

Crane System

CAD Final Project

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Team Crane

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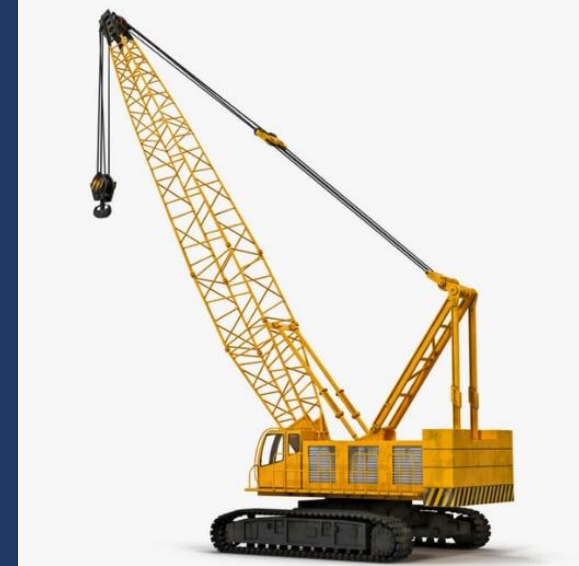
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Introduction

Background



- 굴착기나 크레인 등 중장비들의 회전, 병진 운동이 CATIA로 표현하기 적합하다고 판단
- 이론, 실습시간에 배운 기능을 활용하여 구현 가능

Introduction

Roles

김용호

Mobile Crane

Part Design
