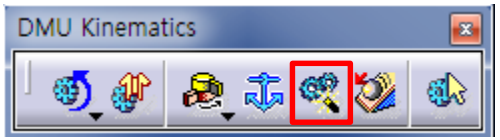
DMU KINEMATICS 2

Computational Design Laboratory
Department of Automotive Engineering
Hanyang University, Seoul, Korea

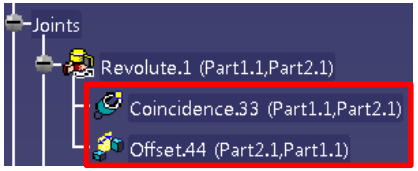
DMU KINEMATICS TOOLS

DMU Kinematics

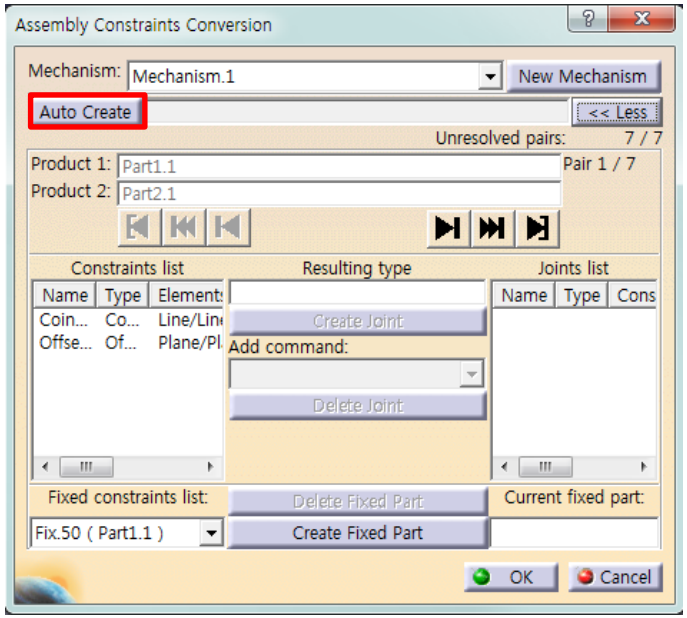


Assembly Constraints Conversion

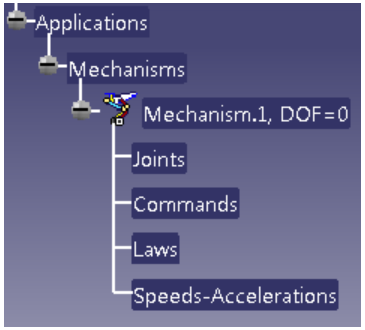
- Assembly Design에서 생성한 constraint를 Joint로 변경

