

Elevator Mechanism Using CATIA

Team . Elevate

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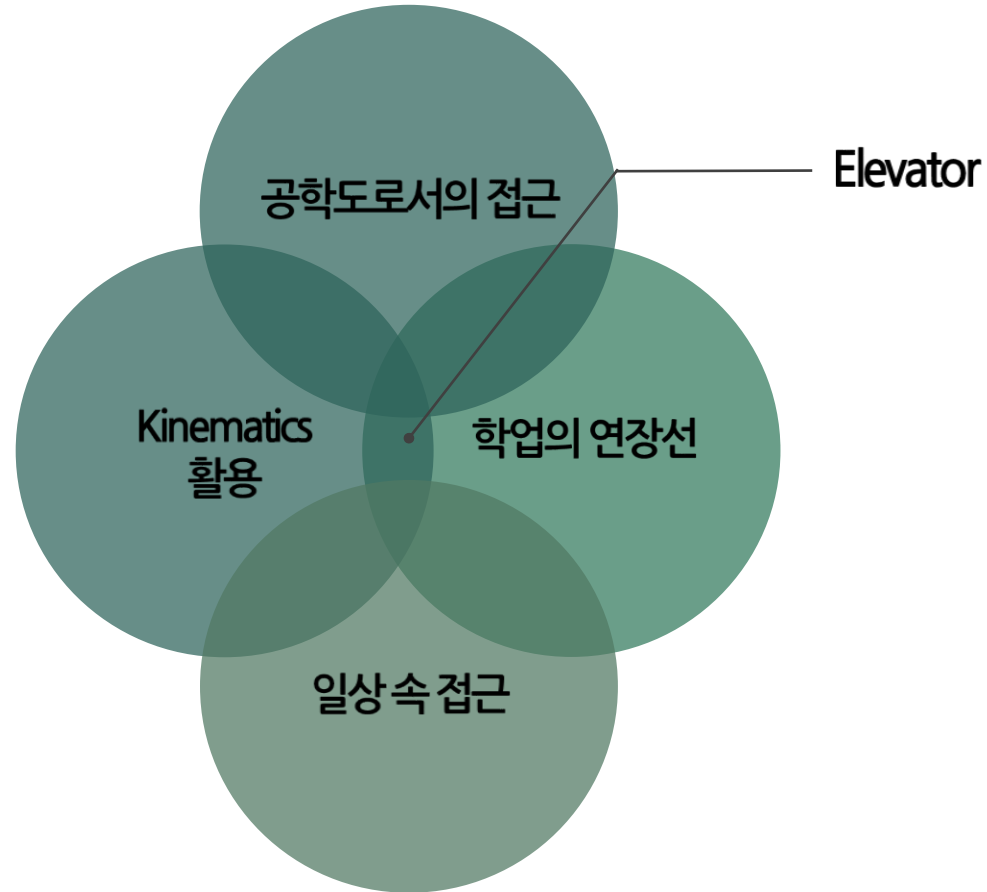
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001. About Topic