Kinematics
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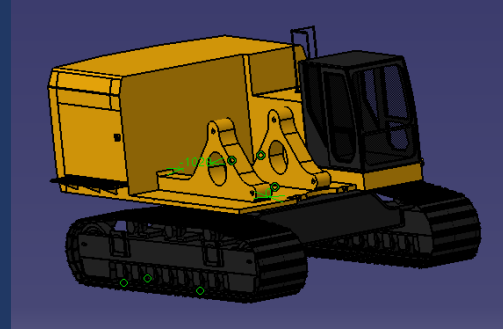
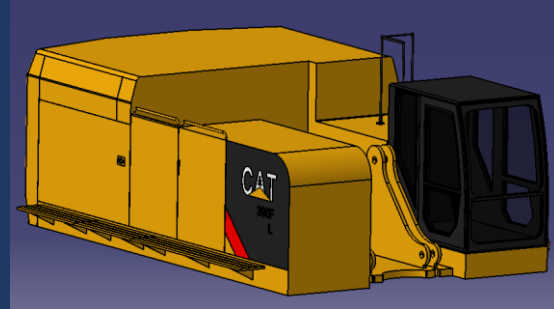
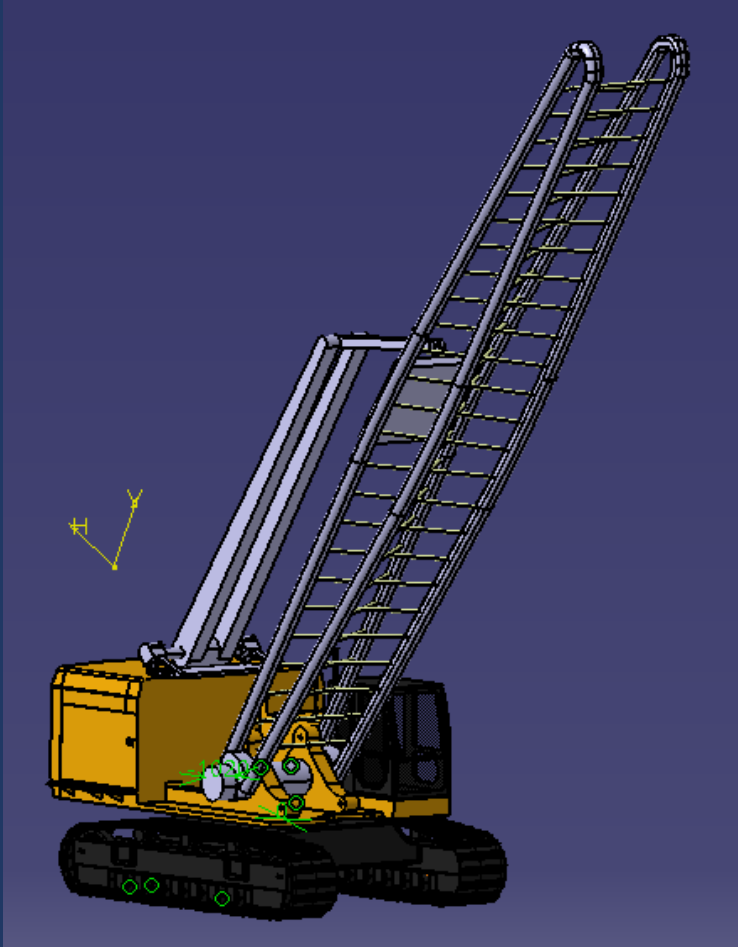
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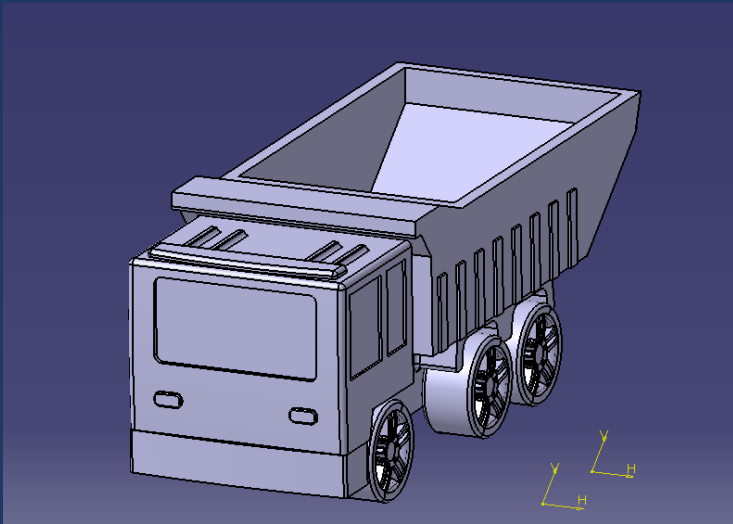
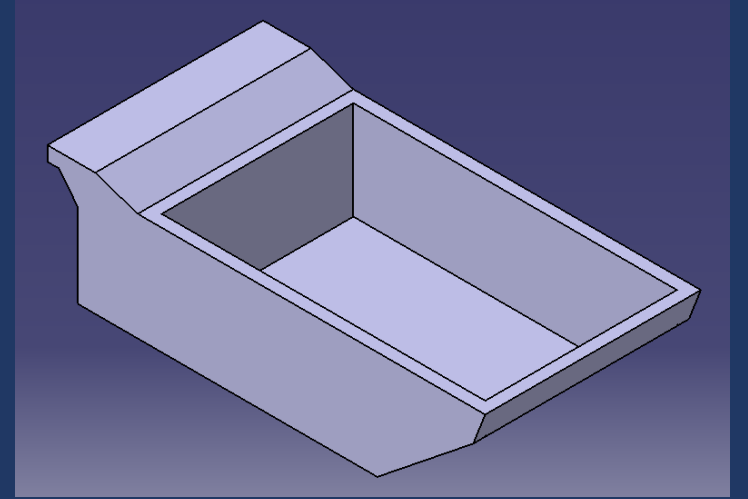
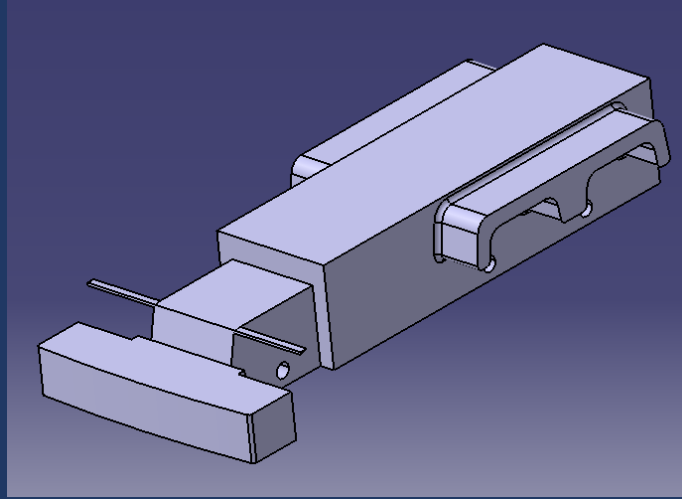
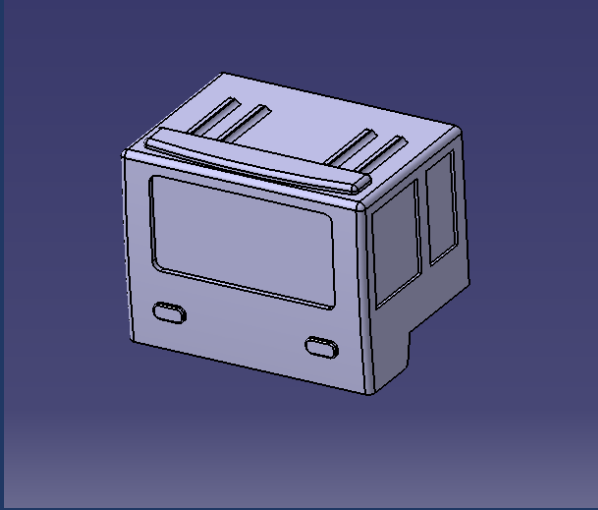
Mobile Crane



