

Scientific report of Dr. Liulan Li for Abel-Visiting-Scholar-Program

During the visit of awardee under the support of the Abel-Visiting-Scholar-Program, we have done research on complex valued harmonic mappings in the unit disk $|z| < 1$. We have managed to complete two research articles and both of them have been submitted to two international journals. The titles of these papers are as follows.

- (1) L. Li and S. Ponnusamy, Injectivity of sections of convex harmonic mappings and convolution theorems (16 pages);
- (2) L. Li and S. Ponnusamy, Sections of stable harmonic convex functions (15 pages).

In the first paper, we consider the class of normalized univalent harmonic convex mappings in the unit disk $|z| < 1$. It is well-known that unlike the analytic case, convolution of two univalent harmonic convex functions is not necessarily even locally univalent in the unit disk. In this article, we first show that the convolution of certain class of harmonic close-to-convex functions with a class of harmonic (not necessarily univalent) functions remains close-to-convex in the unit disk. Using certain convolution results and theorems of Clunie and Sheil-Small, we also show that all sections $s_{n,n}(f)$ of harmonic convex mapping f are convex and univalent in the disk $|z| < 1/4$ for $n \geq 2$ and $n \neq 3$. Moreover, we show that the section $s_{3,3}(f)$ is not convex in the disk $|z| < 1/4$ but is convex in a smaller disk. We expect that the method used in this direction will enhance interest in this topic as not much attempt has been done in studying the properties of sections of univalent harmonic mappings.

In the second paper, we have considered the class of stable harmonic convex mappings and have obtained the radius of the disk on which every section of stable harmonic convex mappings is close-to-convex or convex. Some convolution results about stable harmonic convex mappings have also been achieved.

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