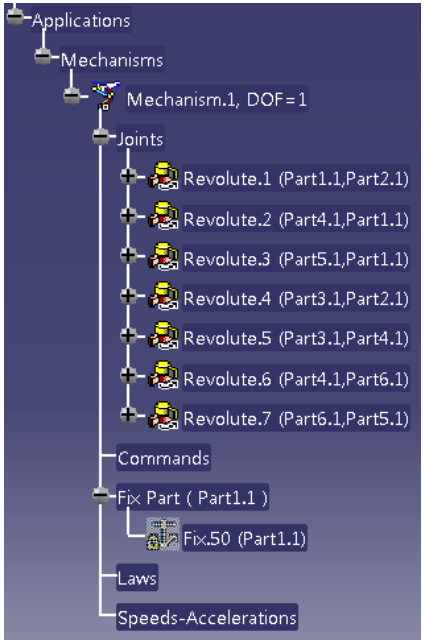


여러 개의 constraint로 구성된 joint



Joint 자동 생성



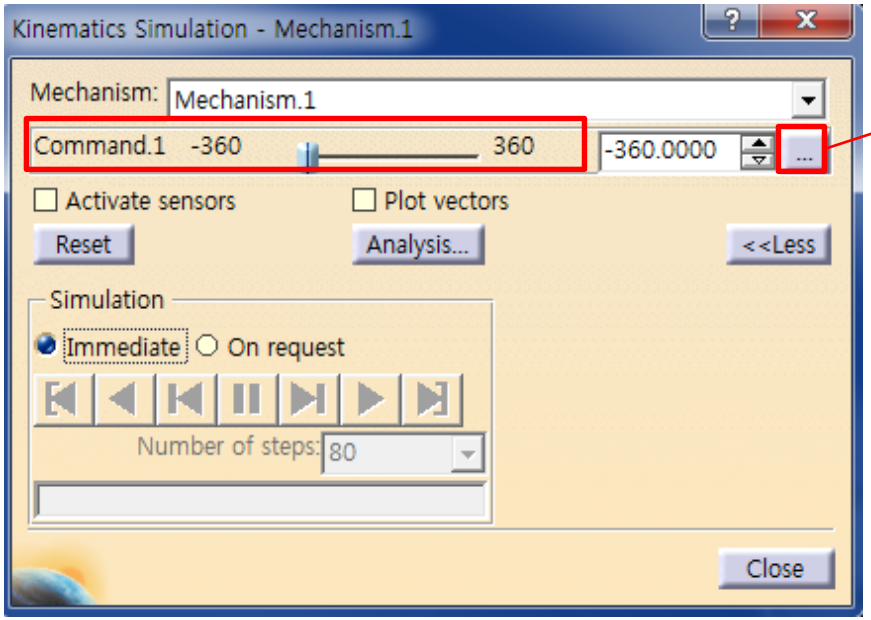


DMU KINEMATICS TOOLS

DMU Kinematics

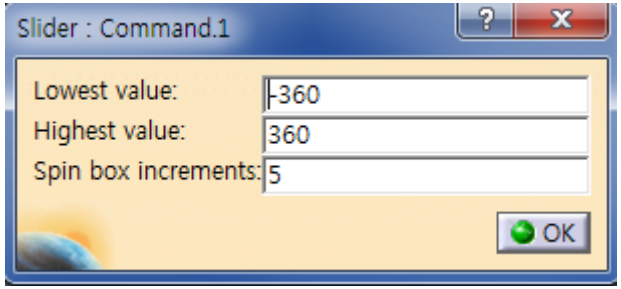
Simulation with Commands 

- 생성된 mechanism이 command를 기준으로 동작

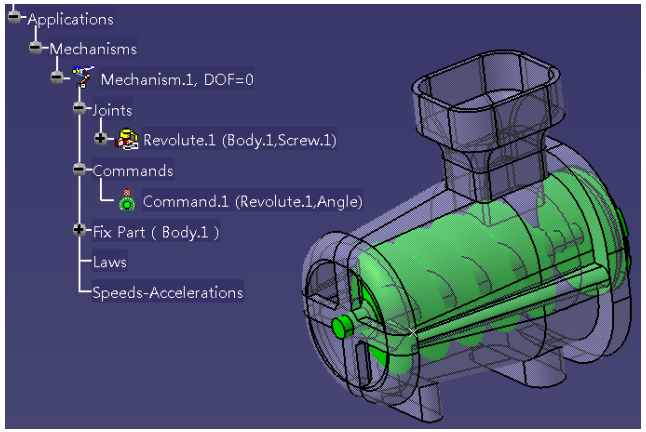


Joint에서의 Angle/Length driven 수만큼 Command가 생성됨

Command의 Limits 조절 가능



Revolute Joint 모델



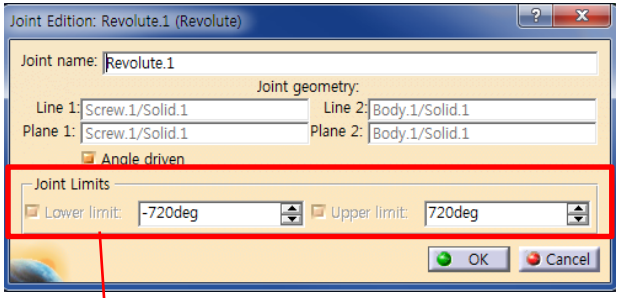
DMU KINEMATICS TOOLS

DMU Kinematics

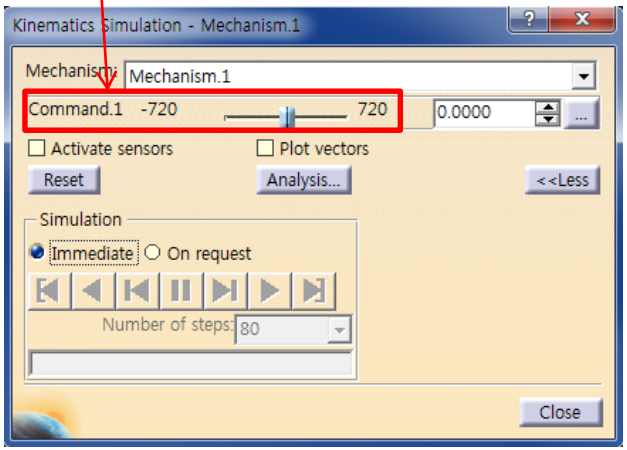
Simulation with Commands 

- 생성된 mechanism이 command를 기준으로 동작

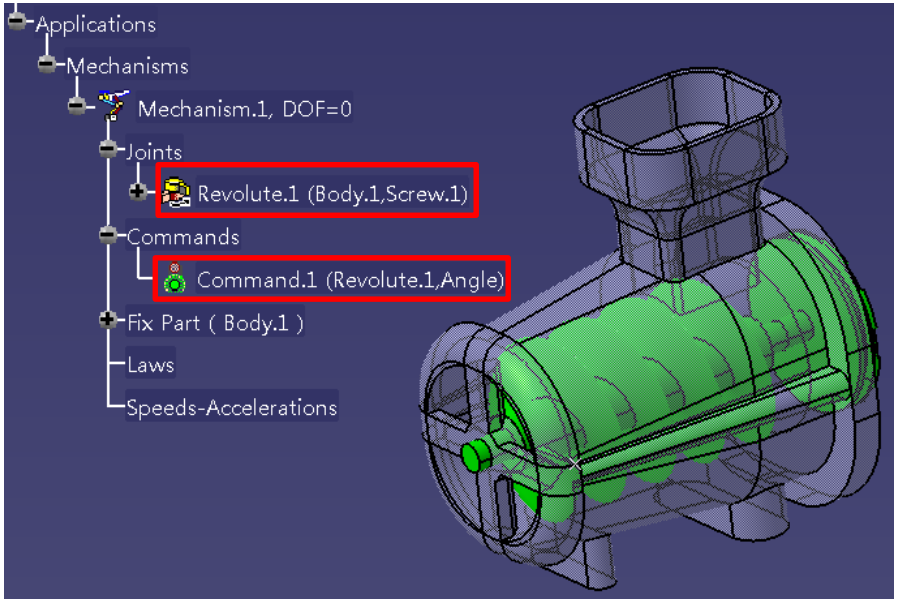
생성한 Joint를 더블 클릭하여 Limits 조절 가능



Simulation Command의 Limits이 됨



Revolute Joint 모델



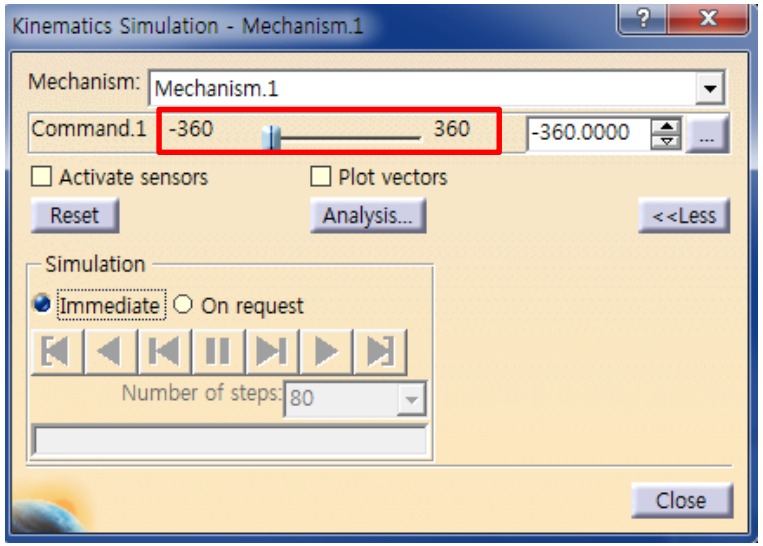
DMU KINEMATICS TOOLS

DMU Kinematics

Simulation with Commands 

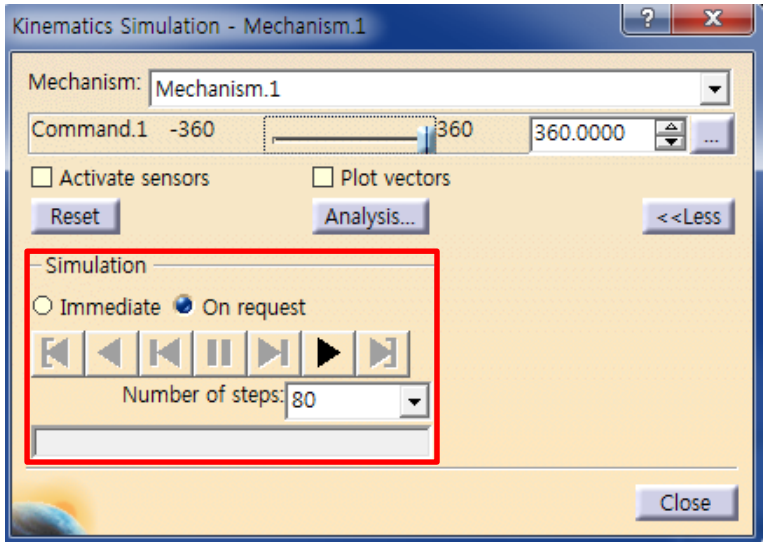
- 생성된 mechanism이 command를 기준으로 동작

스크롤이 이동하는 만큼 mechanism이 구동



Simulation: Immediate

움직인 command 값을 steps수로 나누어 연속적으로 구동



Simulation: On request

DMU KINEMATICS TOOLS

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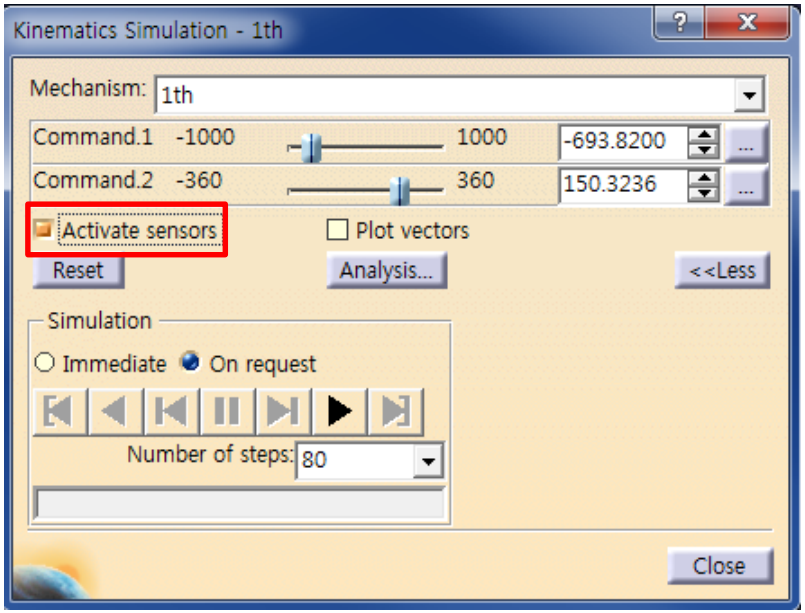
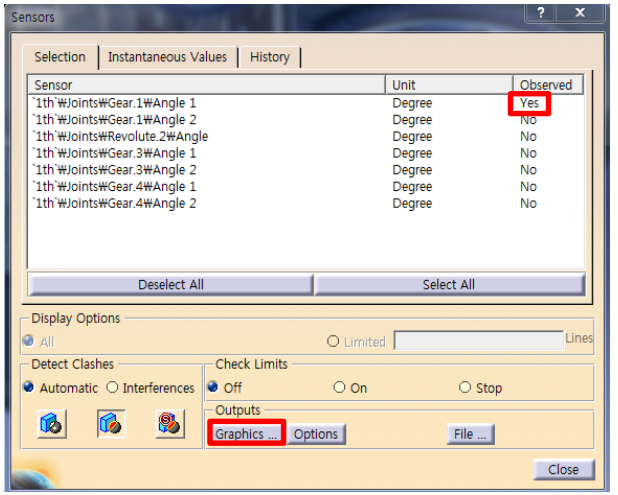
Simulation with Commands 

