José Bico
(PMMH, ESPCI)

Making shapes

Cartographers have early realized that it is impossible to draw a flat map of the Earth without deforming continents. Gauss later generalized this geometrical constrain in his Theorema Egregium. Can we invert the problem and obtain a 3D shape by changing the local distances in an initially flat plate? This strategy in widely used in Nature: leaves or petals may develop into very complex shapes by differential growth. From an engineering point of view, similar shape changes can be obtained when a network of channels embedded in a flat patch of elastomer is inflated. Can we program the final inflated shape?