VirginiaTech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Computer Science Seminar Series

National Capital Region

Self Folding Origami

Speaker: Prof. Jyh-Ming Lien
George Mason University

Friday, April 24, 2015
1:00PM- 2:00PM, NVC 325

Abstract

In recent year, we have witnessed the acceleration in the development of self-folding origami or self-folding machines due to the advances in robotics engineering and material science. These self-folding origami can fold itself into a desired shape via the micro-thick folding actuators or by reacting to various stimuli such as light, heat and magnetic fields. Although the development is still in its early stage, there have already been many applications, such as surgical instruments for minimally invasive surgery, where there is a need for very small devices that can be deployed inside the body to manipulate tissue.

Designing self-folding origami that can resume or approximate a single or multiple target shapes requires careful foldability analysis. In this talk, I will talk about the recent progress made by my research group to advance the foldability analysis. I will first introduce the basic ideas of motion planning and its application in computational origami. I will then discuss computational challenges faced in folding rigid origami, a class of origami whose entire surface remains rigid during folding except at crease lines. To address these challenges, I will present techniques that reuse computation and sample in discrete domain. Finally, I will present preliminary results on the effort of making 3D shapes foldable.

Biography

Jyh-Ming Lien is an Associate Professor in the Department of Computer Science at George Mason University. He is the director of the Motion and Shape Computing (MASC) group and affiliated with the Autonomous Robotics Laboratory. He received his Ph.D. in Computer Science from Texas A&M University in 2006. Prior to joining George Mason in 2007, he was a postdoctoral researcher at UC Berkeley. His research goal is to develop efficient, robust and practical algorithms for representing, manipulating and analyzing massive geometric data of shape and motion. His research finds applications in the areas of computational geometry, computer graphics, GIS, visualization and robotics. His research has been supported by NSF, USGS, DOT, AFOSR, and Virginia Center for Innovative Technology. Images, videos, papers, and software about his work can be found at: https://masc.cs.gmu.edu/