- 생성된 mechanism이 command를 기준으로 동작

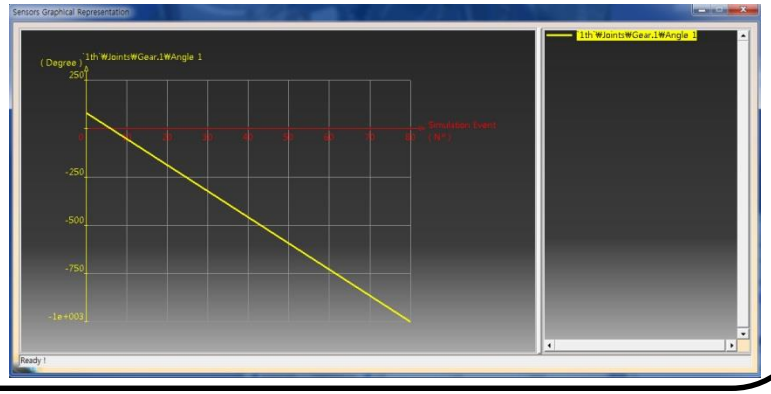
Command를 통해 움직인 Joint의 변화량을 그래프로 확인 가능



측정하고자 하는 Joint를 No→Yes로 변경 (클릭)



시뮬레이션 재생 후 위 그림의 Graphics를 클릭하면 결과 값이 그래프로 나타남



DMU KINEMATICS TOOLS

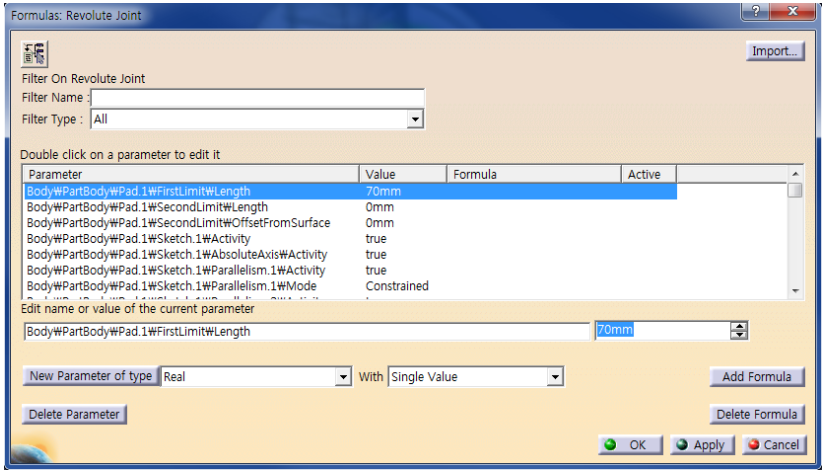
DMU Kinematics

Simulation with Laws 

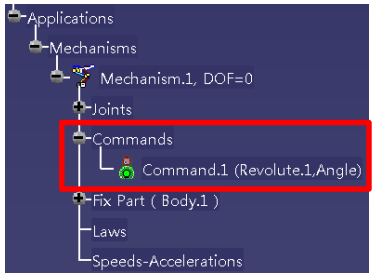
- 생성한 Formula를 기준으로 시뮬레이션 적용 (시간에 대한 변수 사용)

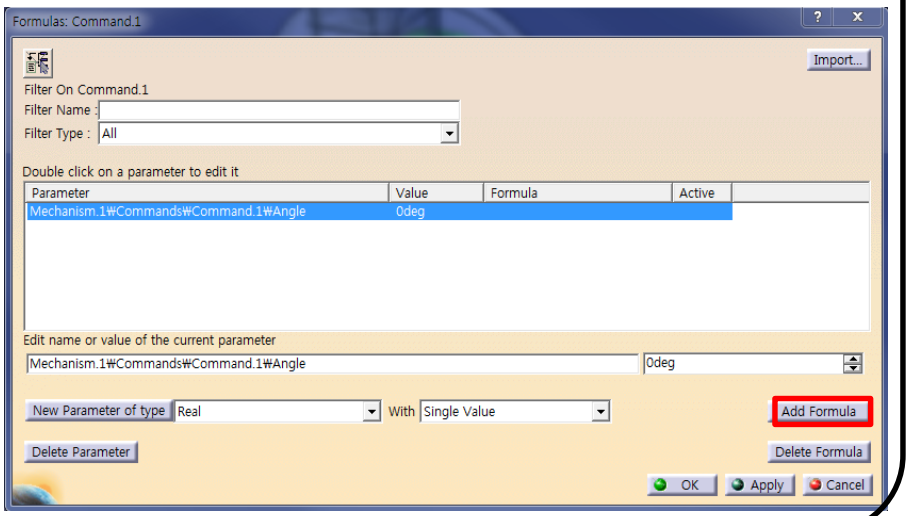
① 화면 하단의 툴바에서 Formula 선택

Formula 초기 화면



② 적용할 command를 더블클릭 후 Add Formula 클릭





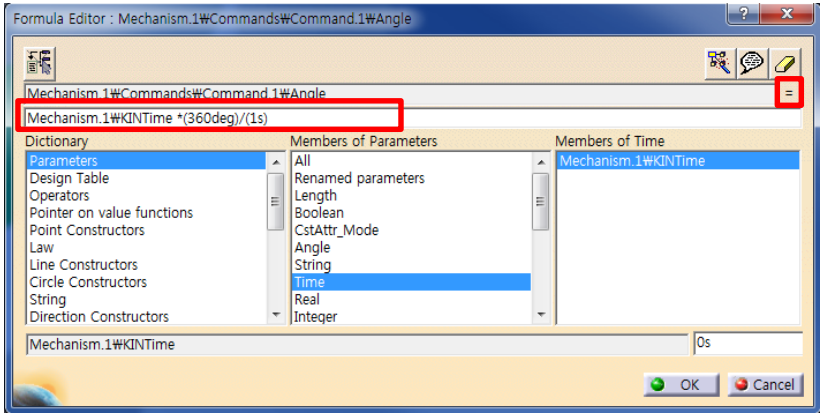
DMU KINEMATICS TOOLS

DMU Kinematics

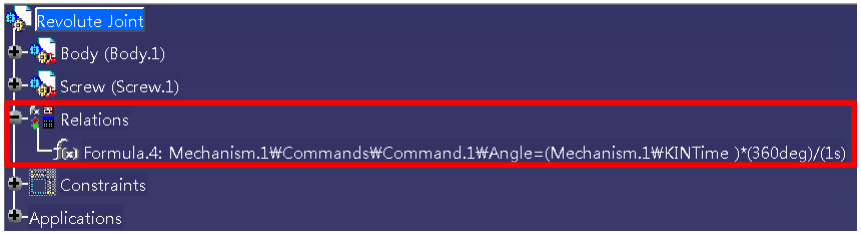
Simulation with Laws 

- 생성한 Formula를 기준으로 시뮬레이션 적용 (시간에 대한 변수 사용)

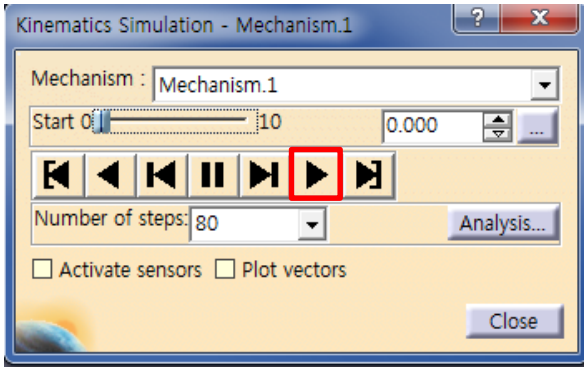
③ Parameters → Time → ₩KINTime 더블 클릭 후
수식 입력 후 Ok 클릭 < Mechanism.1₩KINTime *(360deg)/(1s) >

