Kinematics & Dynamics of Machinery (ME 3320)

Recitation - 4

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1. **Agenda:**
   - GIM Basics
   - GIM

2. **GIM Basics:**
   - **Assume that you are working as a Design Engineer at your dream company, for what kind of problems would you think of building a linkage(or any other components-based) mechanism?**

If you know how a part should be moving(eg, back and forth, circular, elliptical, etc), you can get an actuator and design a linkage-based mechanism that can produce the trajectory and attach your part to that mechanism.

- **Why should you learn GIM?**

It provides the quickest route from drawing to analysis for mechanisms to support mechanism design.

- **What modules does GIM provide?**
  1. Geometry Module
  2. Kinematics Module
  3. Dynamics Module
  4. Synthesis Moule

- **What can you do within the 'Geometry Module' in GIM?**
  Define the design specification of the mechanism

- **What can you do within the 'Motion Module' in GIM?**
  Perform 'Kinematic Analysis' and 'Motion Simulation'

- **What is the overall procedure of performing a kinematic simulation in a GIM?**
  Step 1: Create Points
  Step 2: Create Links
  Step 3: Add Joints

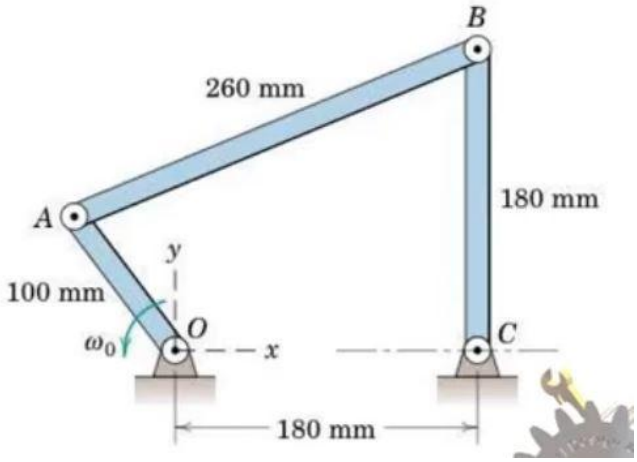
Step 4: Go to ‘Kinematics’ from ‘Geometry’
Step 5: Choose an actuator joint
Step 6: Run the Simulation

3. GIM:

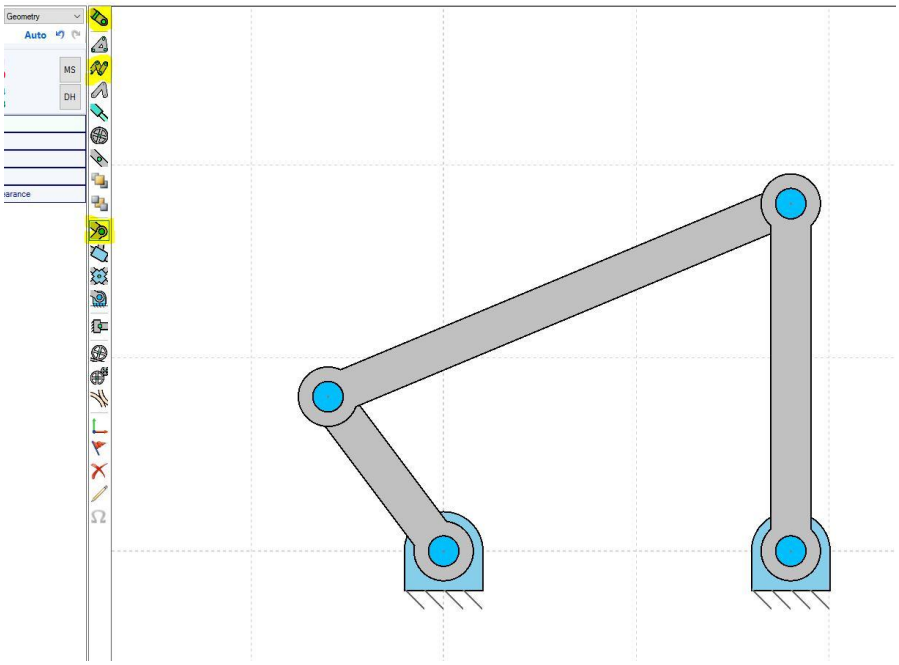
3.1 4-Bar Mechanism

A diagram of the 4-bar linkage is given below. Assume:

- **OA has constant counterclockwise angular velocity w_0 = 10rad/s**
- **Coordinates of A are x = -60 mm and y = 80 mm**

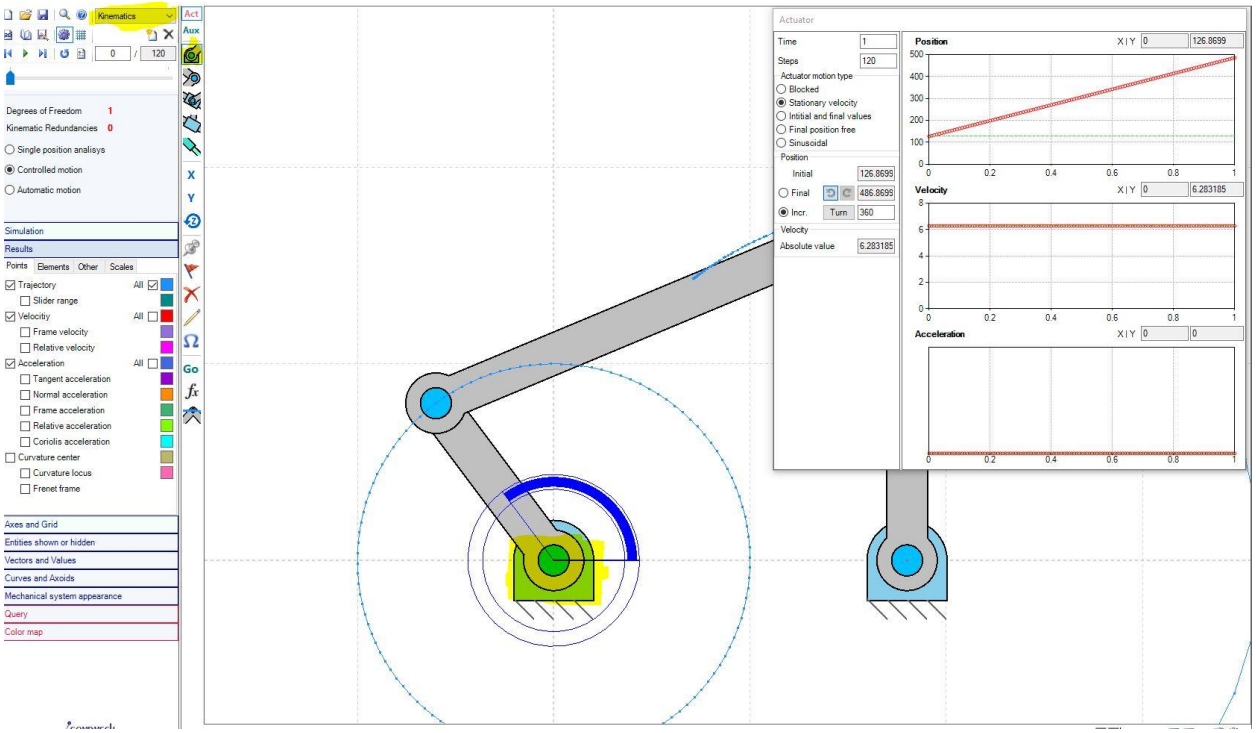


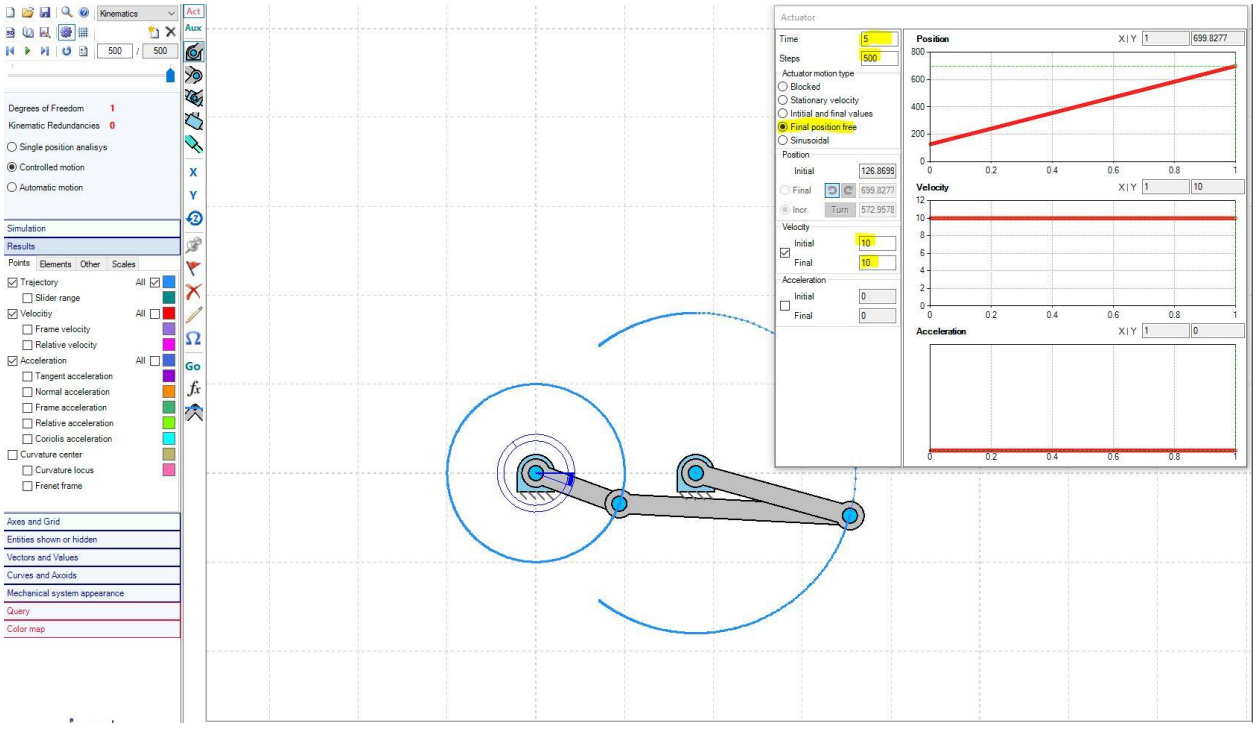
A. Sketch the linkage in the GIM software.

