examples, including (but not limited to) the first Costa—Hoffman—Meeks-type maxfaces. We also analyzed singularities on our examples. It seems that this progress is only a beginning: In view of its power on minimal surfaces, the method may produce many more maxfaces in the future. This is a joint work with Pradip Kumar et al.

Shimpei Kobayashi(Hokkaido University)

Title: The $A_2^{(2)}$ Toda Equations, Affine Spheres, Minimal Surfaces, and Ruh–Vilms Type Theorems

Abstract: In this talk, we explore surfaces in various ambient spaces and examine a special class of surfaces induced by the $A_2^{(2)}$ Toda equations, which are well-known in integrable systems.

We also provide a characterization of these surfaces through Ruh–Vilms type theorems, specifically by examining the properties of their Gauss map. This presentation is based on three papers available on arXiv: 1902.01558, 1909.03207, and 2405.11771.



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List of Participants