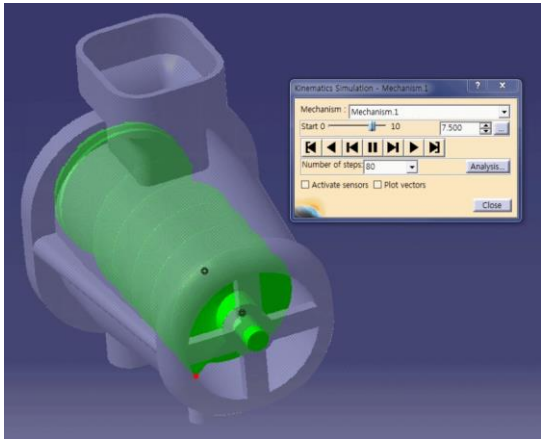


④ Formula 생성 확인



⑤  실행 후 적용됐는지 확인





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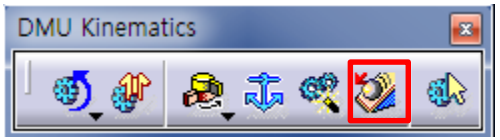
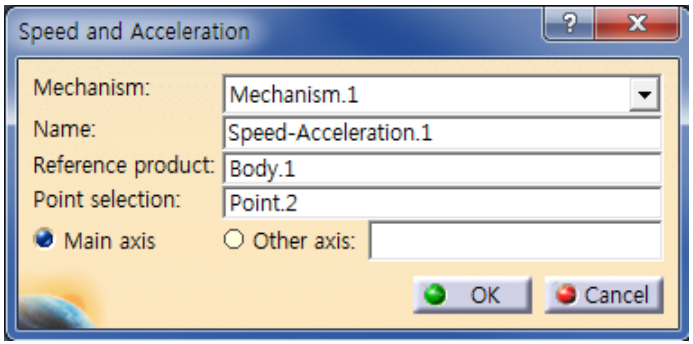
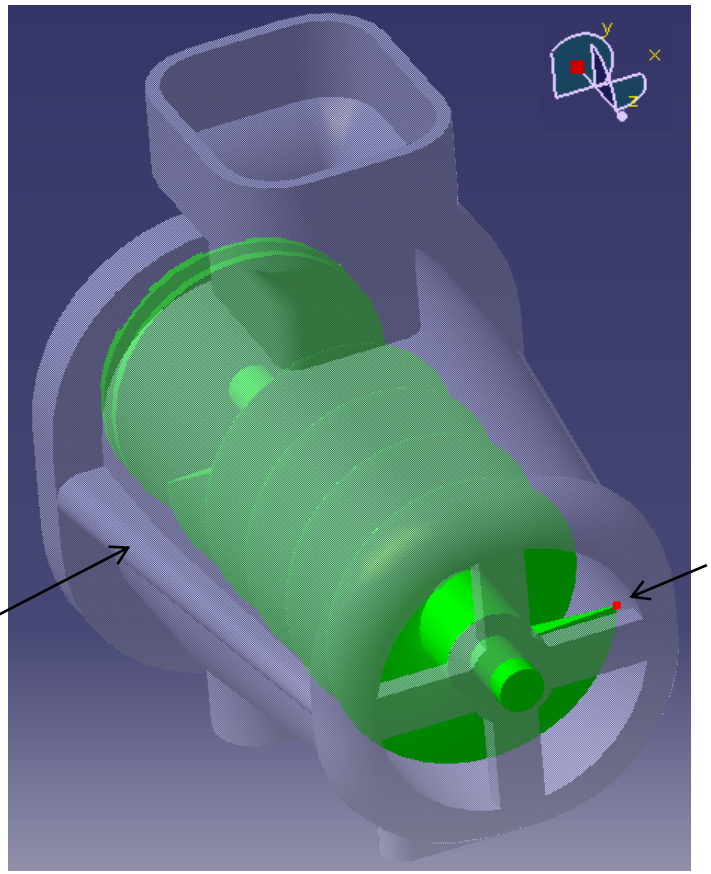


Speed and Acceleration

- 특정 위치의 속도, 가속도 등을 확인함

① 실행 후 Reference product와 측정 Point 선택





DMU KINEMATICS TOOLS

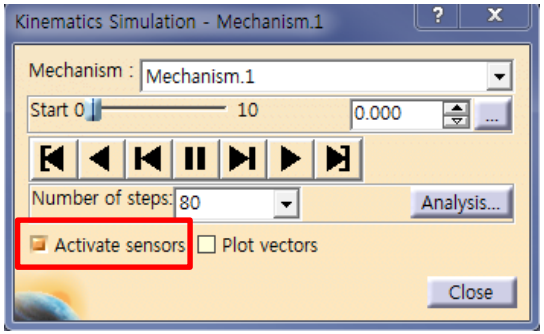
DMU Kinematics

Speed and Acceleration 

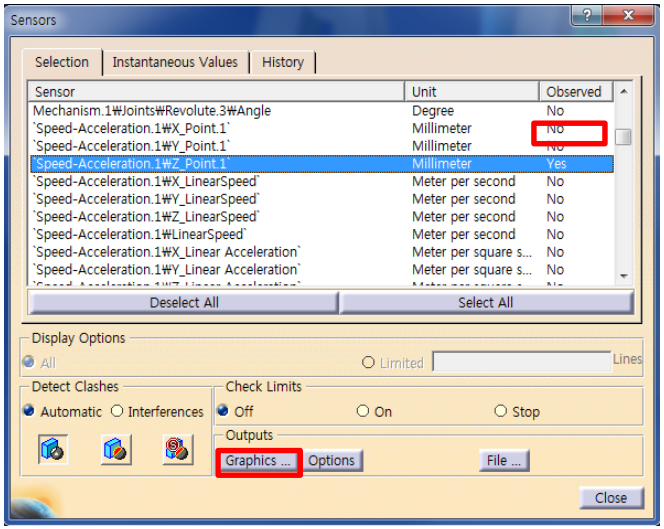
- 특정 위치의 속도, 가속도 등을 확인함

② Simulation with Laws 선택

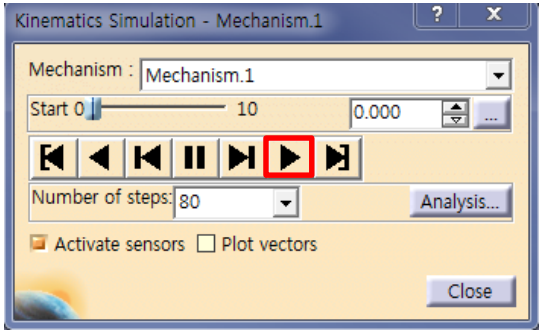
③ Activate sensors 선택



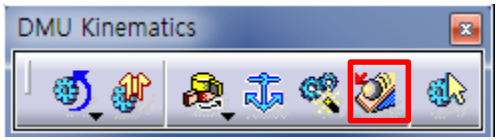
④ 측정하고자 하는 속도, 가속도 등을 활성화
(Observed의 No 클릭→Yes로 변환)
- EX) X_LinearSpeed, Z_Angular Acceleration, Z_Angular Speed



