Mechanism Position Analysis

Important Mechanism Positions

An intermediate position

Figure from Uicker et al., Theory of Machines and Mechanisms, 2003
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Time Ratio

\[ Q = \]
An Example

• Given:
  - \(25\)
  - \(90\)
  - \(85\)

• Find:
  a) Draw limit positions & calculate \(\theta_2, \theta_4, \gamma\)
  b) Draw min./max. transmission angles & compute \(\gamma_{min} \& \gamma_{max}\).
  c) Compute Q
More Complicated Position Analyses

- Notice that in the limit positions, two links always lined up. This resulted in nice triangles that were easy to solve.
- Let’s look at more complicated situations.

Position of a Mechanism Point

- Conventions used in text
What if there are two points?

- What is the “position difference” between $\mathbf{R}_{QO}$ and $\mathbf{R}_{PO}$?

What if there are two coordinate systems?

- Given the “apparent position” of point $P$ in the coordinate system $O_2$, what is the position of $P$ in coordinate system $O_1$?
What if there are two coordinate systems?

- How do you perform the addition for:
  \[ \mathbf{R}_P = \mathbf{R}_{O_2} + \mathbf{R}_{P/2} \]

- The bottom line:

Step 1. Markup the Assembly Drawing

- Get full details of assembled components.
- Identify links with numbers and joint locations with letters.
Step 2. Create Schematic Drawing

Step 3. Create the Vector Diagram
Step 4. Define Loop Closure Equation(s)

Step 5. Solve Loop Closure Equation(s)