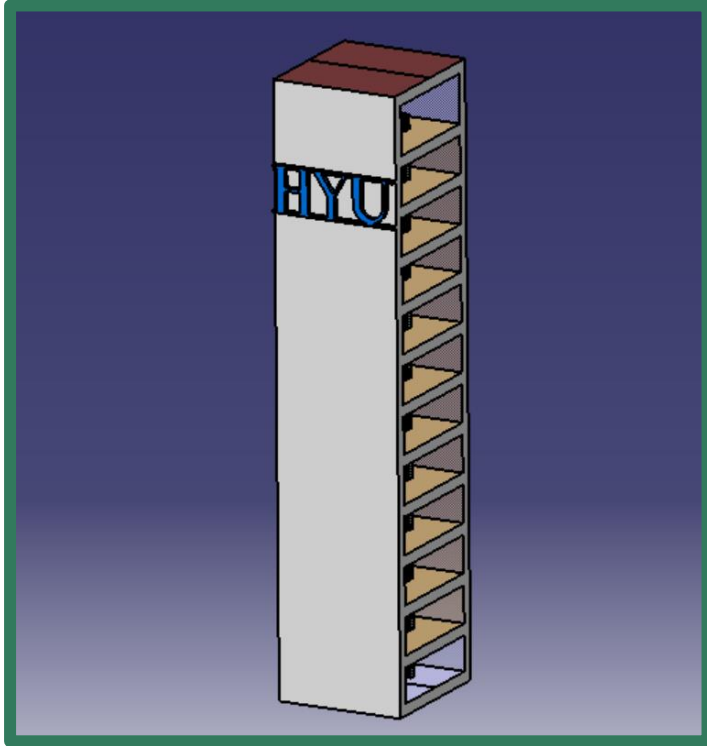


002. Design & Composition

Design - 엘리베이터를 포함한 건물 전체 외관

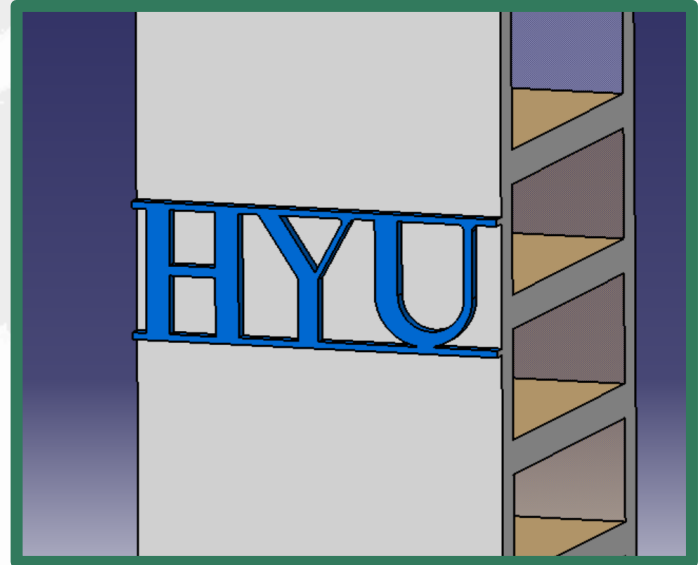


Composition of Building

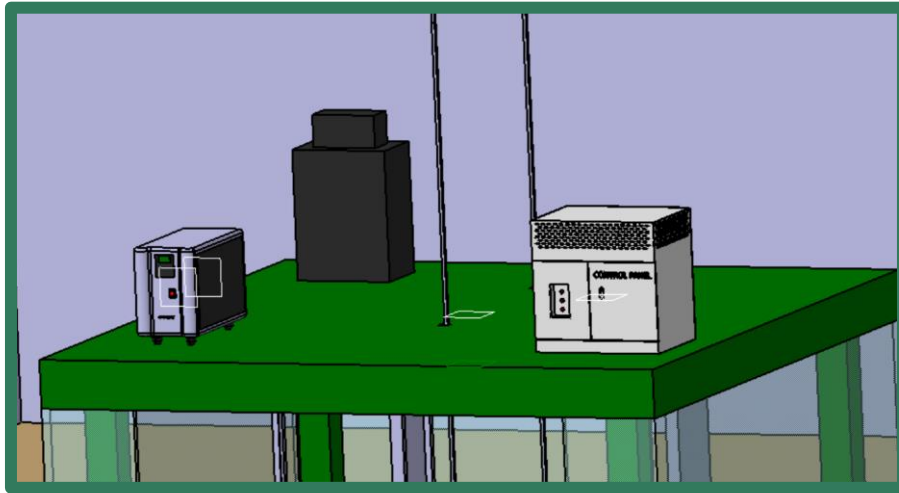


* Isometric view of Tower

* 한양대학교 로고
Sketch Tracer 기능을 통한 jpg 파일로 부터 형상화

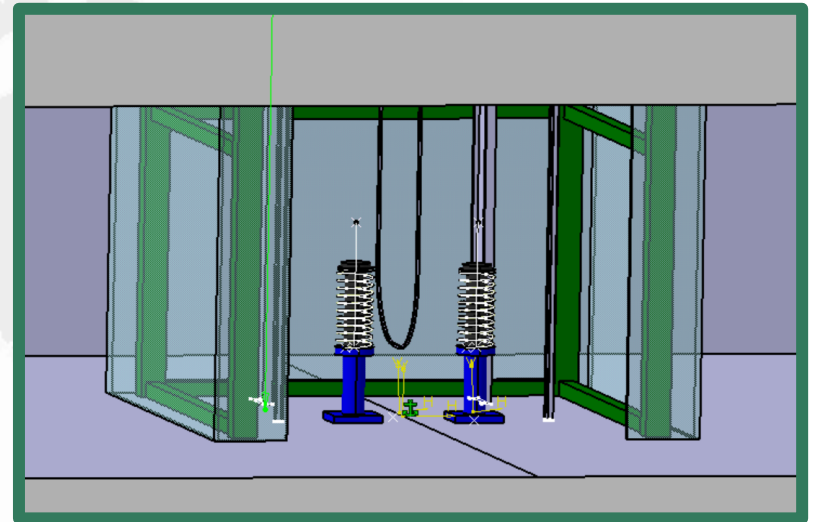


Composition of Building

