Computational Complexity of Pleat Folding

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Abstract: Pleat folding is one of the basic tools in origami design. Recently, the author and colleagues introduce a new origami problem about pleat foldings. For a given assignment of n creases of mountains and valleys, the pleat folding problem aims at making a strip of paper well-creased according to the assignment at regular intervals. We developed efficient algorithms from the viewpoint of computer science. In this talk, the author will give another related problem about pleat foldings called the *least stress pleat folding problem*. For any given assignment of n creases of mountains and valleys, it is not difficult to see that there exists a strip of paper which is folded to of length 1 consistent with the assignment. However, there are exponential many folding ways according to the assignment. Among them, which one is the best folding way? In a real world, it is not easy to fold many papers at once since the paper does not have thick 0. In order to deal such a real problem, we introduce a new notion of *stress* at each crease point. Stress at a crease point is the number of papers between a pair of two apers hinged by the crease point. Then we can consider two kinds of *goodness* of a folded state; the total stress and the maximum stress of all crease points. Given assignment of n creases, the *least stress pleat folding problem* aims to find a good folding state from these viewpoints. We will discuss about the computational complexity of this problem.

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