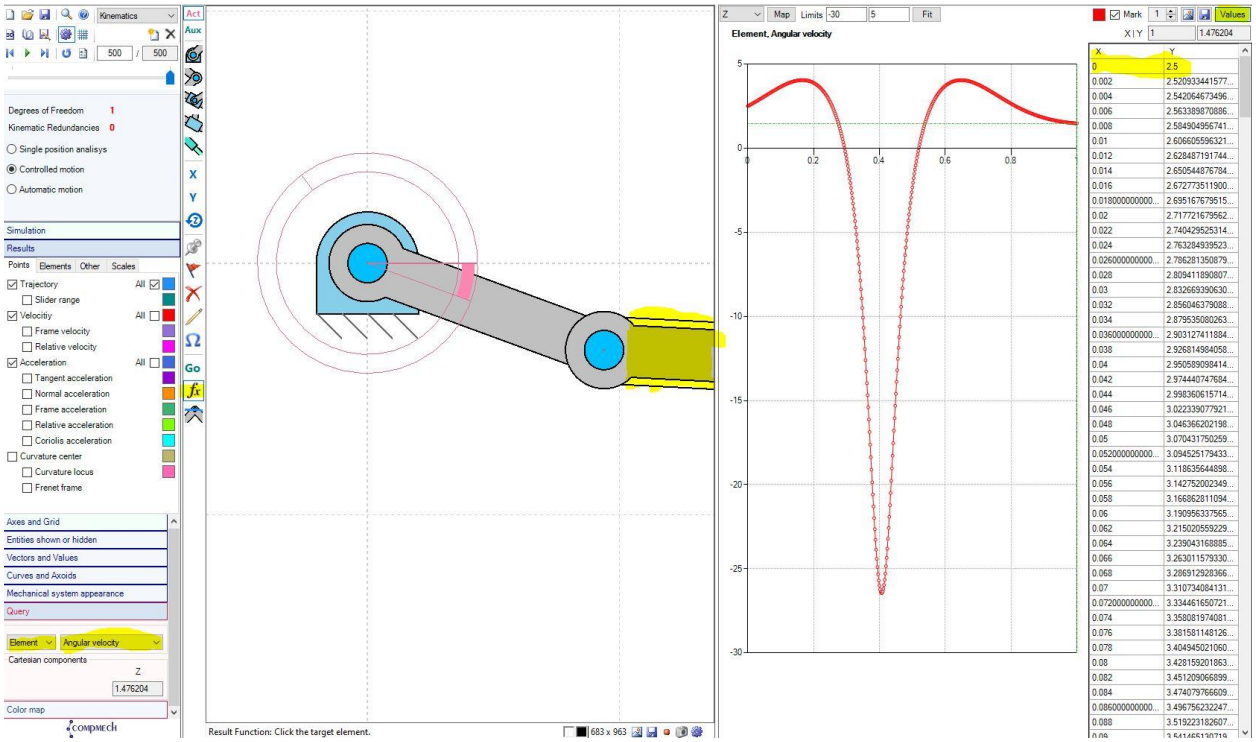


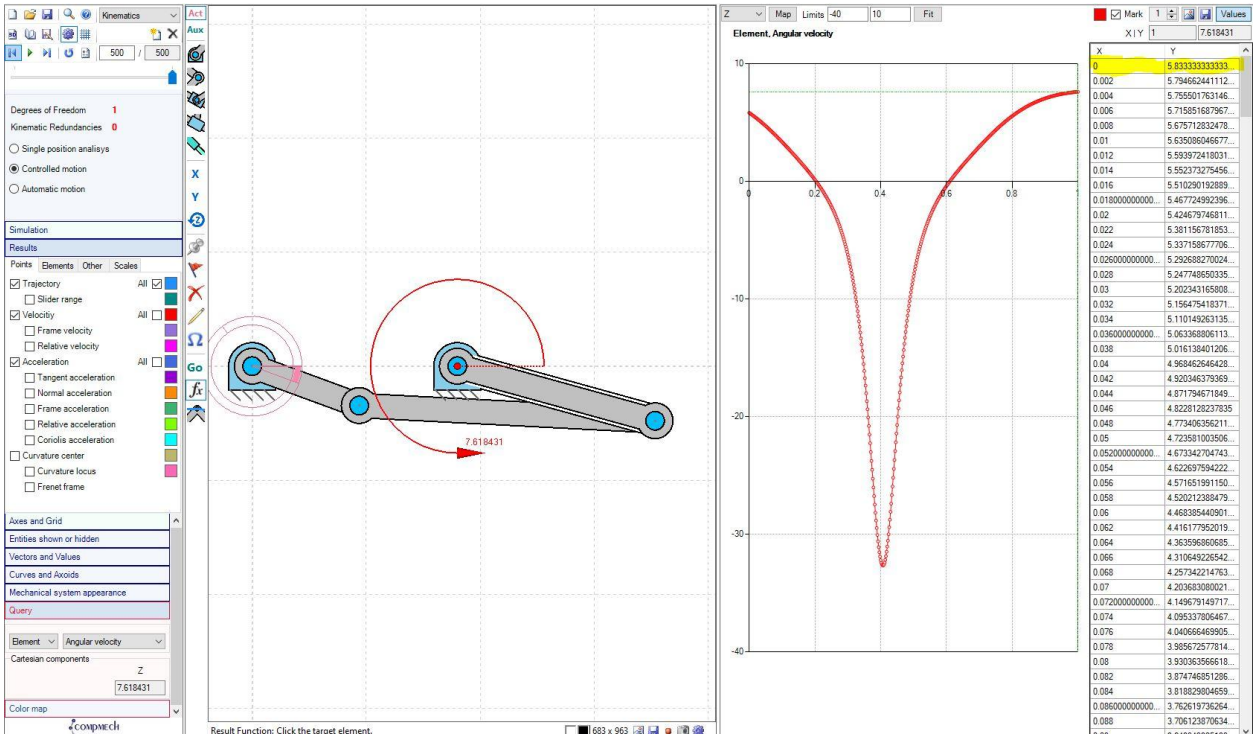
B. Use GIM to:

1. **Verify that the initial angular velocities of the links BC and AB are w_{BC}= 5.83 rad/s & w_{AB} = 2.5 rad/s**

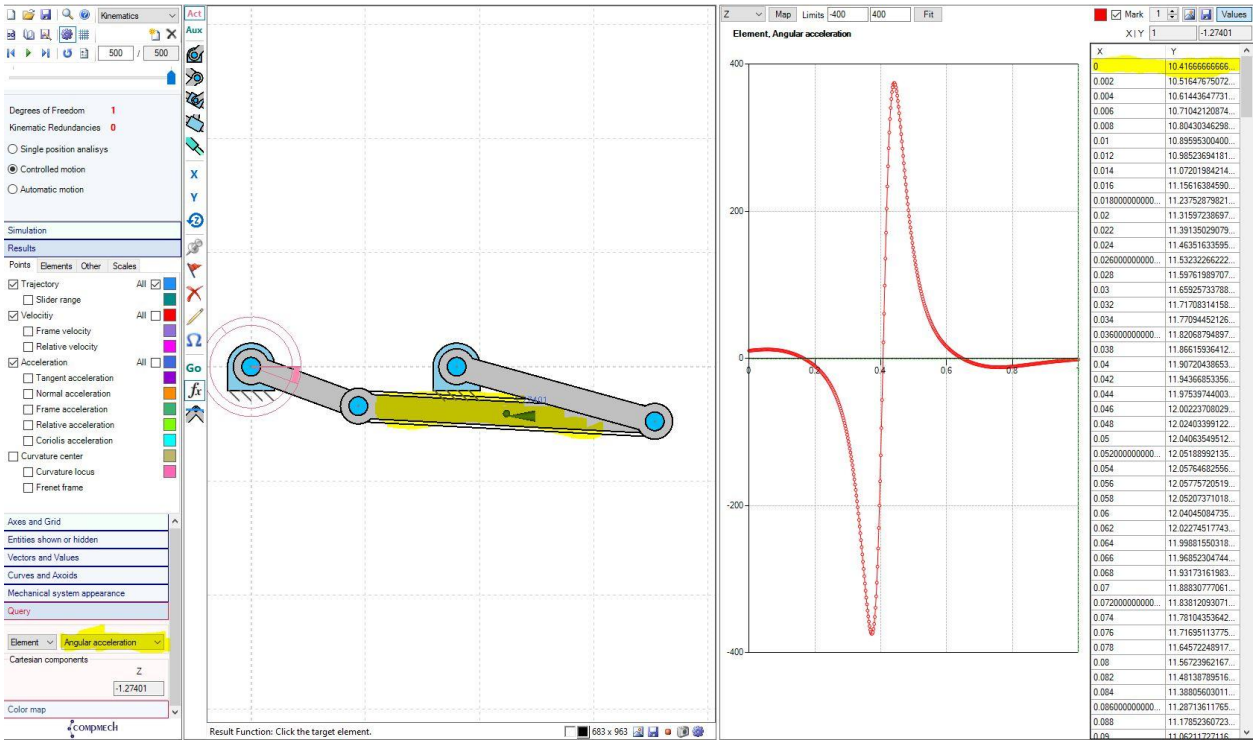






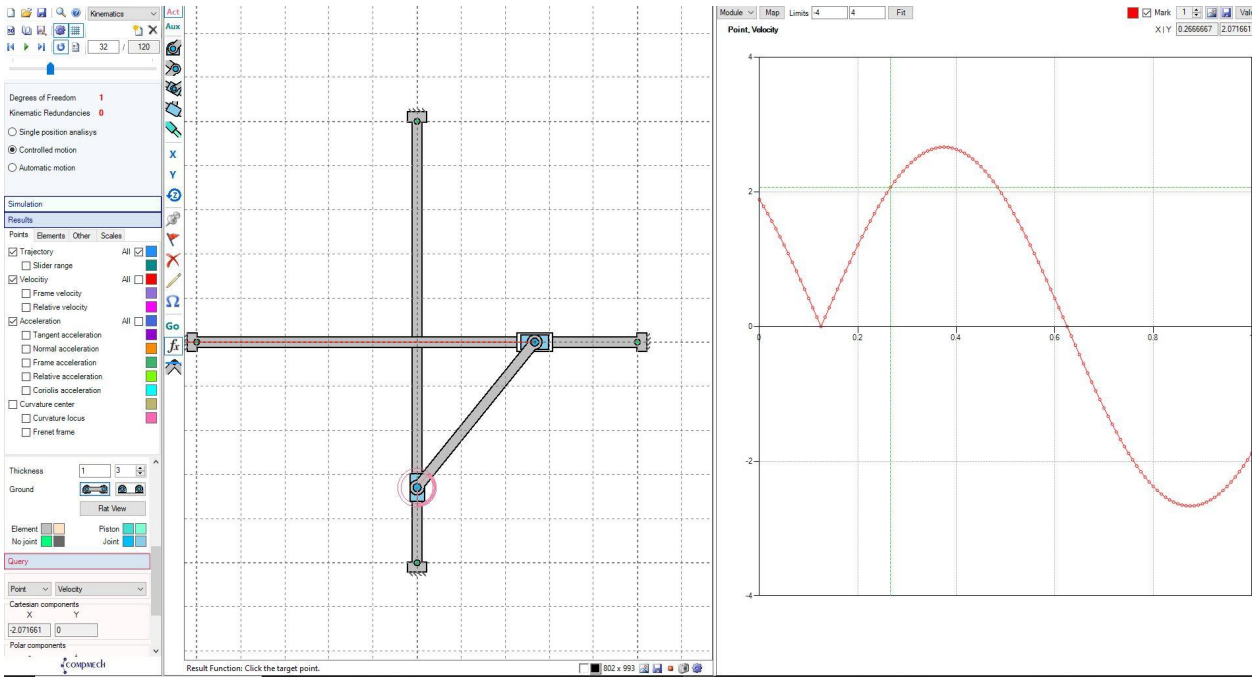


2. Find the initial angular acceleration of the link AB (10.42 rad/s)

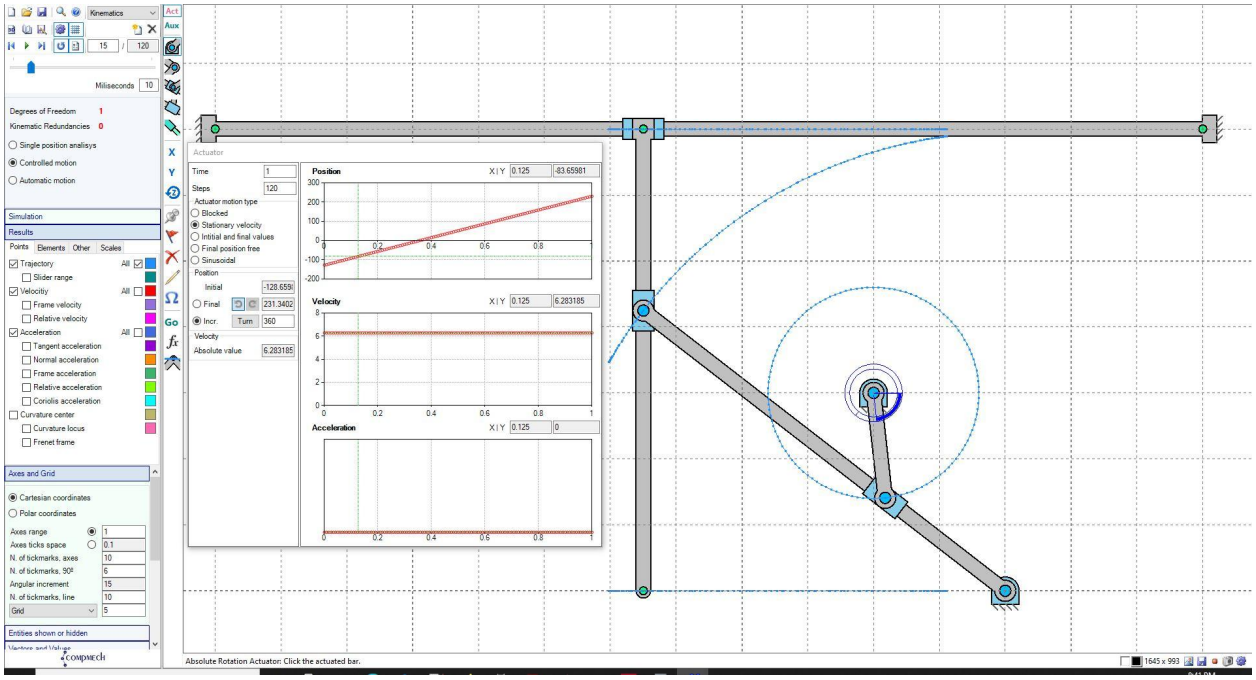