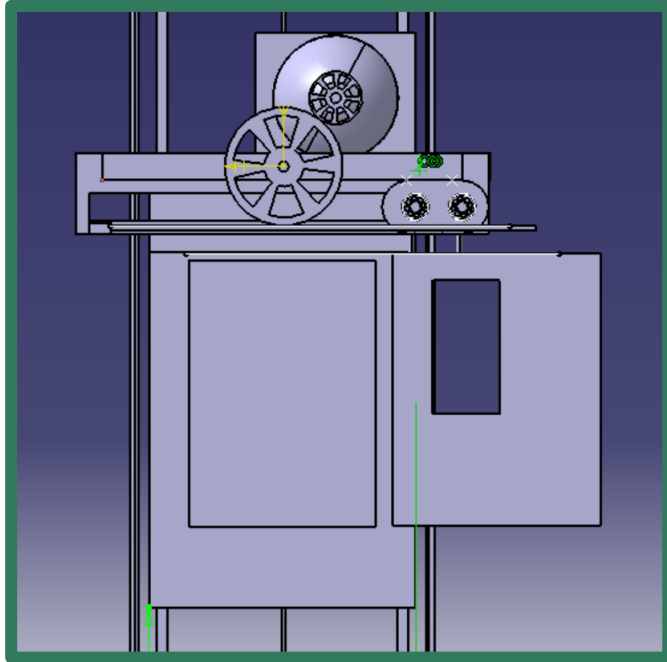


* 건물 옥상에 위치한 기계실

* 건물 지하실에 있는 충격 완화 스프링

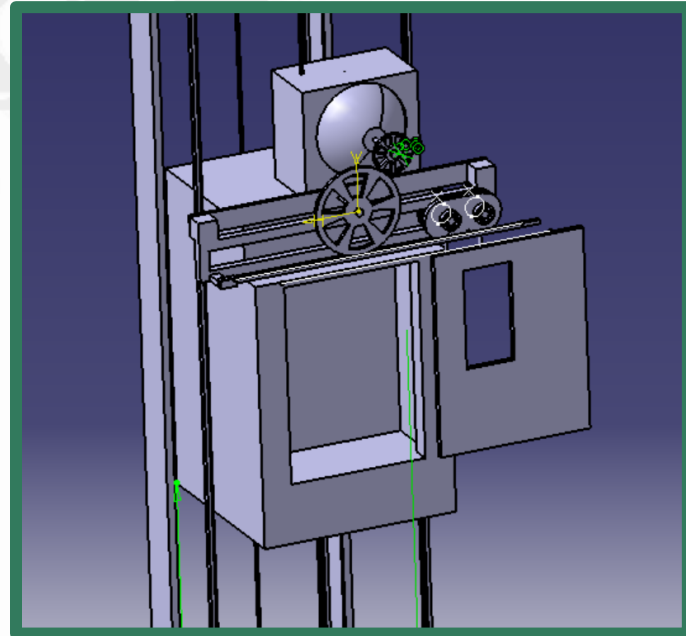


Composition of Elevator

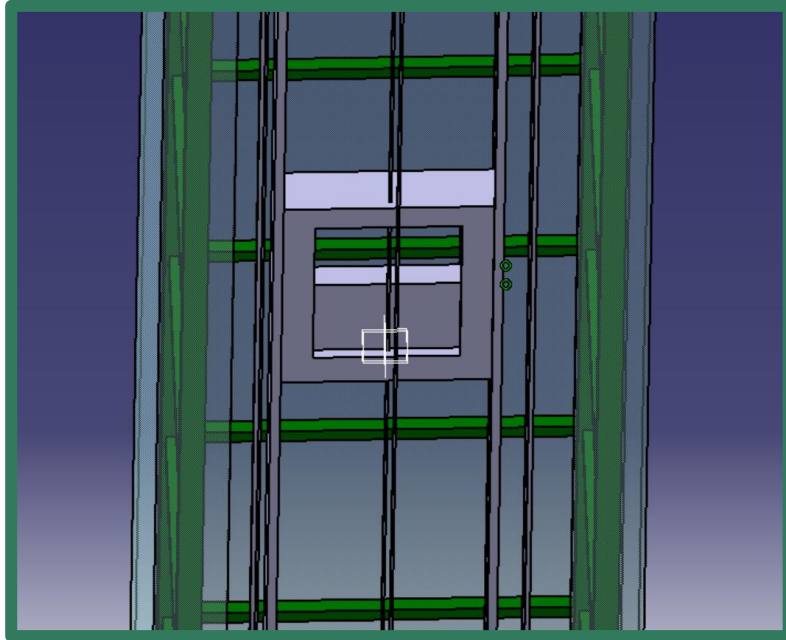


* Front view of Elevator

* isometric view of Elevator

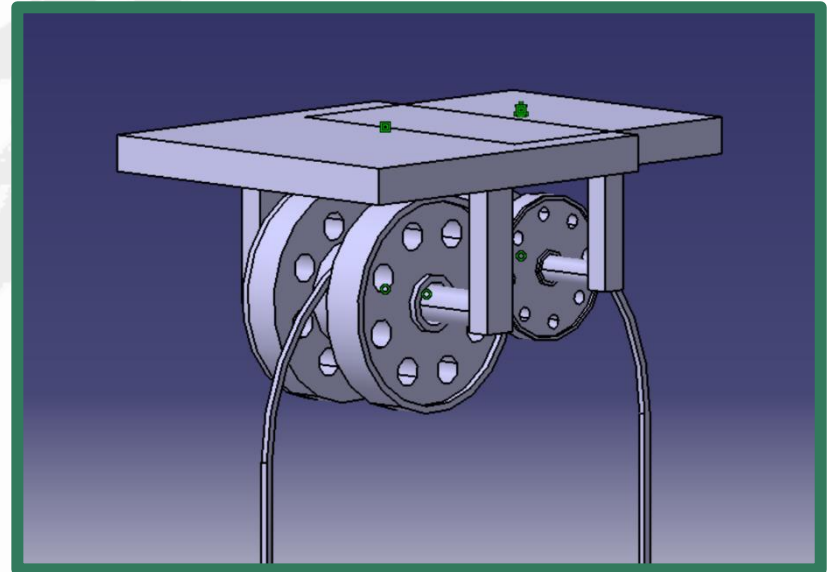


Composition of Elevator

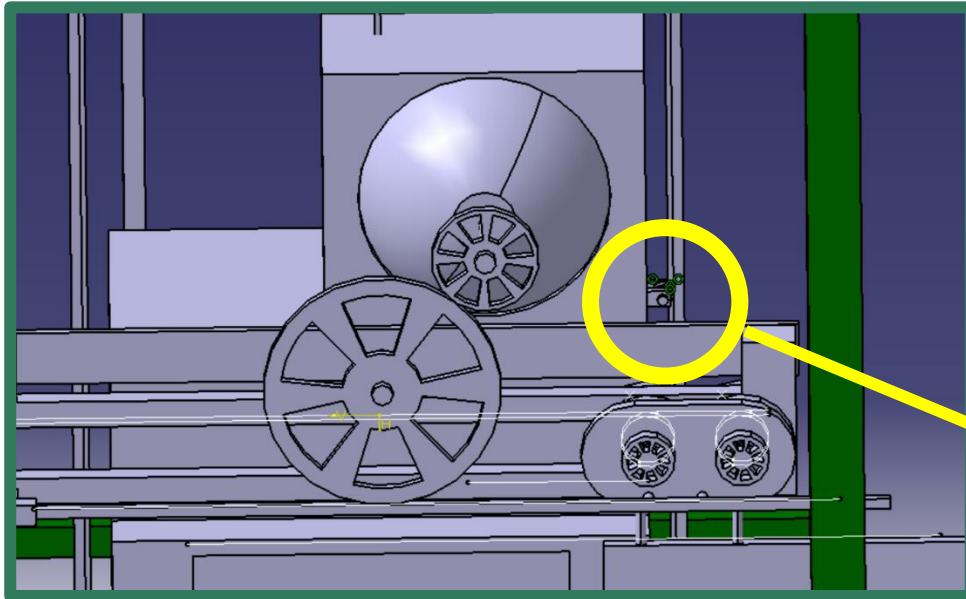


* 가이드레일 및 무게 추

* 도르래 및 와이어(형상)