- Main body , Main Link, Sub link1,2,3,4 부분으로 나누어 모델링
- Main body부분을 아웃소싱하여 변형
- Link를 여러 개 사용하여 각도를 크게 변형하는 joint와 세밀하게 각도를 변경 할 수 있는 joint 구분
- Sketch, Pad, Pocket, Edge Fillet를 이용하여 전체적인 형상 제작
- GSD-Cylinder로 Truss 구조 제작
- Traction 아웃소싱

Modeling

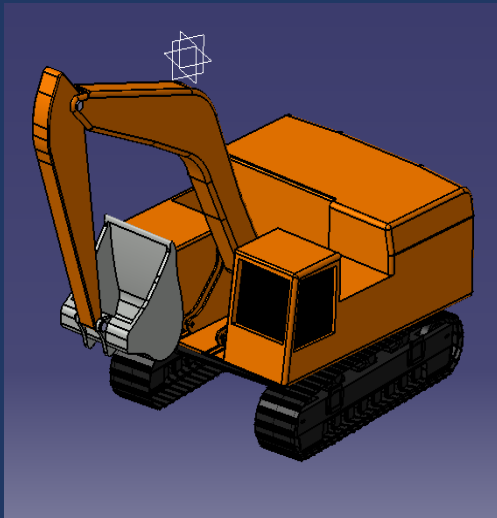
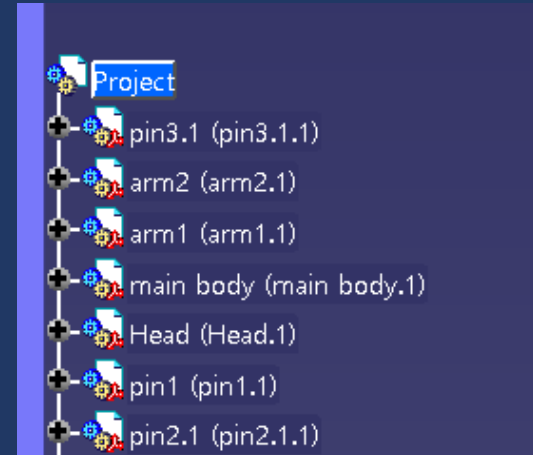
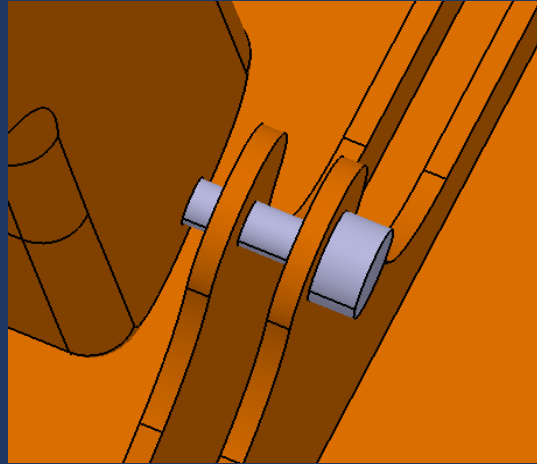
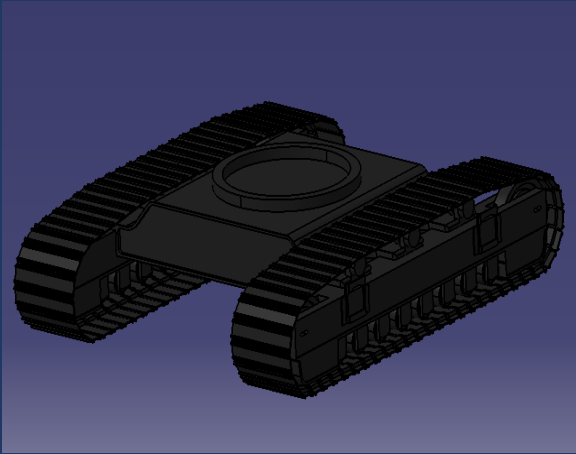
Dump Truck



