Interactive Modeling of Developable Surfaces

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Developable surfaces can be mapped into the plane without distortion and thus represent shapes obtainable with thin materials which do not stretch. They are important in a variety of applications including freeform architecture, sheet-metal based industries, industrial design and curve-creased origami. We present a computational framework for interactive modeling with developable surfaces and curve-creased origami where developable surfaces are represented as splines and the non-linear conditions relating to developability and curved folds are expressed as quadratic equations. This allows us to utilize a fast constraint solver which may be described as energy-guided projection onto the constraint variety. Finally, we briefly address extensions to material-aware modeling where precise developability is replaced by material properties. This is joint work with Chengcheng Tang, Pengbo Bo, Martin Kilian and Johannes Wallner.