SYNTHESIS OF A HINGED FOUR-LINKED MECHANISM BY THE METHOD OF MAXIMUM SHRUNKEN EVOLUTE PART II: DETERMINATION OF THE MECHANISM DIMENSIONS

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Abstract: *On the basis of the elements of the kinematic and analytic geometry, a mathematical model for synthesis of a hinged four-link mechanism is composed by combining two advanced methods.*

In Part II of this article the kinematic scheme of the mechanism is synthesized by the method of maximum contracted evolute. The derived mathematical model for synthesis is illustrated by an appropriate example.

Keywords: *a hinged four-link mechanism, maximum contracted evolute*

1. Introduction

Commonly, the generation of a random continuous function of the position or transfer function can be achieved approximately by lever mechanisms through the so called approximation synthesis. This synthesis represents an optimization problem for whose solving different methods, mainly divided into *algebraic* and *geometric*, may be applied [1], [11].

The founder of the algebraic synthesis approach is P. L. Chebyshev [9]. He introduced the criterion of best uniform approximation of the generated function to the predefined one based on polynomials with a minimum deviation from zero (*Chebyshev polynomials*). Another criterion based on *Legendre polynomials* is the minimizing of the mean-square deviation of functions [8], [7].

In most cases, approximation problems on the synthesis of mechanisms have a geometric base. The founder of kinematic geometry as a theoretical apparatus for synthesis of lever mechanisms is Burmester [12]. In the middle of the last century, the analytical theory of approximation synthesis based on kinematic geometry was developed [10], [13]. Later, methods for synthesis of lever mechanisms without use of precise points were developed, also called *interpolation* or *approximation* nodes [14]. The *method of maximum contracted evolute* developed by Galabov [2], [3], [4] also belongs to this group [15]. This method proved its advantages in its application for synthesis of various types of planar mechanisms [5], [6], [16].

In Part I of the article the *output centrode method* was applied for determination of the β area. If the initial position of the movable centre of the rocker of a hinged four-link mechanism is located in this area, the requirement for favourable transmission of force to the rocker will be fulfilled for the whole geometric range of the synthesized mechanism.

The purpose of this work (Part II) is to *apply the method of maximum contracted evolute* for synthesis of hinged four-link mechanisms. The mathematical model of synthesis derived for this purpose is illustrated by appropriate examples.

2. Applying of the method of maximum contracted evolute

The locus of the centre of curvature A in the plane of the input link is searched. This is