(Now, let's design some mechanisms and explore the simulation using the default values used in the GIM program)

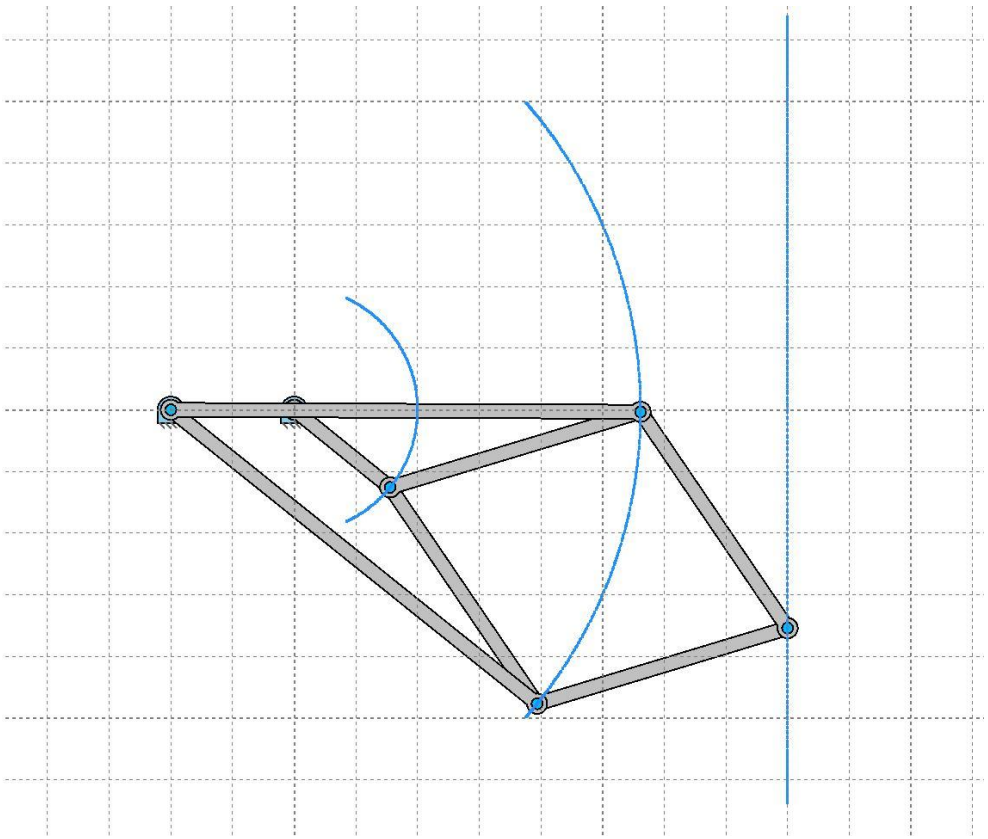
3.2 PRRP Mechanism



3.3 Scotch Yoke Mechanism



3.4 Peaucelier Mechanism
(Using GIM Library: Computed-> Kinematics->)



Bibliography:

- **Petuya, V.; Macho, E.; Altuzarra, O.; Pinto, C. and Hernández, A. "Educational Software Tools for the Kinematic Analysis of Mechanisms". Comp. Appl. Eng. Education. First published online: February 24, 2011. DOI: 10.1002 cae.20532. ISSN: 1061-3773.**
- **https://www.youtube.com/watch?v=wppPMd3oxZo**
- **https://www.youtube.com/watch?v=n6LgMY2iCjM**
- **https://www.youtube.com/watch?v=JyaYKiuxGNs**

Miscellaneous:

- **In the GIM Library, try: Computed-> Cycloidal**