明治大学先端数理科学インスティテュート

MIMS現象数理カフェセミナー

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Development of Origami-forming by modeling and simulation

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Abstract: Origami is a forming process from flat papers to 3D shape by following steps: Shape → Partition → Making crease pattern → Cutting material → Folding → Connecting by glue. In this study, a new manufacturing method called Origami-forming is developed, based on traditional Origami approach. The new method follows the same steps as Origami, applying for wider rank of material (soft and hard material such as aluminum, high tensile steel, etc), and folding by a reconfigurable robot system. If the method is successful, it will allow to produce object in short time and get higher stiffness. In this study, the Origami-forming is applied into Truss Core Panel (TCP) manufacturing, to get the shape that is impossible to be produce by current technology, and a countermeasure to reduce the springback is considered. Secondly, a grooving technique inspired from tradition origami is proposed to bend the material easier than before, hence allow for a dual-arm robot can produce many cases of shape. A optimization process based on Response surface methodology is built to search for best shape of groove. Next, designing handling system and decision-making process are carried out. Modeling and simulation by FEM is used to confirm forming process.

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