Software and Tools for Computational Engineering

RWTH AACHEN UNIVERSITY

Software Lab Computational Engineering Science

Group 12, Pusher Mechanism

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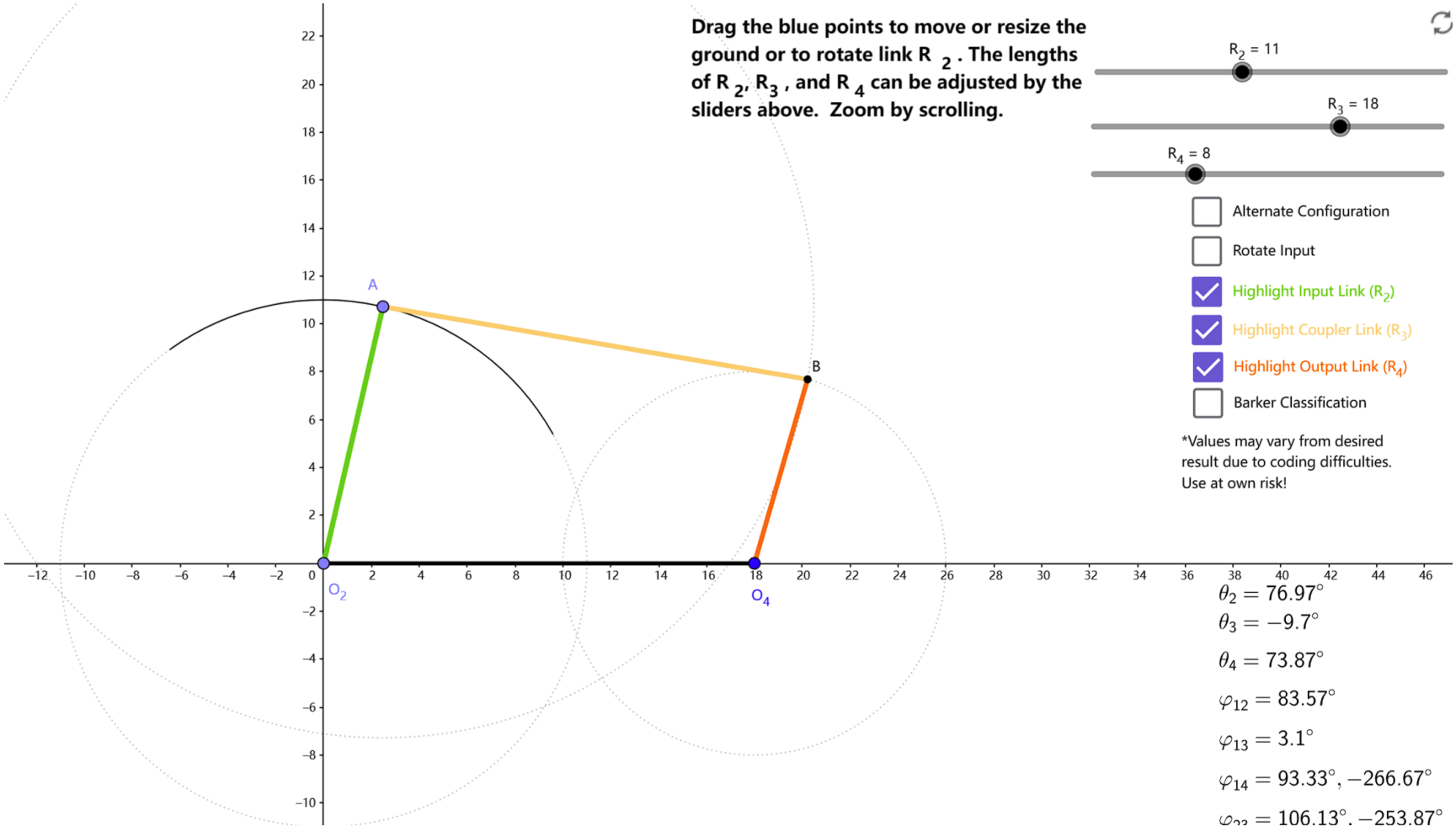
Informatik 12: Software and Tools for Computational Engineering (STCE)
RWTH Aachen University