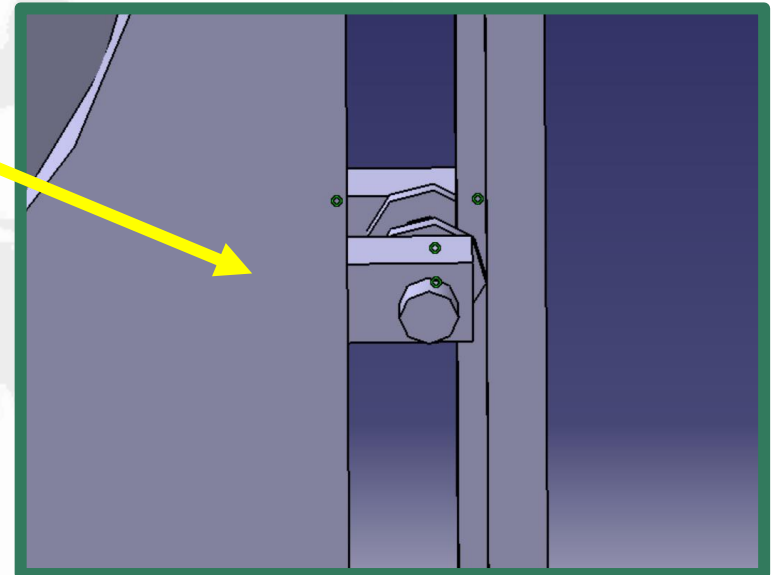


Composition of Elevator



* Detail of Guide Rail_1

* Detail of Guide Rail_2



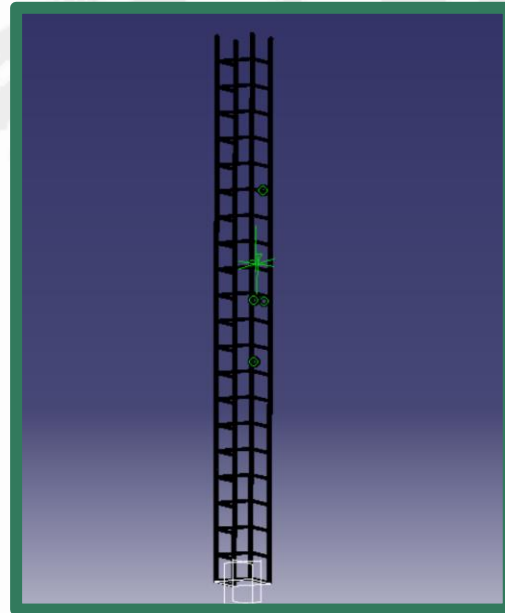


003. Assembly & Kinematics

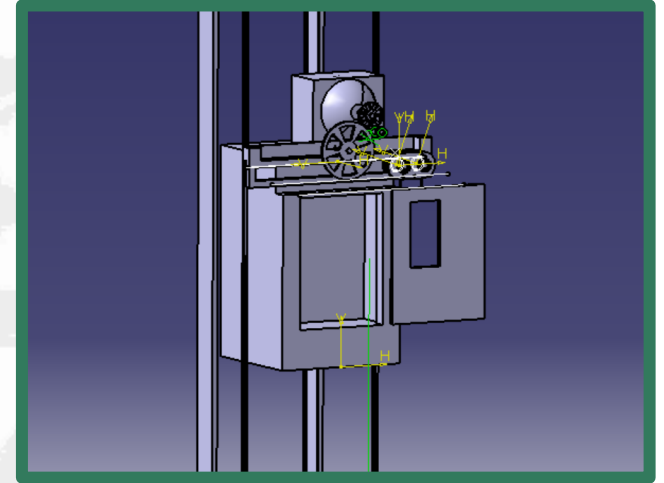
Assembly



1. Tower

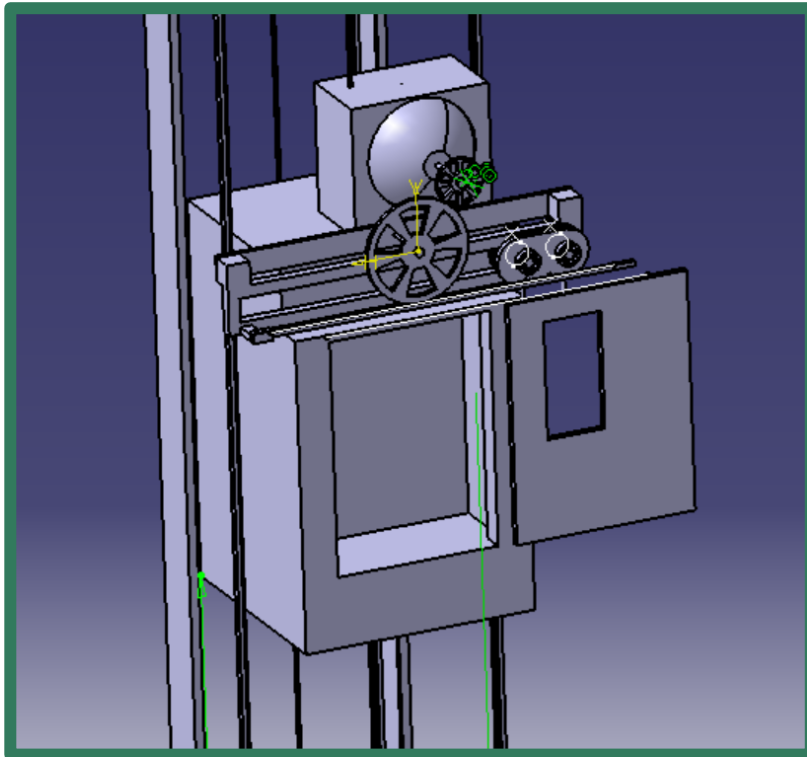


2. Frame



3. Elevator

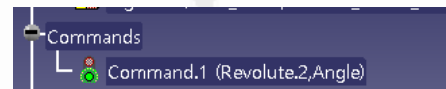
Kinematics of Elevator



Overview of Joints



Single Command (Revolution of Electric Motor)

