

Research Report (April, 2022- March, 2023)

Enrollment from
April 2020

Department of Pure and Applied Mathematics

Tadashi Udagawa

I. List of Papers

II. List of Talks

- [1] Tadashi Udagawa, "Globality of the DPW construction for Smyth potentials in the case of $SU(1,1)$ ", RIMS Workshop Applications of Harmonic Maps and Higgs Bundles to Differential Geometry, Kyoto University, May 2022.
- [2] Tadashi Udagawa, "Global solutions of the sinh-Gordon equation and the Iwasawa factorization for loop groups.", International Workshop Multiphase Flows; Analysis, Modeling and Numerics, Waseda University, December 2022.

III. Research Results in AY2022

First, I constructed constant mean curvature surfaces (CMC surfaces) in the Minkowski space by using the DPW method in the case of Smyth potential. In terms of the DPW method, the global solutions of the Gauss-Codazzi equation corresponds to the global Iwasawa factorization for loop group. Since the corresponding Gauss-Codazzi equation can be regarded as the sinh-Gordon equation, we obtain the global solution of the sinh-Gordon equation from the global Iwasawa factorization. Solutions of the sinh-Gordon equation can be characterized by the asymptotic behavior of solutions and then real numbers. By considering the solution of the sinh-Gordon equation as a harmonic metric, we give a relation between real numbers, the global solutions and Smyth potentials in terms of representation theory.

IV. Research Plan for AY2023

There is a one-to-one correspondence between Smyth potentials and real numbers. By using the DPW method, we can classify Smyth potentials in terms of the resulting CMC surface obtained by the DPW method. I will interpret this classification from the standpoint of representation theory.

When we regard the sinh-Gordon equation as a harmonic metric, we can relate the solutions to positive energy representation, and by using the DPW method, it is also associated with the Smyth potential. Therefore, I think that there is a relationship between the classification of Smyth potential and positive energy representation. Now we consider the classification of Smyth potentials not only from the CMC surface but also from the aspect of physics such as conformal field theory.