- Main body , Arm , Head 부분으로 나누어 모델링
- Sketch, Pad, Pocket, Edge Fillet을 이용하여 전체적인 형상 제작
- Assembly Design의 Coincidence, Contact, Offset Constraint를 이용하여 모든 Part 조립
- Wheel, 아웃 소싱

Modeling

Excavator



- Main body , Arm , Head 부분으로 나누어 모델링
- Sketch 와 Pad 를 기반으로 전체적인 형상 제작
- Boolean Operation 의 Remove 기능을 활용하여 비어있는 형상인 Head 제작
- 제작한 Pin으로 연결부분 구현
- 궤도 부분의 Traction body , Traction wheel 아웃소싱

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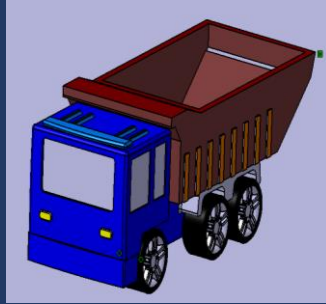
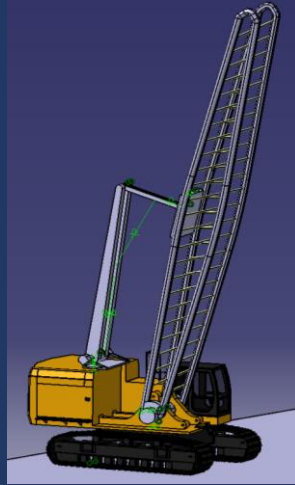
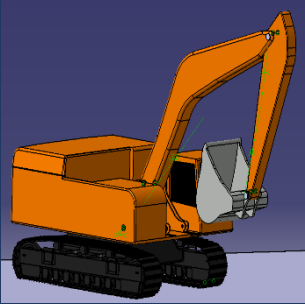
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Kinematics & Simulation