⑤ **시뮬레이션 실행 후** (4)의 Graphics ... 클릭



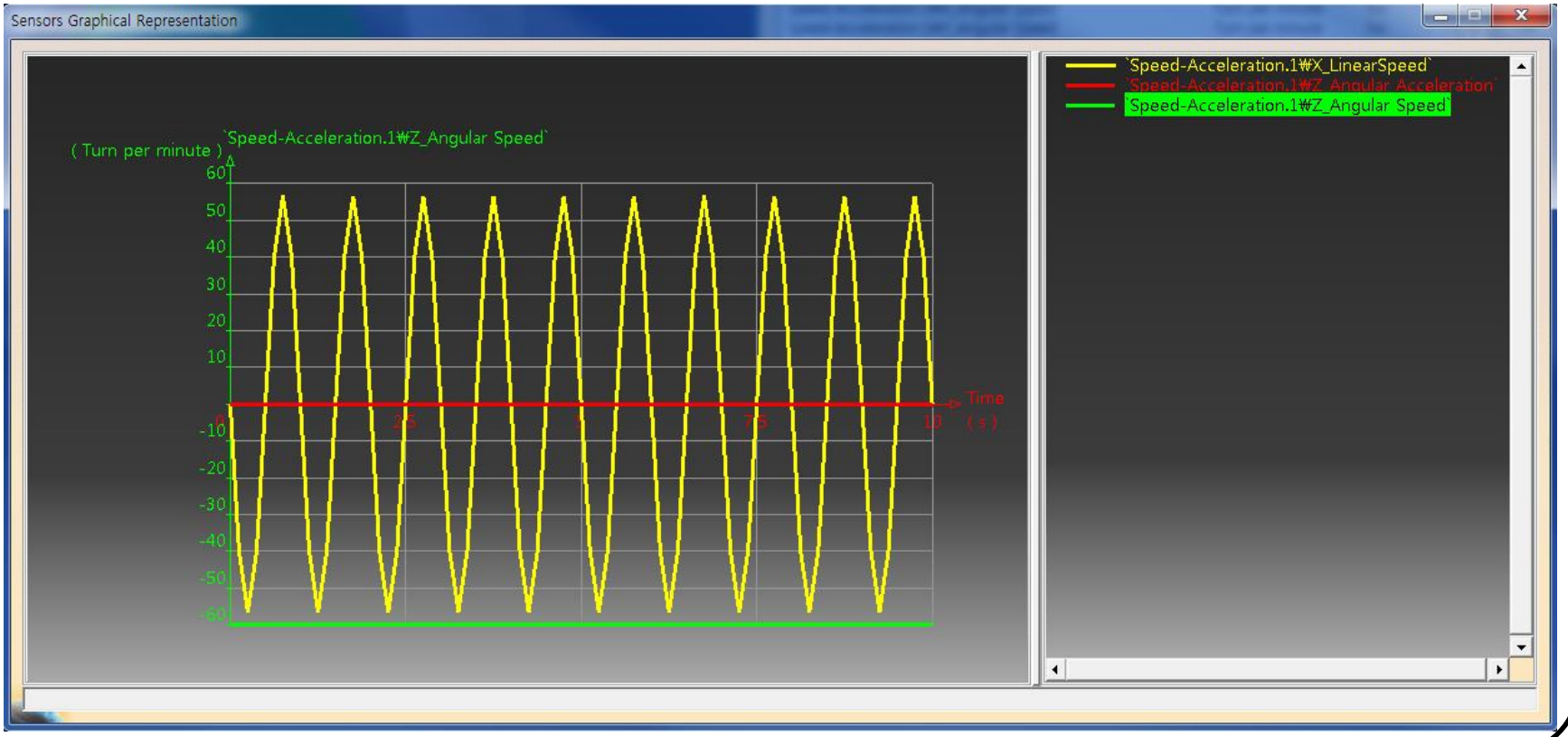
DMU KINEMATICS TOOLS

DMU Kinematics 

Speed and Acceleration 

- 특정 위치의 속도, 가속도 등을 확인함

⑥ 속도/가속도 결과

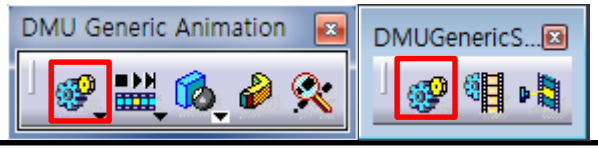


CONTENTS

- ✓ 시작하기
- ✓ DMU Kinematics Tools
- ✓ **DMU Generic Animation**

DMU KINEMATICS TOOLS

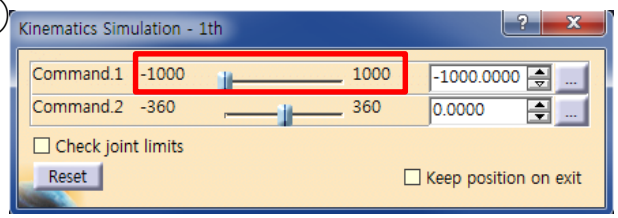
DMU Generic Animation



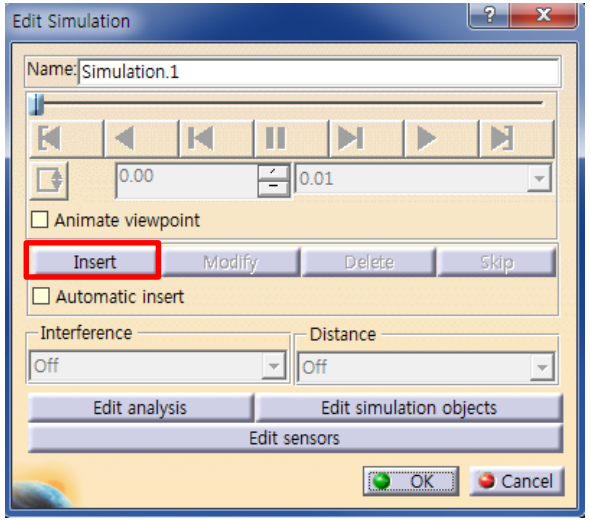
Simulation 

- 변화된 command 값 만큼 mechanism을 동작시킴

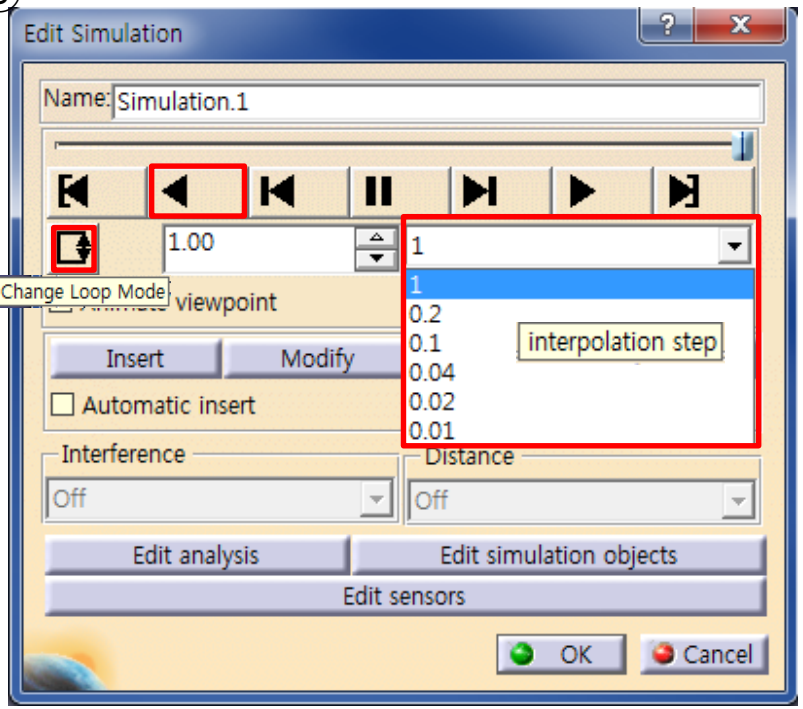
원하는 동작을 설정

① 

② Insert

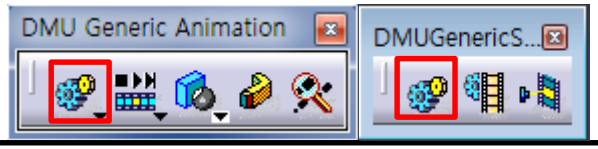


③ Loop Mode 및 Step 선택 후 재생



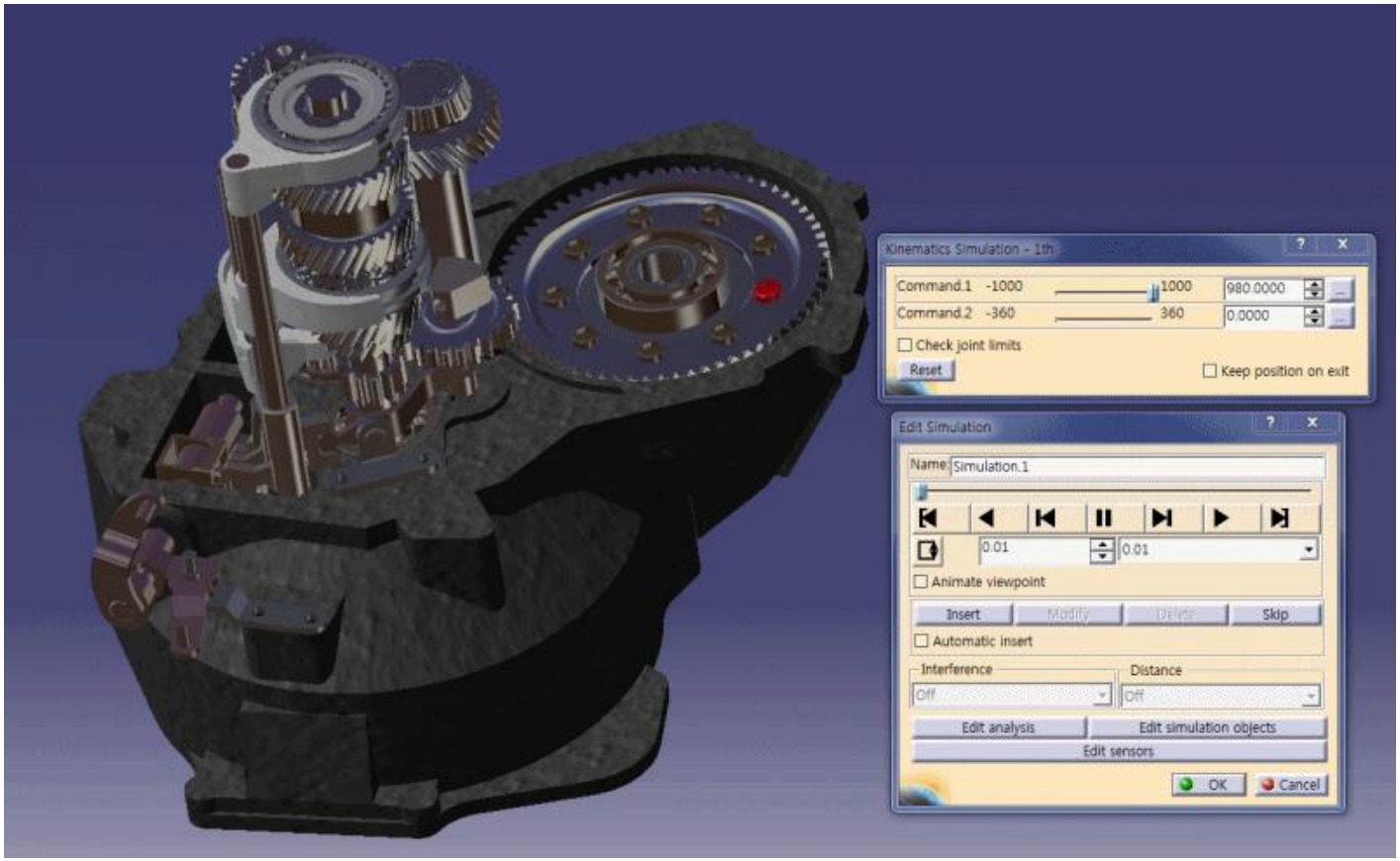
DMU KINEMATICS TOOLS

DMU Generic Animation



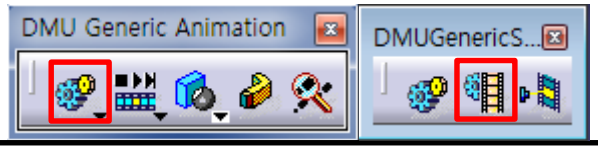
Simulation 