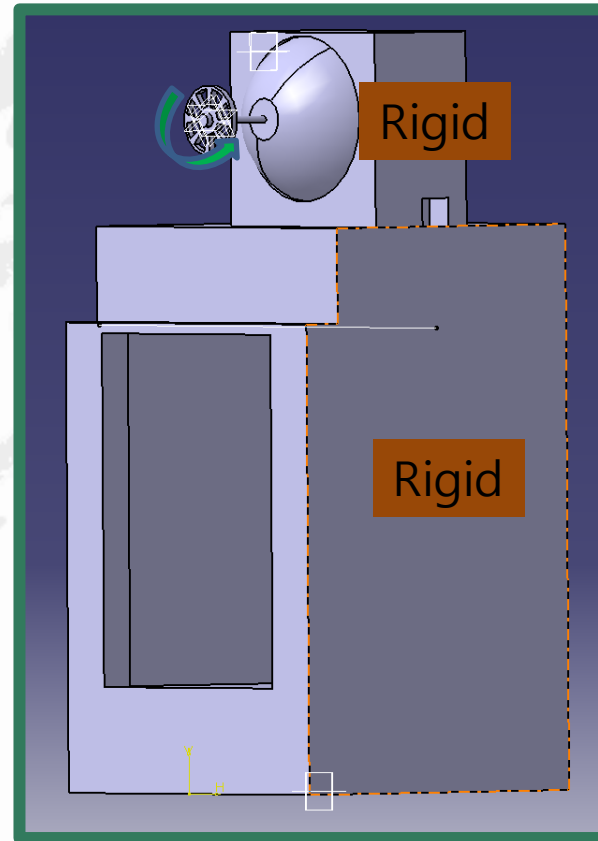


Overview of Joints

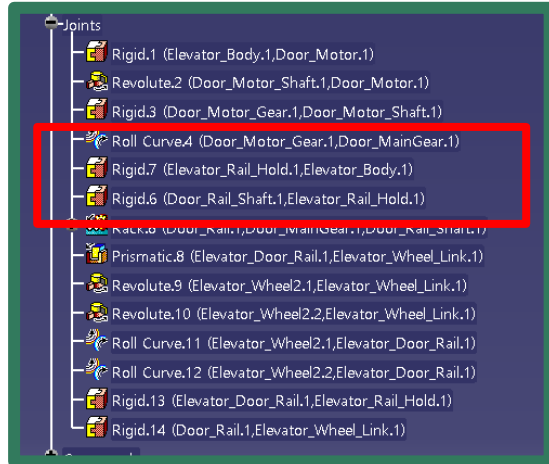


1. 모터의 회전운동을
기어로 전달

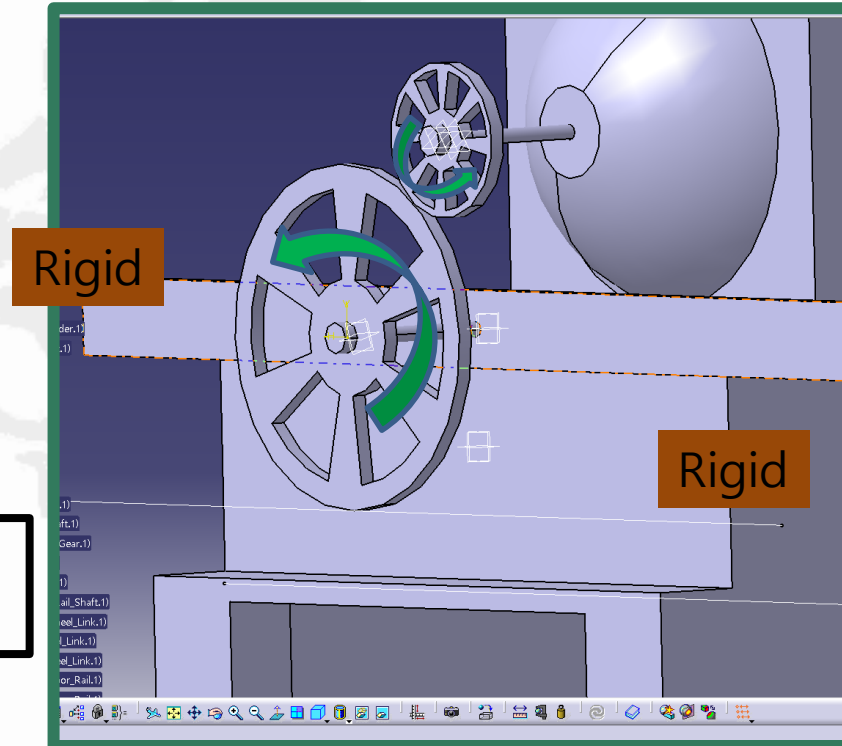
Kinematics of Elevator



Overview of Joints

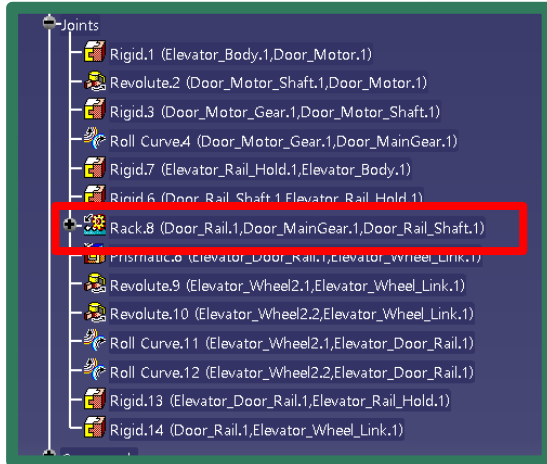


Kinematics of Elevator



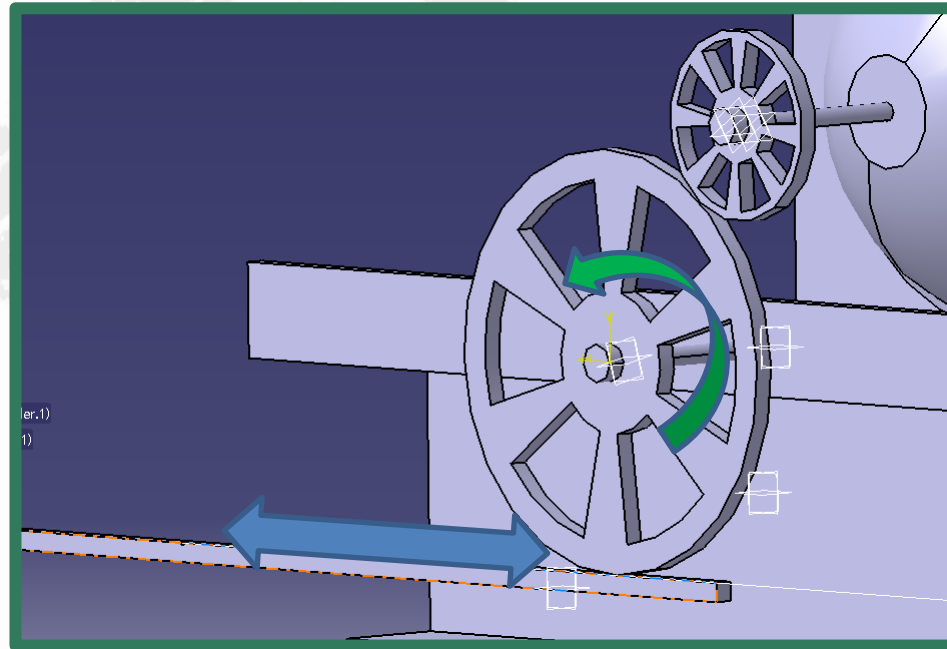
1. 모터의 회전운동을
기어로 전달

Overview of Joints



2. 모터의 회전운동을
병진운동으로 변환

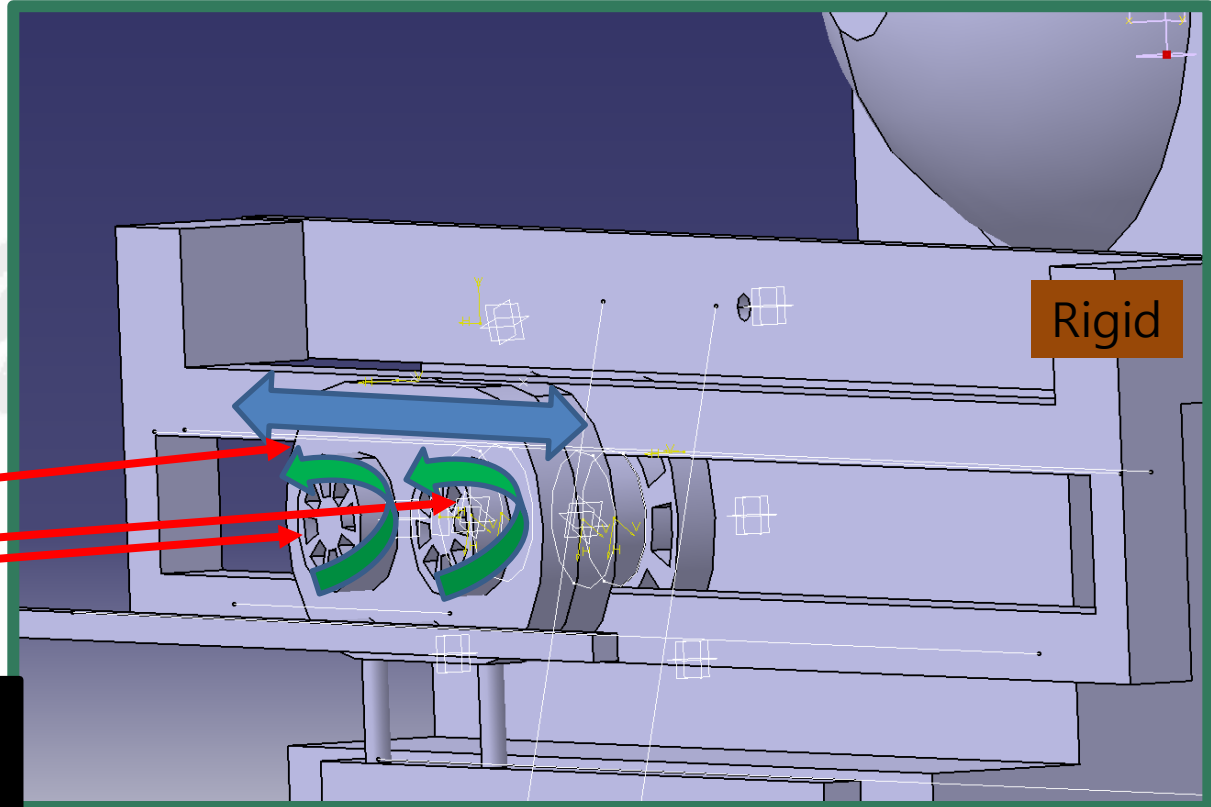
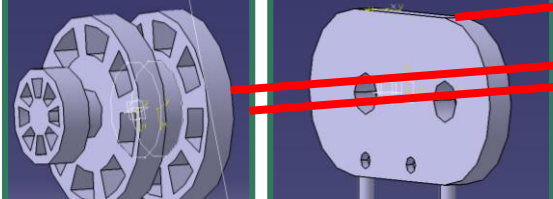
Kinematics of Elevator



Kinematics of Elevator

Overview of Joints

- └ Joints
- └ Rigid.1 (Elevator_Body.1,Door_Motor.1)
- └ Revolute.2 (Door_Motor_Shaft.1,Door_Motor.1)
- └ Rigid.3 (Door_Motor_Gear.1,Door_Motor_Shaft.1)
- └ Roll Curve.4 (Door_Motor_Gear.1,Door_MainGear.1)
- └ Rigid.7 (Elevator_Rail_Hold.1,Elevator_Body.1)
- └ Rigid.6 (Door_Rail_Shaft.1,Elevator_Rail_Hold.1)
- └ Rack.8 (Door_Rail.1,Door_MainGear.1,Door_Rail_Shaft.1)
- └ Prismatic.8 (Elevator_Door_Rail.1,Elevator_Wheel_Link.1)
- └ Revolute.9 (Elevator_Wheel2.1,Elevator_Wheel_Link.1)
- └ Revolute.10 (Elevator_Wheel2.2,Elevator_Wheel_Link.1)
- └ Roll Curve.11 (Elevator_Wheel2.1,Elevator_Door_Rail.1)
- └ Roll Curve.12 (Elevator_Wheel2.2,Elevator_Door_Rail.1)
- └ Rigid.13 (Elevator_Door_Rail.1,Elevator_Rail_Hold.1)
- └ Rigid.14 (Door_Rail.1,Elevator_Wheel_Link.1)