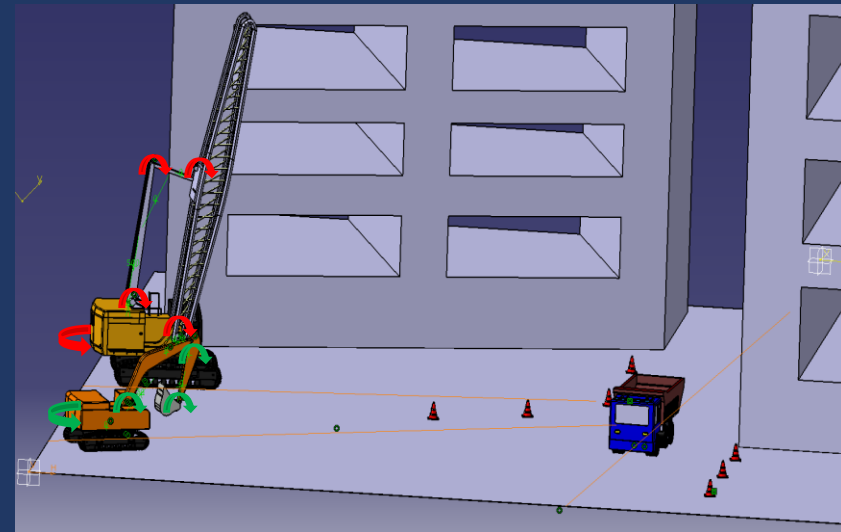
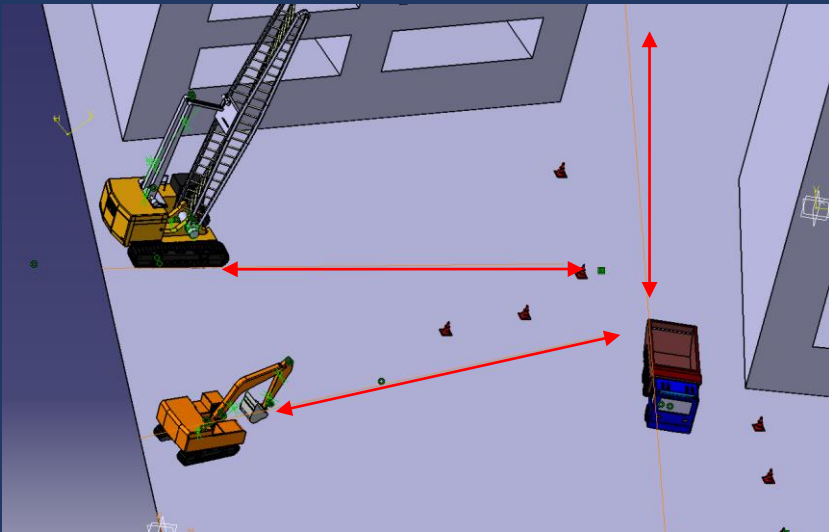
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Conclusion

Kinematics



- Constraint : Coincidence, Offset, Contact 활용
- Kinematics : Revolute , Rigid , Prismatic 활용
- 각 Product가 활동하기 위한 Surface 제작
- Product들의 이동경로를 Line 으로 설정



Kinematics

Constraints

- Constraints
 - Fix.1 (surface.1)
 - Coincidence.2 (Track Connector.1,surface.1)
 - Coincidence.3 (Track Connector.1,surface.1)
 - Coincidence.4 (Main Body.1,Track Connector.1)
 - Offset.5 (Main Body.1,Track Connector.1)
 - Coincidence.6 (Part1.1,Main Body.1)
 - Offset.7 (Part1.1,Main Body.1)
 - Offset.8 (Part2.1,Main Body.1)
 - Coincidence.9 (Part3.1,Part1.1)
 - Offset.10 (Part3.1,Part1.1)
 - Coincidence.11 (Part5.1,Part3.1)
 - Offset.12 (Part5.1,Part3.1)
 - Coincidence.13 (Part4.1,Part5.1)
 - Offset.14 (Part4.1,Part5.1)
 - Coincidence.15 (Part4.1,Part2.1)
 - Offset.16 (Part4.1,Part2.1)
 - FixTogether.1(Part2.1,Main Body.1)