- 변화된 command 값 만큼 mechanism을 동작시킴



DMU KINEMATICS TOOLS

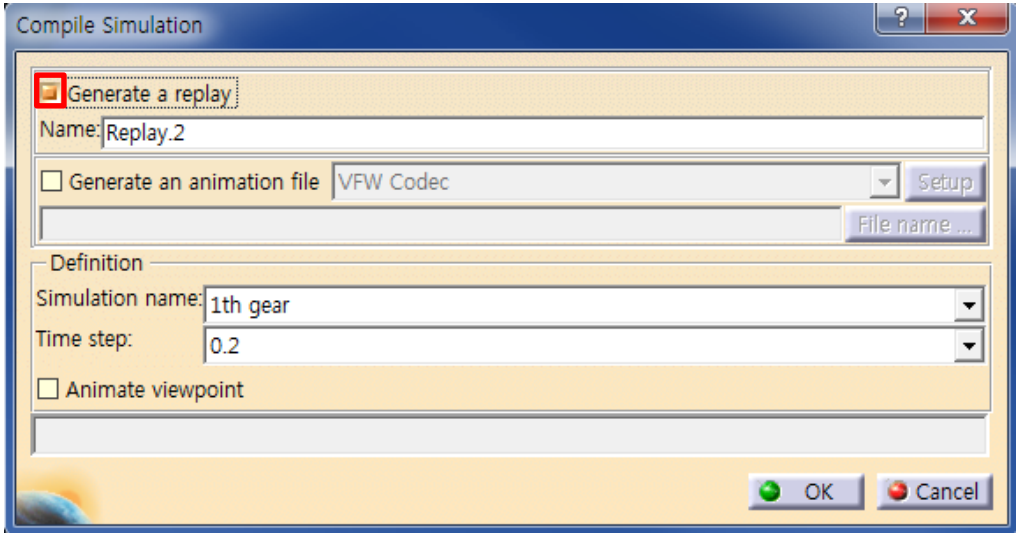
DMU Generic Animation

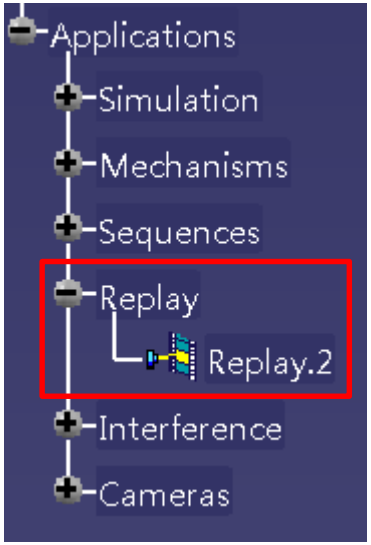


Compile Simulation 

- 만들어진 시뮬레이션을 Replay 또는 동영상 파일로 저장함

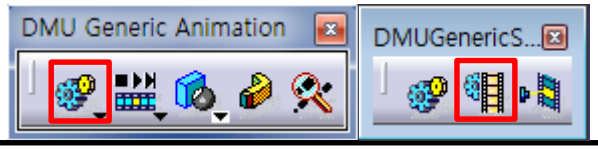
Replay 생성





DMU KINEMATICS TOOLS

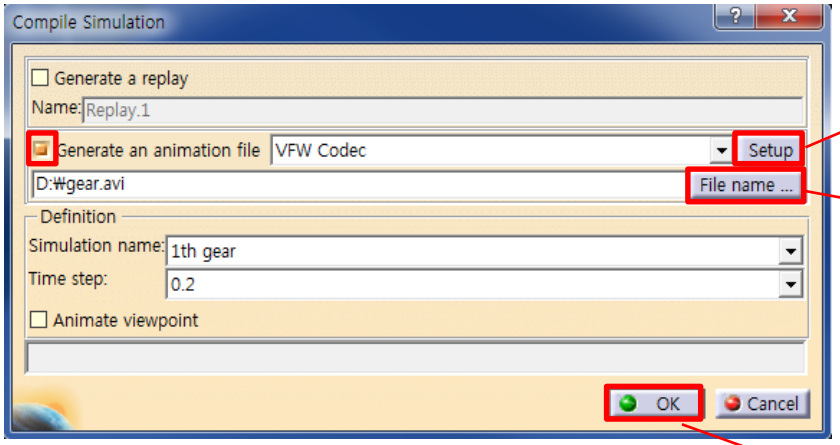
DMU Generic Animation



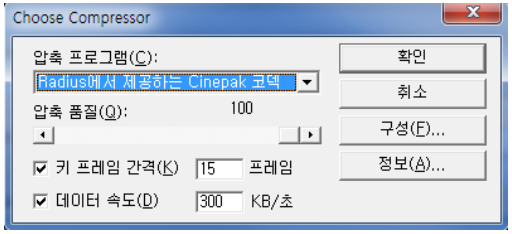
Compile Simulation

- 만들어진 시뮬레이션을 Replay 또는 동영상 파일로 저장함

동영상 파일 생성



압축 코덱 /프레임 설정

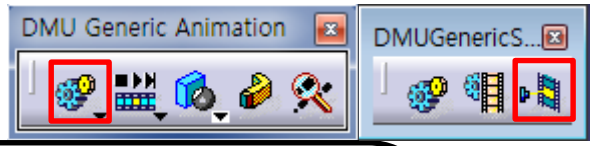


파일 경로 설정

동영상 파일 생성

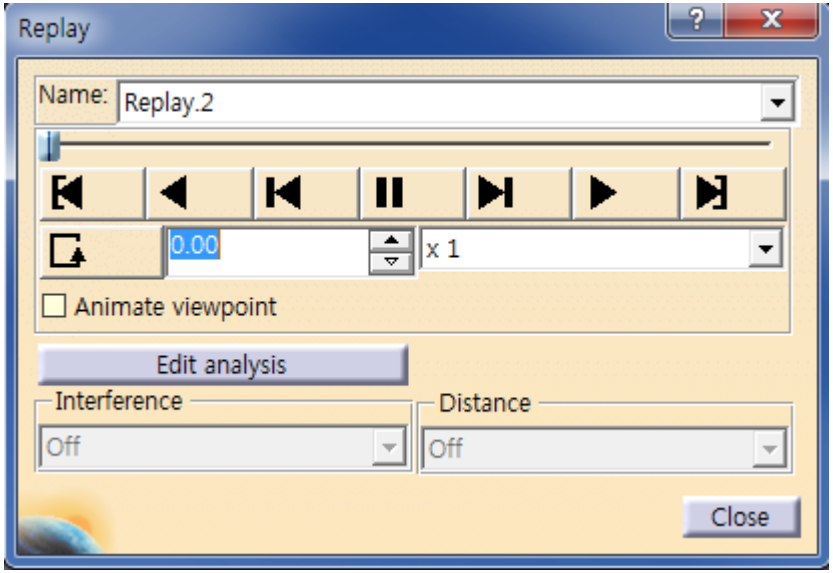
DMU KINEMATICS TOOLS

DMU Generic Animation



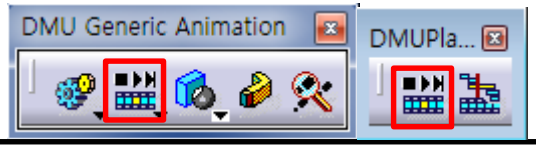
Replay 

- 만들어진 시뮬레이션의 Replay를 실행함



DMU KINEMATICS TOOLS

DMU Generic Animation

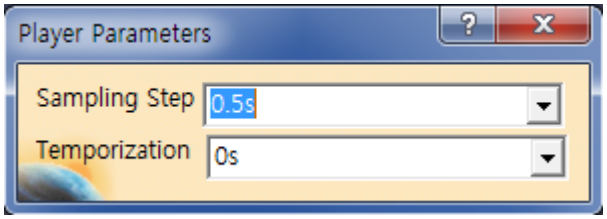