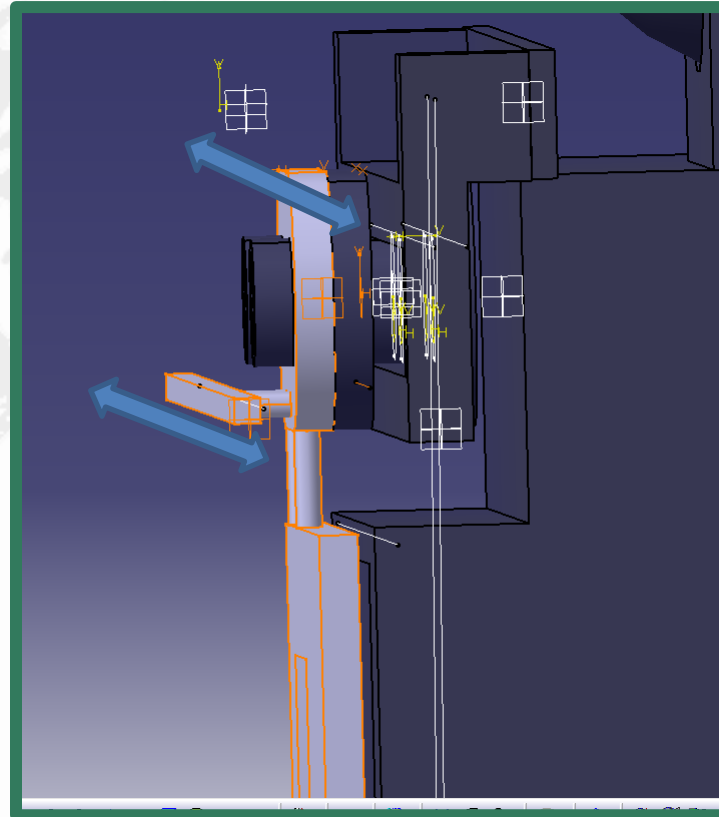
3. 문의 병진운동을
기어의 구름운동(Rolling
Motion)으로 변환

Kinematics of Elevator

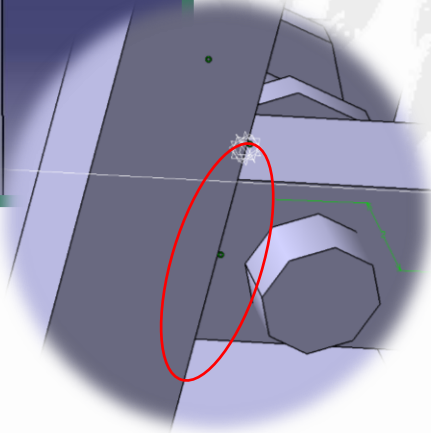
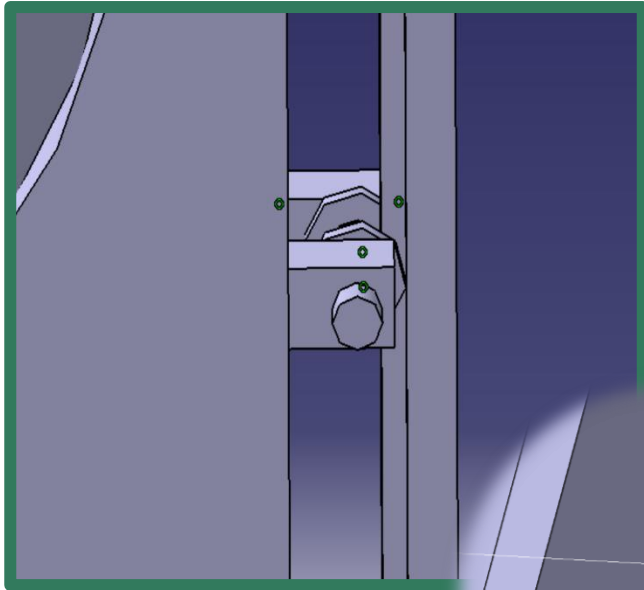
Overview of Joints

- └ Joints
 - └ Rigid.1 (Elevator_Body.1,Door_Motor.1)
 - └ Revolute.2 (Door_Motor_Shaft.1,Door_Motor.1)
 - └ Rigid.3 (Door_Motor_Gear.1,Door_Motor_Shaft.1)
 - └ Roll Curve.4 (Door_Motor_Gear.1,Door_MainGear.1)
 - └ Rigid.7 (Elevator_Rail_Hold.1,Elevator_Body.1)
 - └ Rigid.6 (Door_Rail_Shaft.1,Elevator_Rail_Hold.1)
 - └ Rack.8 (Door_Rail.1,Door_MainGear.1,Door_Rail_Shaft.1)
 - └ Prismatic.8 (Elevator_Door_Rail.1,Elevator_Wheel_Link.1)
 - └ Revolute.9 (Elevator_Wheel2.1,Elevator_Wheel_Link.1)
 - └ Revolute.10 (Elevator_Wheel2.2,Elevator_Wheel_Link.1)
 - └ Roll Curve.11 (Elevator_Wheel2.1,Elevator_Door_Rail.1)
 - └ Roll Curve.12 (Elevator_Wheel2.2,Elevator_Door_Rail.1)
 - └ Rigid.13 (Elevator_Door_Rail.1,Elevator_Rail_Hold.1)
 - └ Rigid.14 (Door_Rail.1,Elevator_Wheel_Link.1)

