Name E:No

Dept. of Mechanical Engineering
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MEL837 Minor 2 16/09/2019

Q1. Consider the urgent need to design a mechanism to pass through four points C_1, C_2, C_3 and C_4 on a straight line whose positions are specified below. This is not something that any Tom-Dick-and-Jane mechanical engineer can do as it is beyond the basic kinematics course. Do it as follows.

i) We arbitrarily choose $A_1 \equiv A_2$ at a convenient location and also select the location of O_A. This is given in the figure below. The rest is semi deterministic.
ii) Draw the locus of moving pivot A and identify, A_3 and A_4.
iii) Identify P_{13}, P_{14}, and the image poles P_{24}^1 and P_{23}^1which form opposite pole quadrilaterals.
iv) Draw the circle point curve.
v) Verify that the circle point curve passes through C_1, A_1, and obviously the corners of the quadrilateral; else check your construction.
vi) What is the order of traverse on the curve immediately to the right of P_{14}? It is not sufficient to state an order, please justify it.
vii) Pick B_1 in between the two parallel lines and on the circle point curve to start with. Find three other positions of B by inversion and verify that they all lie on a circle!
viii) Find O_B and realise the mechanism in Cindy and write which point I can drag to move the mechanism. Sketch the coupler curve and comment on the nature of the solution. Is O_BB a crank? Does the mechanism move C in the right order? How close is the straight line motion.
ix) Not done yet. We find the point on the circle point curve to the RHS of P_{14} where the mechanism type transists to Grashof. Do it by shifting B_1 along the curve starting from P_{14} to the second vertical line and creating a table of link lengths, parametrized by path length (ρ) along the curve from P_{14}. List shortest + longest and sum of other two. Plot the last two against the path length and determine the point of Grashof transition on the circle point curve!

S.No	L1	L2	L3	L4	$s + \ell$	$\ell_a + \ell_b$	ρ
1							
2							
3							
4							
5							
6							

x. How do we improve the solution?
xi. What is the problem is choosing $A_1 \neq A_2$?
xii. What are the pluses and minus of using a Paucellier cell to generate exact straight line motion for this problem?

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