Week HW 2, KIN PLANE 2

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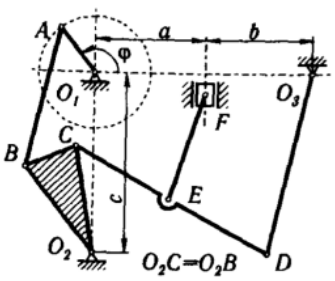
1 Task 1:

You should find:

1. simulate this mechanism (obtain all positions.)
2. velocities and accelerations for A, B, C, E, F, D.
3. draw plots: speed and acceleration B, C, F, E; angular speed and angular acceleration CD, CO_2, DO_3.

Needed variables:

$\omega_{O_1A} = 2\ rad/s$;
$\phi = 130°$; $a = 31$; $b = 30$; $c = 50$;
$O_1A = 15$; $O_2B = 30$; $O_3D = 50$; $AB = 40$; $BC = 16$;
$CD = 60$; $CE = 30$; $EF = 30$..



Task 1
(Yablonskii (rus) K4)

1.1 Solution:

Given Points: $O_1(0,0)$ $A(O_1A\cos(\omega_{O1A}t+\phi), O_1A\sin(\omega_{O1A}t+\phi))$ $O_2(0,-c)$ $O_3(c+b,0)$ $F(x=a)$ — (line of translation of point F)

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Solve the system to find B:

$$\begin{cases}(x_B-x_A)^2+(y_B-y_A)^2=AB^2\\(x_B-x_{O2})^2+(y_B-y_{O2})^2=O_2B^2\end{cases}$$

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Solve the system to find C:

$$\begin{cases}(x_C-x_B)^2+(y_C-y_B)^2=BC^2\\(x_C-x_{O2})^2+(y_C-y_{O2})^2=O_2C^2\end{cases}$$

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Solve for D:

$$\begin{cases} (x_D - x_{O3})^2 + (y_D - y_{O3})^2 = D_{O3}^2 \\ (x_D - x_C)^2 + (y_D - y_C)^2 = CD^2 \end{cases}$$

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Find E from:

$$\overrightarrow{CE} = \frac{\overrightarrow{CD} \cdot CE}{CD}$$

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Solve for F:

$$\begin{cases} (x_F - x_E)^2 + (y_F - y_E)^2 = EF^2 \\ x_F = a \end{cases}$$

1.2 Animation Description

The animation visualizes the trajectory and the vectors representing velocities and accelerations for A, B, C, E, F, D. The plots show speed and acceleration for points B, C, F, E; and angular speed angular acceleration CD, CO2, DO3.

1.3 Code

The full code solution is available on GitHub: GitHub Repository Link.