APPLICATION OF CONFORMAL MAPS TO ORIGAMI-BASED STRUCTURES: NEW METHOD TO DESIGN DEPLOYABLE CIRCULAR MEMBRANES

Sachiko ISHIDA
Meiji University
Nakano, Tokyo, Japan
tz12013@meiji.ac.jp

Taketoshi NOJIMA
Art Excel Co., Ltd.
Hirakata, Osaka, Japan
taketoshinojima@gmail.com

Ichiro HAGIWARA
Meiji University
Nakano, Tokyo, Japan
ihagi@meiji.ac.jp

ABSTRACT

This paper presents a new method using conformal transformation to design crease patterns of circular membranes that can be wrapped up compactly. This method is focused on the advantages of origami that are packaged compactly and deployable at will, and enables to design complex deployable structures systematically and efficiently from simple structures, controlling angles among fold lines. Various deployable circular membranes are successfully produced by the method. They are wrapped up around the center of membranes and form structures such as regular polygons, rectangles, diamond shapes, etc. Circular membranes with zigzag fold lines to radial direction are also demonstrated. They are deployable along radial direction of membranes. The proposed method is flexible to generate zigzag fold lines, compared with the method by mirror image, since zigzag fold lines can be designed close to the center of membranes without geometrical constraints. For industrial application, models made of a plastic film, closing and a stainless steel plate are also demonstrated.