We then give a justification based on potential theory for the Bolyai-type gravitation force. Finally, based on the Einstein gravity equations we discuss the cosmological importance of the geometrical world of Bolyai.

Optimum Arrangement of Circles And The Associated Generalized Tensegrity

Gáspár Zsolt, Tarnai Tibor, Hincz Krisztián

BME, Magyarország

Connelly posed a problem: How must the centres of n equal discs of given radius r be distributed in the unit circle so that, in the unit circle, the area covered by the discs will be a maximum? He considered the case of n = 5 as an example, and wanted to know that, with a continuous increase in r, how the disc configuration changes in the transition from packing to complete covering. If r is only a little larger than the maximum packing radius then the discs have double overlaps. In such a case, the motion of the discs can be described as a function of a parameter, and the derivative of the area with respect to the motion parameter can be expressed with a formula of Csikós. Connelly has provided a stress interpretation of Csikós's formula, and shown how a tensegrity framework can be associated to the maximum area configuration. However, if r is close to the minimum covering radius, then the discs can have some triple overlaps for which it is not known how to construct a mechanical model to represent the maximum area configuration. In this paper, we introduce triangular elements to model the triple overlaps of the circles. Edge forces of these elements can be calculated as functions of the coordinates of the vertices of the triangles. In the case of the optimum arrangement for a given r, the associated generalized tensegrity structure composed of cables, struts and triangular elements is in a state of self-stress. It is problematical, however, that in certain intervals, more states of self-stress can occur. The stiffness matrix of the elements and that of the structure, however, can be constructed, by the help of which the locus and type of the points of bifurcation as well as the complete system of the equilibrium paths can be determined.
Support by OTKA Grant K81146 is gratefully acknowledged.