Folding shapes with oritatami systems

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Résumé

Joint work with Erik D. Demaine, Jacob Hendricks, Meagan Olsen, Matthew J. Patitz, Trent A. Rogers, Shinnosuke Seki and Hadley Thomas.
An oritatami system (OS) is a theoretical model of self-assembly via co-transcriptional folding. It consists of a growing chain of beads which can form bonds with each other as they are transcribed. During the transcription process, the $δ$mostrecentlyproducedbeadsdynamicallyfoldsoastomaximizethenumberofbondsformed, self−
assemblyingintoashapeincrementally.Theparameter$δ$iscalledthe{delay}andisrelatedtothetranscriptionrateinnature

Thisarticleinitiatesthestudyofshapeself−assemblyusingoritatami.Ashapeisaconnectedsetofpointsinthetriangularlat
assemblysystemsbyexhibitingafamilyofinfiniteshapesthatcanbetile−assembledbutcannotbefoldedbyanyOS.AsitisNP
hardingeneraltodeterminewhetherthereisanOSthatfoldsinto(self−assembles)agivenfiniteshape, weexplorethefoldin
3$, byanOSwithdelay$1$.Wealsoshowthatanyshapecanbefoldedatthesmallerscale2byanOSwith{unbounded}delay.Th
Theseresultsserveasafoundationforthestudyofshape−buildinginthisnewmodelofself−assembly, andhavethepotentia
assembleviathiscomplexdynamicalprocess.

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