DETERMINING A PLANE QUADRILATERAL MECHANISM WHEN A POINT OF THE ROD GOES THROUGH FIVE GIVEN POINTS

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The synthesis of the plane articulated mechanism for which a point of the rod plane approximates a given curve can be solved by determining a mechanism so that a point of the mechanism's rod should go through five points chosen on the given curve. Thus we reach a five positional synthesis problem which is solved by determining the Burmester points. In the paper we use a mixed method CAD – analytic in order to solve such a problem.

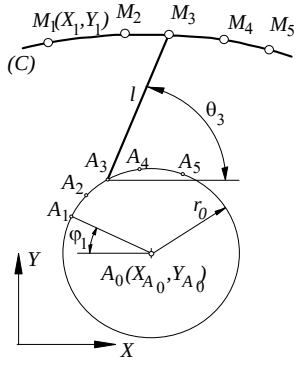

Fig. 1

Having the given curve (C) in fig.1 we are asked to determine an articulated quadrilateral mechanism so that a point of the rod's plane should approximate this curve. In this regard we take into consideration five points on the curve M_i, i = 1, 2, 3 .., 5, we choose a point A_0 and we trace a circle with a chosen radius r and the centre A_0. Using a chosen length l we trace on the circle points A_i , i = 1, 2, ..., 5, thus $A_iM_i = l$.

If we consider that segment A_iM_i is a segment of the rod plane, the problem reduces to determining point B in the rod's plane which in the five positions remains situated on a circle. The centre B_0 of this circle and the point A_0, represent two of the four Burmester points. As it is presented in works [2], [3] the Burmester points are situated at the intersection of the Hackműller conics. In order to obtain the equations of the conics C_{ij} and of the Hackműller conics we use the equations employed in paper [3], we find the equations of the two conics which when intersected determine the Bumester points.

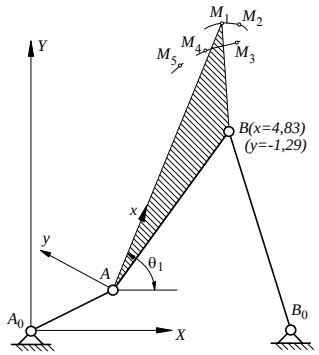

Fig.3

In order to obtain the movable articulations we choose one of the 3 Burmester points to be an articulation, we find the movable aticulation and in the end we find the length l_{AB} of the rod AB. The algorithm proposed to calculate goes through the previously mentioned stages. For a graphical representation we determine through AutoACAD procedures the parameters: X_{Ao}, Y_{Ao}, X_{Ai}, Y_{ai}, θ_i, we analytically determine the equations of the Hackműller conics, we represent graphically these conics and from their intersection with the help of the AutoACAD we determine the coordinates of the Burmester points. From the three Burmester points we choose articulation B_0 and we determine parameters x, y, z, l_B, l_{AB}.

Finally, the work encloses a numerical application, where we determine an articulated quadrilateral mechanism so that point M of the rod plane should go through five points given in the coordinates. The mechanism obtained, the rod curve and the five positions of point M are rendered in figure 3.

REFERENCES

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