Simulation Player 

- 만들어진 simulation, replay, sequences를 실행시킴

Simulation 또는 Replay 선택

Step 입력



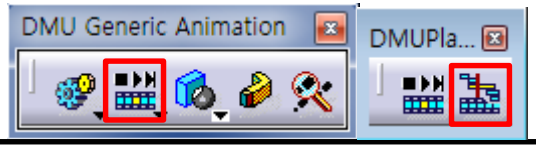
 corresponds to the single loop mode

 corresponds to the one way loop mode

 corresponds to the return simulation mode.

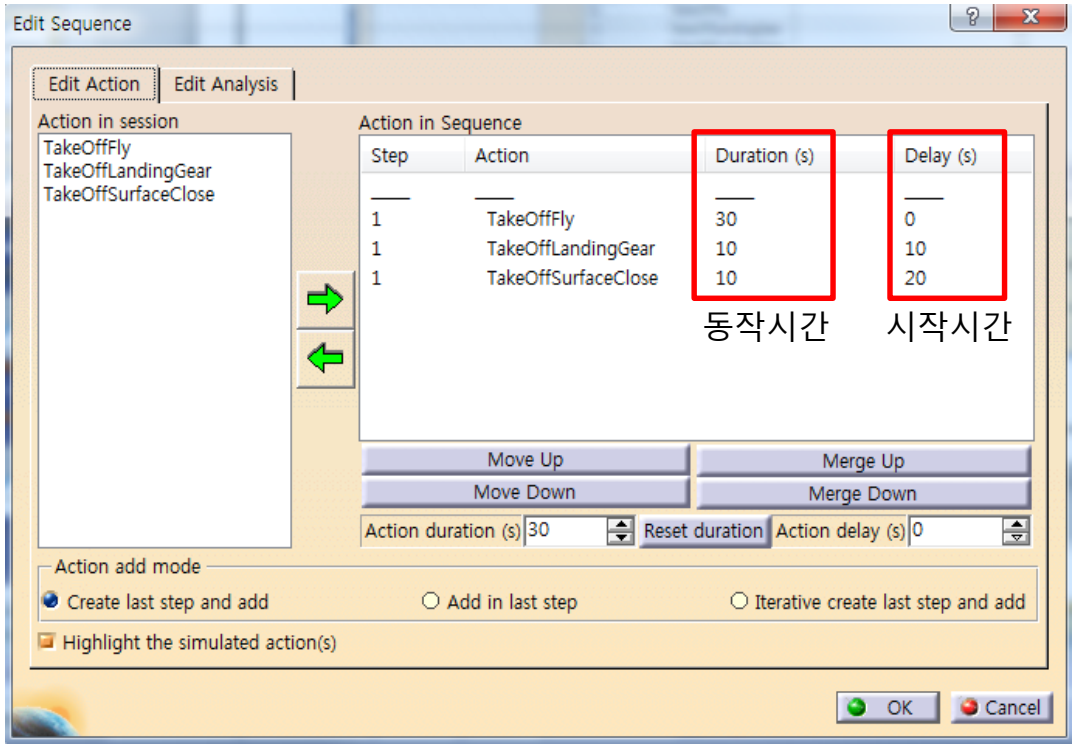
DMU KINEMATICS TOOLS

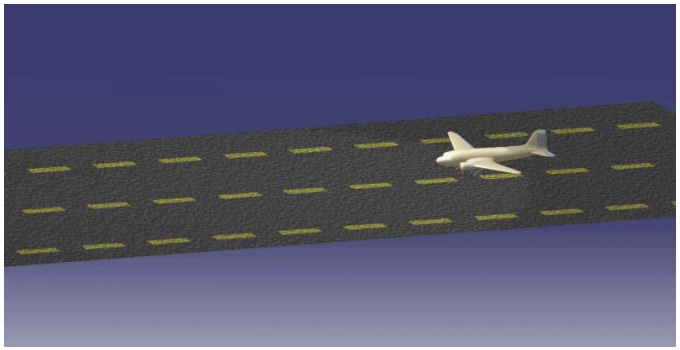
DMU Generic Animation

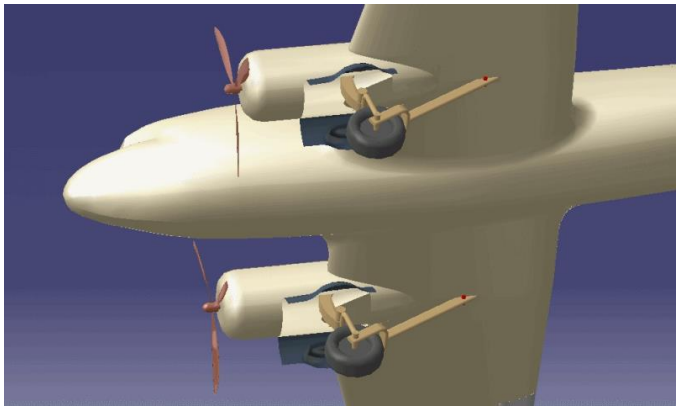


Edit Sequence 

- 만들어진 시뮬레이션들의 시간을 조절하여 하나의 시뮬레이션으로 구성함







DMU KINEMATICS TOOLS

DMU Generic Animation

Clash Mode

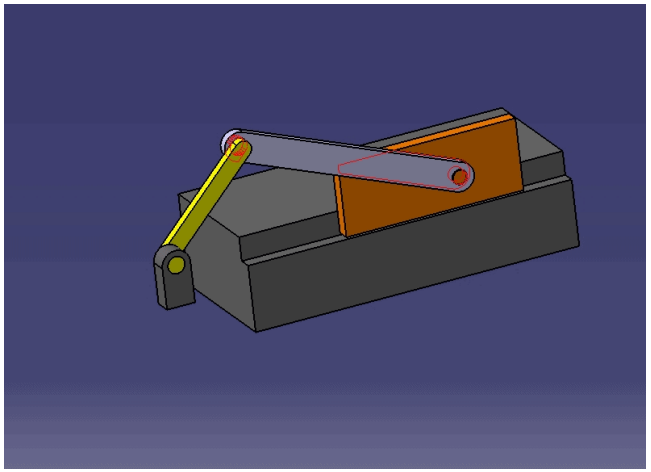
- 시뮬레이션을 실행할 때 간섭여부를 확인함

Deactivates automatic clash detection for simulation

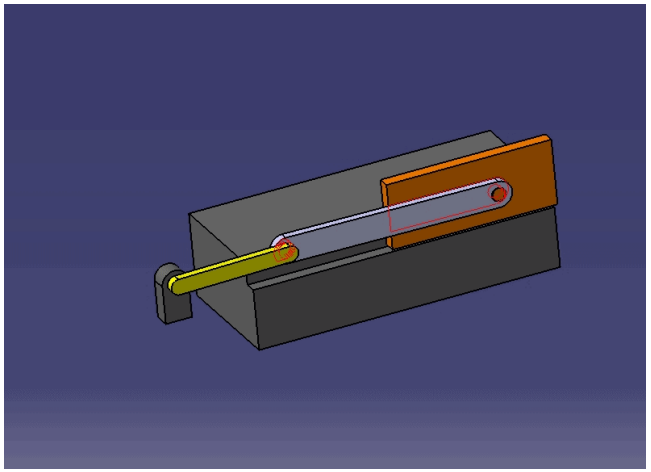
Activates automatic clash detection for simulation

