1 Results

Research followed two main thrusts:

1.1 Reconfigurable Robots

- Solved the hinged dissection problem, which was over a 100 years old, proving that any finite collection of shapes have a hinged dissection.
- Proved that crystalline robots can reconfigure extremely efficiently: $O(\log n)$ time and $O(n)$ moves.
- Proved that any orthogonal polyhedron can be folded from a single, universal crease pattern (box pleating).

1.2 Origami Design

- Developed mathematical theory for what happens in paper between creases, in particular for the case of circular creases.
- Circular crease origami on permanent exhibition at MoMA in New York.
- Developing mathematical theory of Tomohiro Tachi's Origamizer framework for efficiently folding any polyhedron from a sheet of paper.
- Developing mathematical theory of Robert Lang's TreeMaker framework for efficiently folding tree-shaped origami "bases".
- Developing tools with Tomohiro Tachi for animation of real origami.
- Visited Japan in December 2007, sharing latest results in computational origami.
2 Publications

2.1 Book


2.2 Journal Papers


2.3 Book Chapters


2.4 Conference Papers


REPORT DOCUMENTATION PAGE

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14. ABSTRACT
I. RECONFIGURABLE ROBOTS
* Solved the hinged dissection problem, which was over a 100 years old, proving that any finite collection of shapes have a hinged dissection.
* Proved that crystalline robots can reconfigure extremely efficiently: \(O(\log n)\) time and \(O(n)\) moves.
* Proved that any orthogonal polyhedron can be folded from a single, universal crease pattern (box pleating).

II. ORIGAMI DESIGN
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* Circular crease origami on permanent exhibition at MoMA in New York.
* Developing mathematical theory of Tomohiro Tachi's Origamizer framework for efficiently folding any polyhedron from a sheet of paper.
* Developing mathematical theory of Robert Lang's TreeMaker framework for efficiently folding tree-shaped origami "bases".

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