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SLIDER-CRANK MECHANISM

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ABSTRACT

In this work an application of the computing methods is shown for the quick and parametric dimensional synthesis of a mechanism slider – crank for four positions of precision. Additionally such methods are applied to analyze the synthesized mechanism and to simulate three-dimensional and dynamically their behaviour like function of the nature of their kinematic pairs.

For three displacements **s12 = -8**, **s13 = -20**, and **s14 = -35** of the slider one, which should be produced by the corresponding rotations **φ12 = 15^0**, **φ13 = 35^0**, and **φ14 = 65^0** of the crank, using Excel and the procedure indicated in [1] four solutions are obtained (to see Table 1) for the longitudes of the crank (**a1**), of the transmitter (**a2**), for the eccentricity (**a3**) and for the horizontal distance of the slider one to the centre of rotation of the crank (**s1**). Each solution corresponds o different values of the angle among the crank, in its first position (**ANGLE1**), and the positive axis x. Still when the Table 1 – for space reason – it only shows four solutions of he infinite number of existent solutions, it is possible to obtain as many solutions as it is required the exit parameters since they are relative function of the entrance data.

Table 1 Exit parameters for different solutions

Solution	**ANGLE1**	**a1**	**s1**	**a3**	**a2**
First	**28**	**22.229**	**62.770**	**-27.215**	**57.262**
Second	**29**	**23.001**	**62.951**	**-23.704**	**55.223**
Third	**30**	**23.716**	**62.934**	**-20.385**	**53.263**
fourth	**31**	**24.384**	**62.745**	**-17.225**	**51.361**

Using Inventor, with the parameters indicated in the Table 1, it is possible to analyze each one of he obtained solutions. The Figures 1, 2, 3, and 4 show, for the third of the possible solutions, the four position so much of the slider one as of the crank. You can verify that the synthesized mechanism satisfies with the conditions settled down by the entrance values, maintaining without change the longitudes of the crank and of the transmitter as well as the eccentricity.

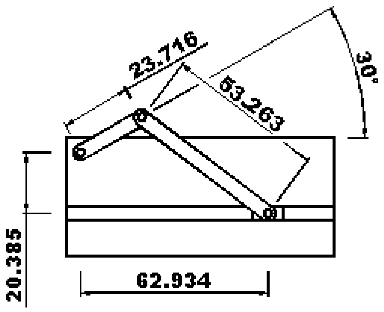

Figure 1 Mechanism in first position.

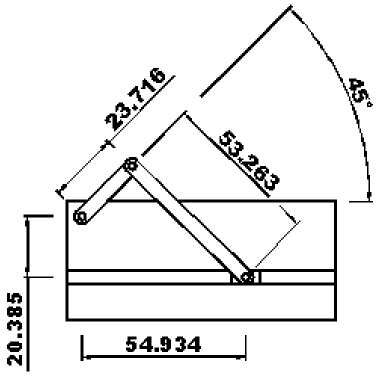

Figure 2 Mechanism in second position.

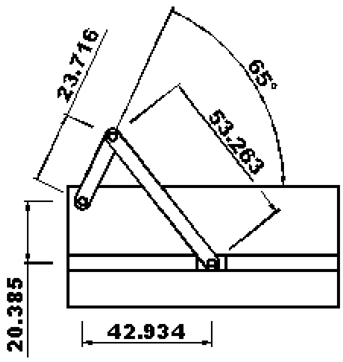

Figure 3 Mechanism in third position.

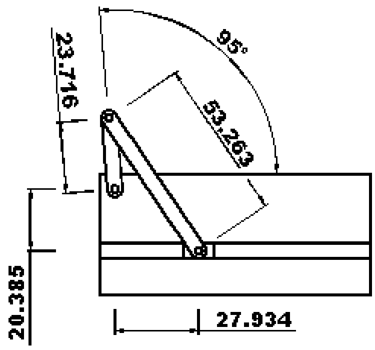

Figure 4 Mechanism in fourth position

The simulation three-dimensional dynamics is possible when varying the parameter ANGLE1, indicated in the Figure 5, from 0^0 up to 360^0.

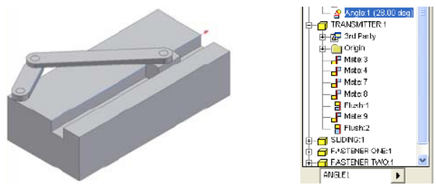

Figure 5 Mechanism in three dimensions.

Analysis of results: The results of the Table 1 show that the four solutions satisfy the condition of Grashof and the obtained mechanism are crank – oscillator [2] and [3].

Conclusions: The computing methods applied to a system crank – slider they allow their dimensional synthesis and their analysis, in a quick and parametric way, for four positions of precision. Additionally they simulate their behaviour in a quick, parametric, three-dimensional and dynamics way. Resolved the synthesis of a mechanism crank – slider, in a quick and parametric way, it is possible to concentrate on qualitative aspects of the same one and to omit all those repetitive procedure that lead to solutions quantitative singular.

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