Activates automatic clash detection stop mode for simulation

기존의 Slider-Crank 모델

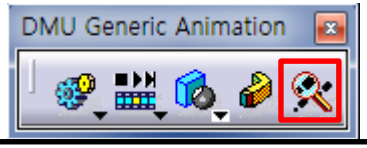


간섭이 일어나는 모델



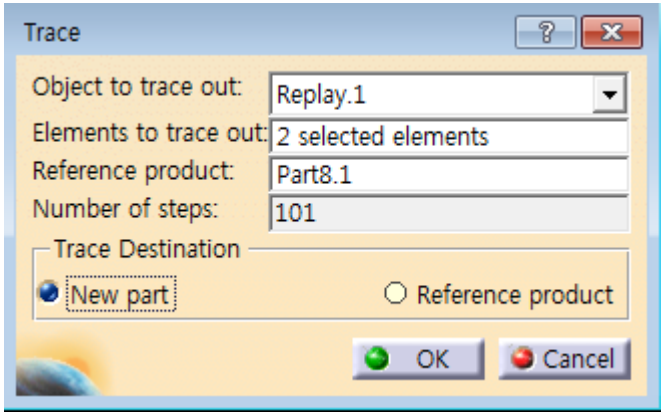
DMU KINEMATICS TOOLS

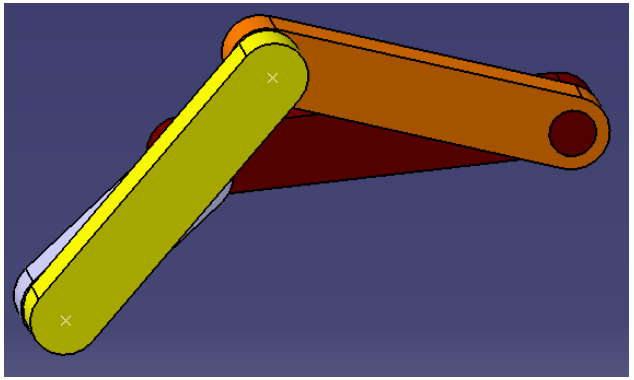
DMU Generic Animation

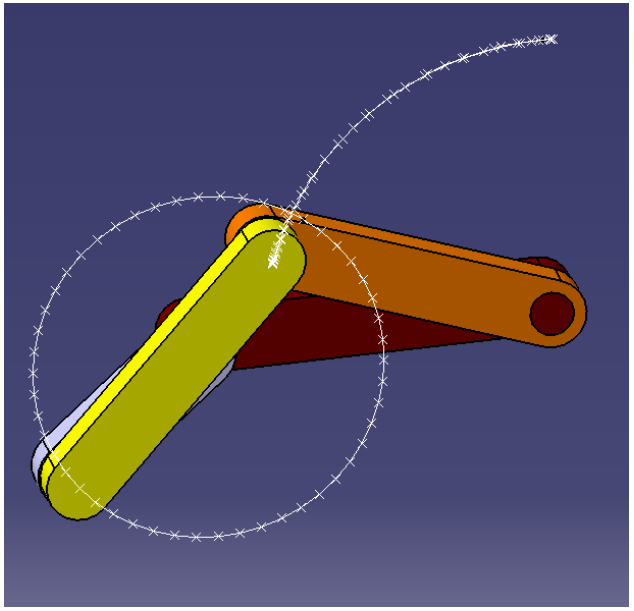


Trace

- 선택한 elements의 이동을 replay를 기준으로 표시함.

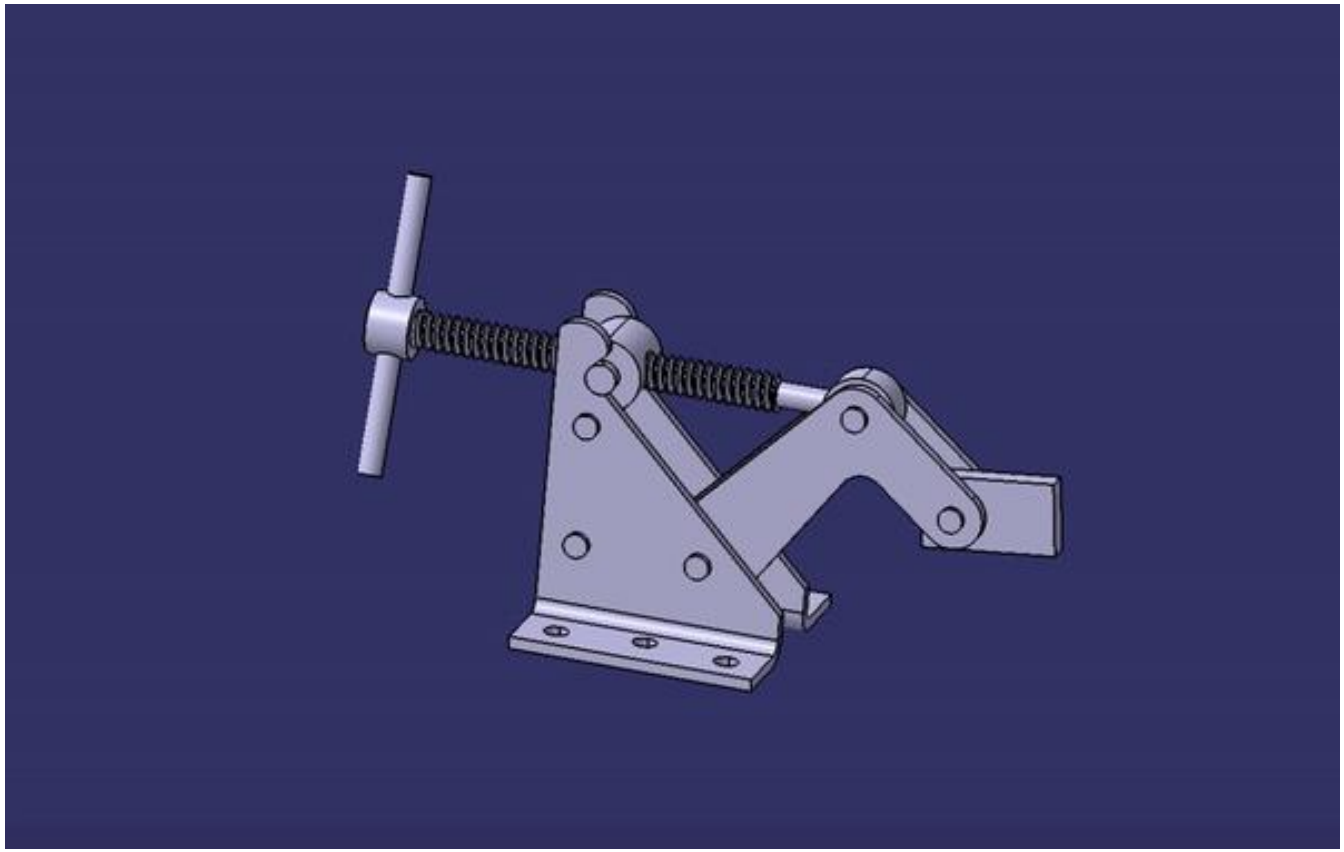






실습 예제

Assembly Design을 완성하고 아래와 같이 DMU Kinematics 작업 진행하기(Screw joint pitch 10)



문제 링크
http://cdl.hanyang.ac.kr/wp-content/uploads/exam/CAD/2013final-lab.pdf
파트 링크
http://cdl.hanyang.ac.kr/wp-content/uploads/2022/CAD/example/07_DMU_Kinematics/DMU_example.zip

실습 과제

Assembly Design의 Piston 모델을 이용하여 아래와 같이 DMU Kinematics 작업 진행하기

(Simulation 동영상 + Product + Part 파일들 압축하여 업로드)