4. 모터의 변환된 병진운동을
문의 병진운동으로
전달해주는 역할

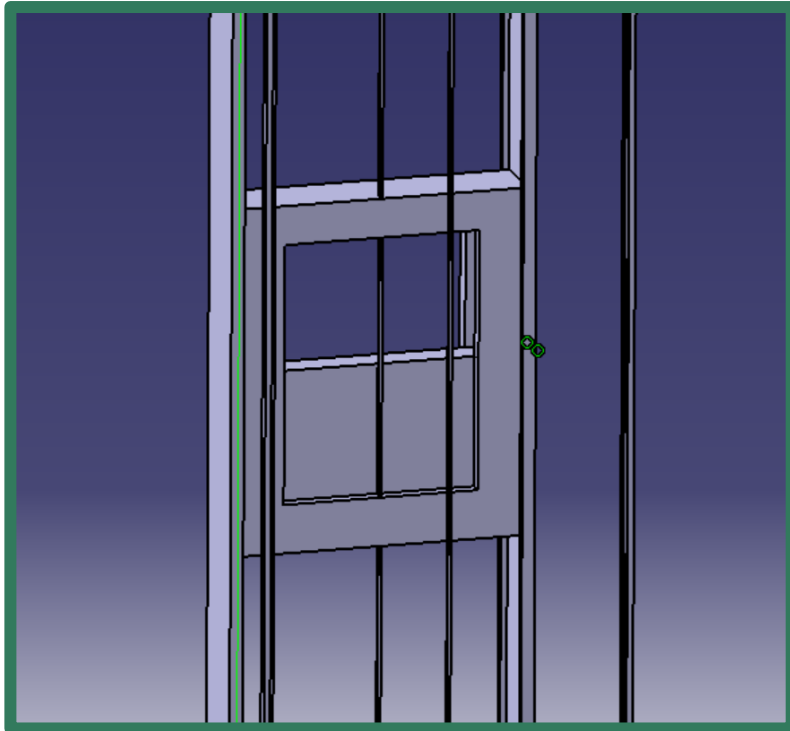


Kinematics of Guiderail



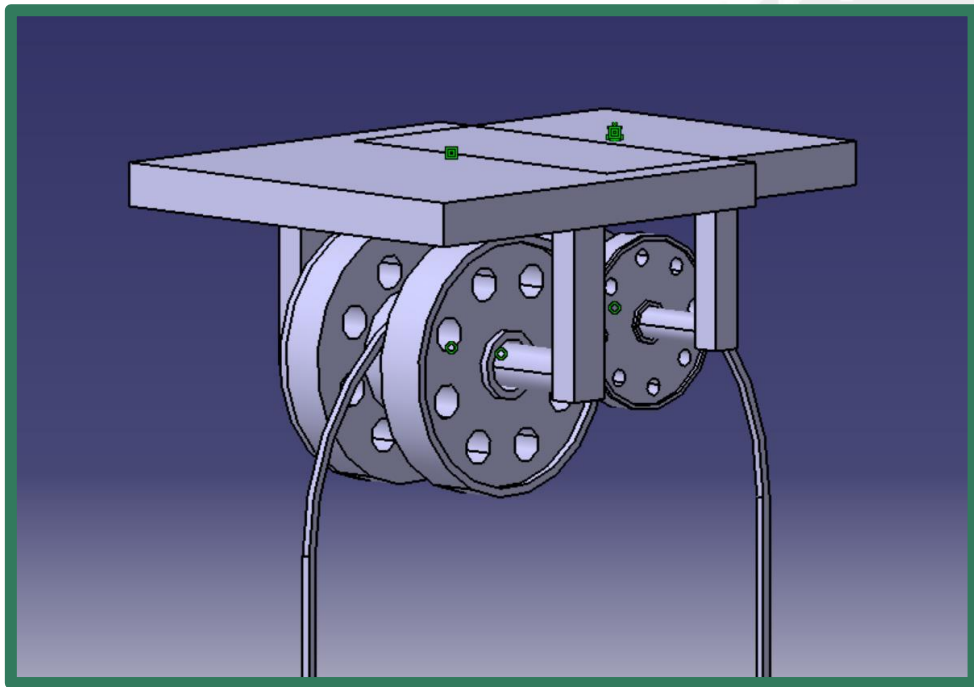
- Rack joint (roller가 guiderail 굴러감)
- Prismatic joint : guide wheel holder & guiderail
- Revolute joint : guide wheel & wheel shaft
- Rigid joint : guide wheel holder & elevator

Kinematics of Weight Career



- Cable joint : 엘리베이터와 무게 추가 도르래 운동

Kinematics of Pulley



- 도르래(R15) & 도르래(R10)와
도르래 틀 간의 Revolute joint 이용

- CATIA는 Rigid Body(강체)의 형상 및
Motion을 구현할 수 있음. 따라서 Wire의
Motion은 구현하지 못함.



004. Video

Video Link (in Youtube)

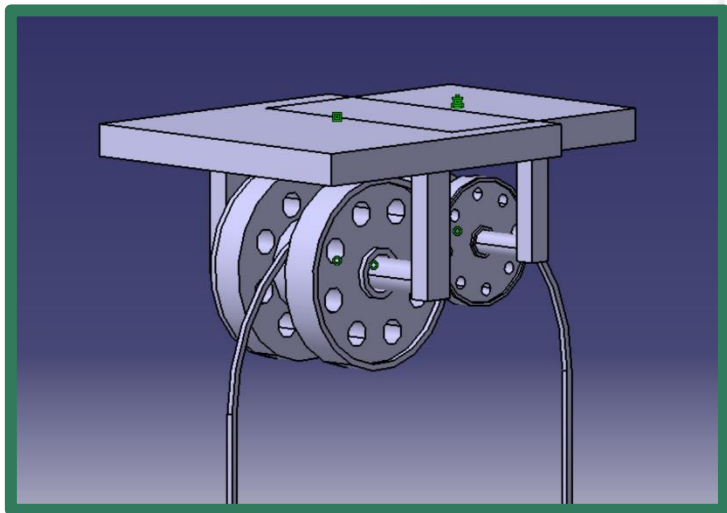
https://www.youtube.com/watch?v=gWLiRbX_A8M





005. About Limitations

About Limitations

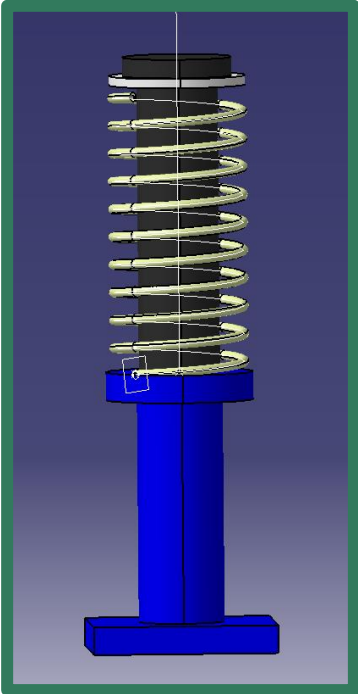


* In Wire

- 움직이는 도르래 줄을 만들려고 계획
- 도르래에 접하고 양쪽 길이가 시간에 따라 변하는 줄은 Catia에서 제작 불가능
- 그에 대한 대체재로 pulley belt를 만들기로 결정. 2300mm에 육박하는 경로 위의 이웃한 chain 사이마다 constraint를 생성. Simulation에서 과도한 딜레이를 야기시켜 실패

About Limitations

- 스프링의 수축, 이완 운동을 구현하려고 계획
- 스프링의 뼈대 helix의 property에서 function과 measure between을 이용하여 시도
- Simulation에서 움직임이 발생할 때마다 바로 바로 update 되지 않아 실패



* Buffer spring





06. Q n A