EML1533 Introduction to CAD for Mechanical Engineers

ANALYSIS OF MECHANISM DESIGN

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Analysis of Mechanism Design

A mechanism is an assemblage of links and joints that are connected together to achieve a desired motion task.

The links provide the mechanical structure of the mechanism!

The joints provide the ability for the mechanism to move.

Some typical kinds of mechanisms used by the mechanical engineers:

- 4-Bar Linkage,
- 6-Bar Linkage,
- Slider-Crank.

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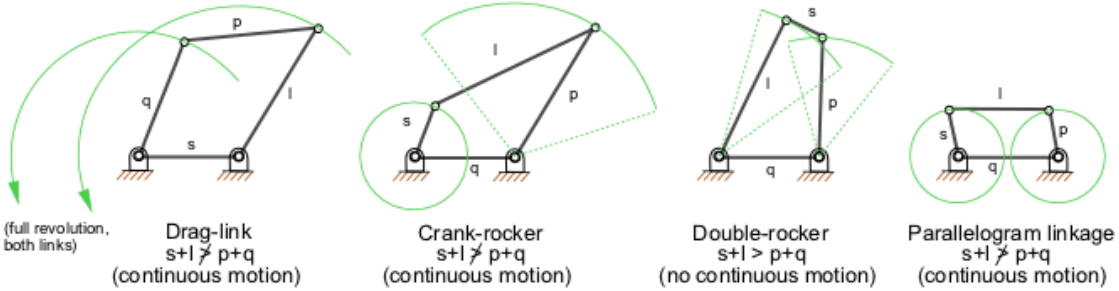
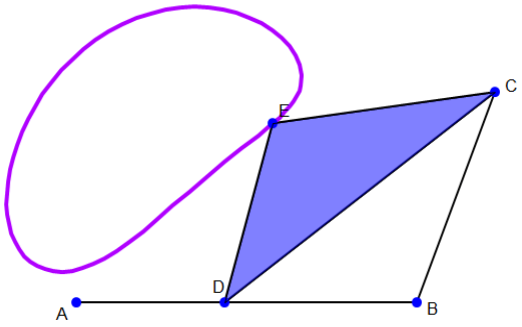
4- Bar Linkage

A **four-bar linkage**, also called a **four-bar**, is the simplest movable closed chain linkage. It consists of four bodies, called bars or links, connected in a loop by four joints. Generally, the joints are configured so the links move in parallel planes, and the assembly is called a *planar four-bar linkage.*





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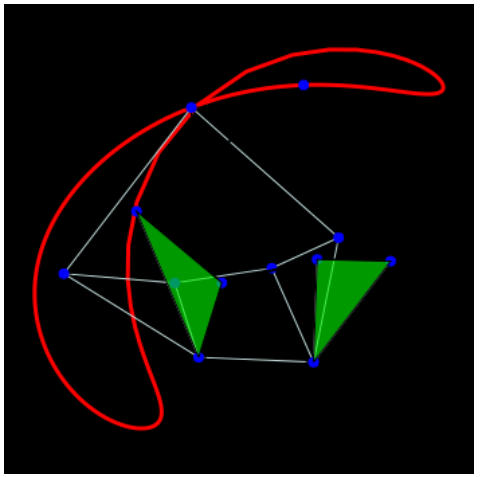
6- Bar Linkage

The six bar linkage shown is given the name Stephenson's mechanism.

Change the mechanism geometry by dragging the vertices of the ghost linkage.



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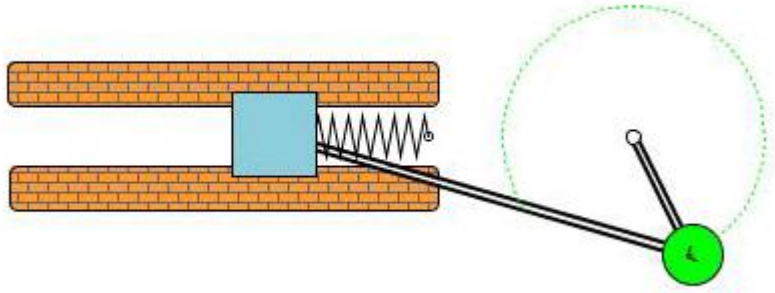
Slider-Crank

The slider-crank mechanism converts linear motion into rotary motion, or vice versa.



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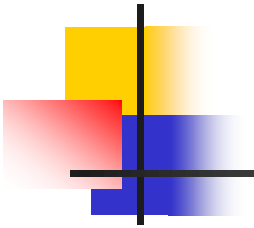
Analysis of Mechanism Design with SolidWorks Assemblies



The ways in which we can connect links with joints and provide a mechanism with the ability to move are seemingly endless.

The links can take on any shape and size we desire,

The motion may change in complicated and seemingly unpredictable ways as we modify the links.

CAD packages have become valuable tools in the design and analysis of mechanisms.

The solid works program has ability to represent geometric constraints between structural components using assembly mates.

It is ideally suited to the design and virtual prototyping of complex mechanisms.

The remainder of this chapter will be devoted to the use of the Solid Works program in the design of mechanisms through a case study involving the design of a four-bar linkage.

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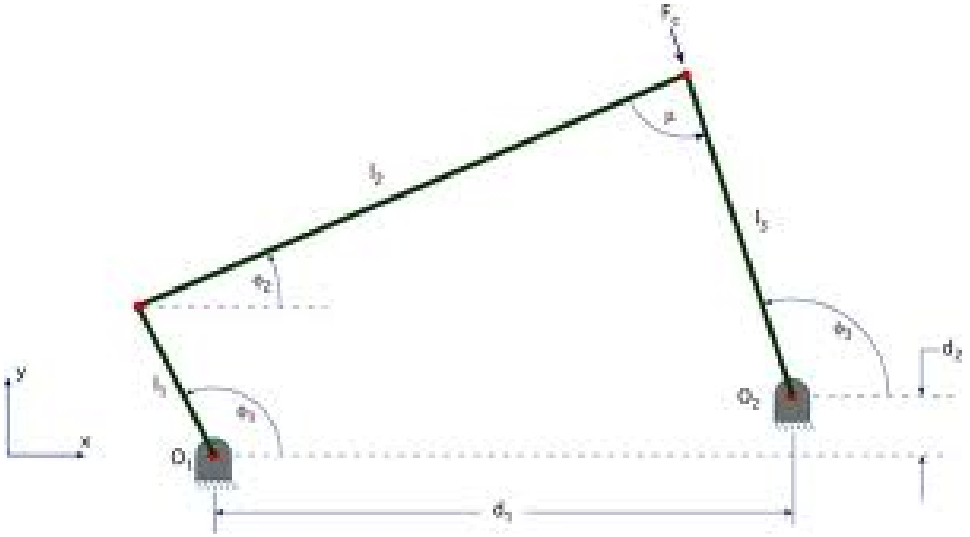
Approaching Mechanism Design with SolidWorks Assemblies

A classical four-bar linkage consists of three structural links, connected to each other and fixed pivot points by pin joints that allow for rotating motion between the links.

It only has 3 physical links. It is called 4-bar linkage because there is an implied fourth structural link that connects the fixed ground points.



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Approaching Mechanism Design with SolidWorks Assemblies

First, we will create the links. Once we have two links we can connect them by a pin joint.

The pin through the holes in the links allows for rotation between the links, giving a "scissors" action. The mated assembly will have two parts.

One mate will be created between the front face of one link and the back face of the other link. This allows one link to "slide by" the other without any interferences between the surfaces.

Another mate will be created between the holes using concentric mate. This keeps the holes aligned at their central axes.