Lecture_3

Synthesis and Analysis

design or create a mechanism to give a certain motion

1. Synthesis

Qualitative Synthesis

the creation of potential solutions in the absence of a well-defined algorithm that configures or predicts the solution

Type Synthesis

the definition of the proper type of mechanism best suited to the problem

Dimensional Synthesis

the determination of the proportions (lengths) of the links necessary to accomplish the desired motions

2. Function, Path and Motion Generation

Function Generation

output motion is a defined mathematical function of the input motion

Path Generation

output motion is a defined path along a set of x, y points

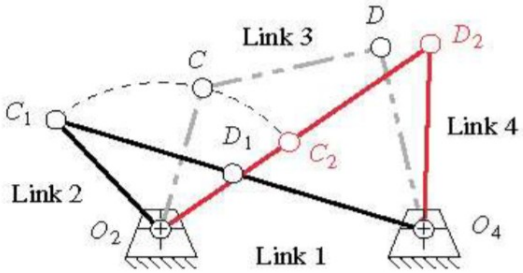
Motion Generation

output motion is a set of positions of a line defined as x, y, θ successive locations

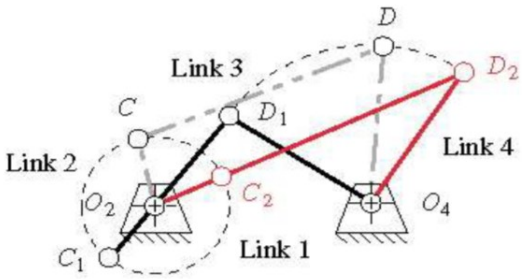
3. Limiting Conditions

Toggle

the toggle positions are determined by the collinearity of two moving links



(a) Triple-rocker toggle positions

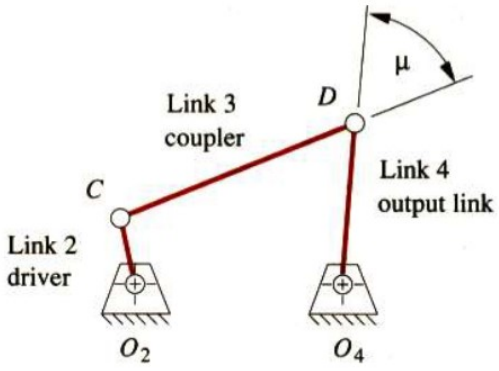


(b) Crank-rocker toggle positions

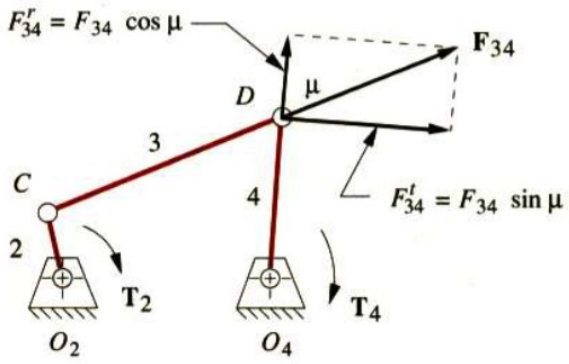
- it will not allow further input motion in one direction from one of its rocker links
- a different link will then have to be driven to get it out of toggle

Transmission Angle

the transmission angle is defined as the acute angle between the output link and the coupler



(a) Linkage transmission angle μ



(b) Static forces at a linkage joint

- varies continuously
- a measure of the quality of force and velocity transmission at the joint
- the optimal value of the transmission angle is 90 degree
- most machine designer try to keep the minimum TA above 40 degree
- when TA is less than 45 degree, the radial component is larger than the tangential component

4. Dimensional Synthesis

Dimensional Synthesis

a linkage is the determination of the proportions of the links necessary to accomplish the desired motions

Two-Position Synthesis

rocker output (pure rotation) and **coupler output** (complex motion)