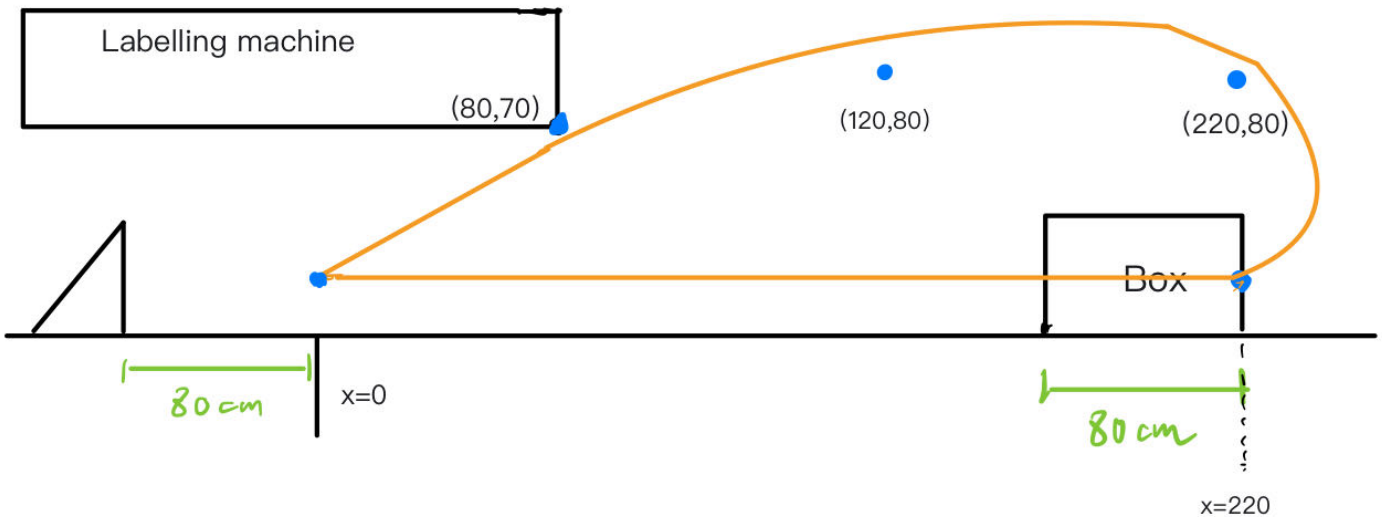
Contents

- Establish the basic geometry for a planar mechanism to achieve the given path.
- Provide the following data for the designed four-bar mechanism:
  - Position of the two fixed pivot positions
  - Lengths of the three moving links and of the fourth base link
  - The position of the couple offset point relative to the coupler
- Using Solid Edge, design and generate the 3D models of links of the mechanism:
  - Construct the links out of sub-parts
  - Assemble the links
  - A diagram (produced from Solid Edge) of the assembled 3D mechanism
- Simulate the motion of the mechanism using the Simply Motion option within Solid Edge.
- Evaluate the KE of the mechanism as it cycles:
  - Produce a graph of the KE against time (or against crank angle) with at least 36 points
  - Find the kinetic energy of the mechanism as it goes through a cycle
- Obtain a configuration suitable for RP production.

- Online Demo: `https://www.geogebra.org/m/BueCG9ch`



The Example



Functional:

- Use the "mechanism selector" in the constraint modeller to find a four-bar mechanism that fits the given path.
- Use the CAD (Solid Edge) to generate parts as 3D models:
  - Construct the links out of sub-parts (to minimize the eventual cost of RP).
  - Assemble the links in Solid Edge to ensure that they fit together.
  - Additional requirements for RP:
    - Moving parts should be designed with a clearance between holes and shafts of approximately 0.25mm.
- Simulate the motion of the mechanism using the Simply Motion option within Solid Edge.

Functional:

- Evaluate the KE of the mechanism as it cycles:
  - Use the constraint modeller or other appropriate methods:
    - Firstly adapt a macro for a four-bar chain to represent and simulate the motion of the particular mechanism.
    - Then enhance the macro to find velocities and kinetic energies of the links.
  - Results to be achieved:
    - Produce a graph of the KE against time (or against crank angle) with at least 36 points.
    - Find the kinetic energy of the mechanism as it goes through a cycle.
- Obtain a configuration suitable for RP production:
  - In Solid Edge, save each component as a separate part file.
  - Lay out the various parts using Solid Edge on a plane.
  - These parts then need to be packed reasonably closely on a plane region of size 140mm x 220mm.
  - Identify the maximum height (RP build depth).

Non-Functional:

- Use the constraint modelling software created at Bath University.
- Use Solid Edge.
- Provide the following data for the designed four-bar mechanism:
  - Position of the two fixed pivot positions.
  - Lengths of the three moving links and of the fourth base link.
  - The position of the couple offset point relative to the coupler.
- Things to be prepared:
  - A listing of any constraint modeller macro used.
  - A listing of any programming language code used.
  - An indication of the calculation performed by any spreadsheet used.
  - The graph of KE and a statement of its maximum value.

Gantt Chart

Summary and Conclusion