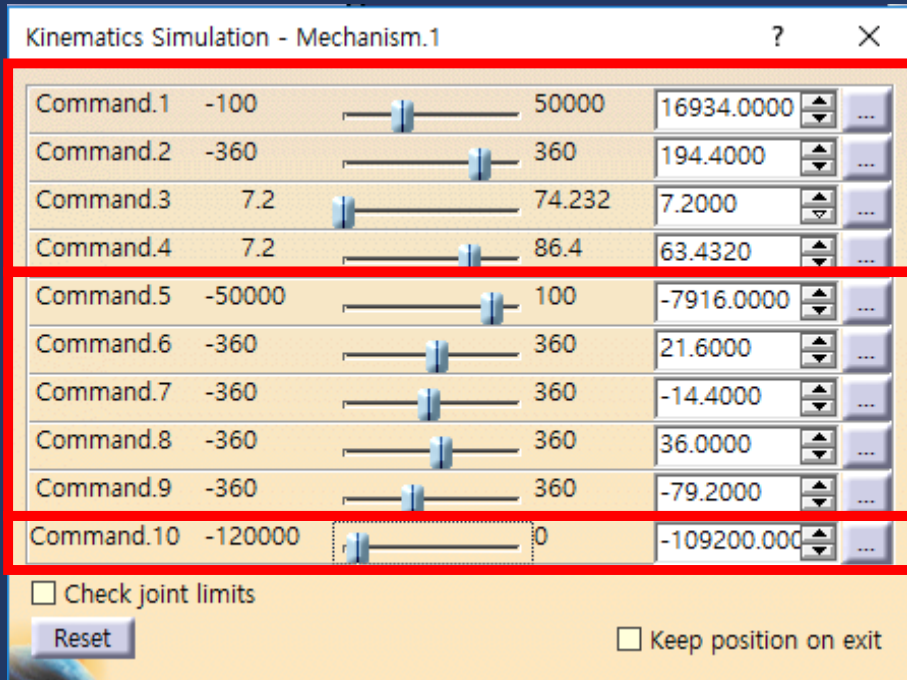
- Coincidence.17 (STrack Connector.1,surface.1)
- Coincidence.18 (STrack Connector.1,surface.1)
- Coincidence.19 (STrack Connector.1,main body.1)
- Offset.20 (STrack Connector.1,main body.1)
- FixTogether.2(pin1.1,main body.1)
- FixTogether.3(arm1.1,pin3.1.1)
- FixTogether.4(pin2.1.1,Head.1)
- Coincidence.27 (main body.1,arm1.1)
- Offset.28 (main body.1,arm1.1)
- Coincidence.29 (arm2.1,arm1.1)
- Offset.30 (arm2.1,arm1.1)
- Coincidence.31 (arm2.1,Head.1)
- Offset.32 (arm2.1,Head.1)
- Coincidence.33 (Part12.1,surface.1)
- Coincidence.34 (Part12.1,surface.1)
- Fix.35 (Part19.1)
- Surface contact.36 (Part18.1,surface.1)

Kinematics

- Applications
 - Mechanisms
 - Mechanism.1, DOF=0
 - Joints
 - Prismatic.1 (Track Connector.1,surface.1)
 - Revolute.2 (Main Body.1,Track Connector.1)
 - Revolute.3 (Part1.1,Main Body.1)
 - Revolute.4 (Part3.1,Part1.1)
 - Revolute.5 (Part5.1,Part3.1)
 - Revolute.6 (Part4.1,Part5.1)
 - Revolute.7 (Part4.1,Part2.1)
 - Rigid.8 (Part2.1,Main Body.1)
 - Prismatic.9 (STrack Connector.1,surface.1)
 - Revolute.10 (STrack Connector.1,main body.1)
 - Rigid.11 (pin1.1,main body.1)
 - Rigid.12 (arm1.1,pin3.1.1)
 - Rigid.13 (pin2.1.1,Head.1)
 - Revolute.14 (main body.1,arm1.1)
 - Revolute.15 (arm2.1,arm1.1)
 - Revolute.16 (arm2.1,Head.1)
 - Prismatic.17 (Part12.1,surface.1)

- Commands
 - Command.1 (Prismatic.1,Length)
 - Command.2 (Revolute.2,Angle)
 - Command.3 (Revolute.4,Angle)
 - Command.4 (Revolute.7,Angle)
 - Command.5 (Prismatic.9,Length)
 - Command.6 (Revolute.10,Angle)
 - Command.7 (Revolute.14,Angle)
 - Command.8 (Revolute.15,Angle)
 - Command.9 (Revolute.16,Angle)
 - Command.10 (Prismatic.17,Length)
- Fix Part (surface.1)
 - Fix.1 (surface.1)
- Laws
- Speeds-Accelerations

Simulation



Crane

- Command 1 = Crane 의 병진운동
- Command 2 = Main body 회전운동
- Command 3 = Sub link 회전운동
- Command 4 = Main link 회전운동

Excavator

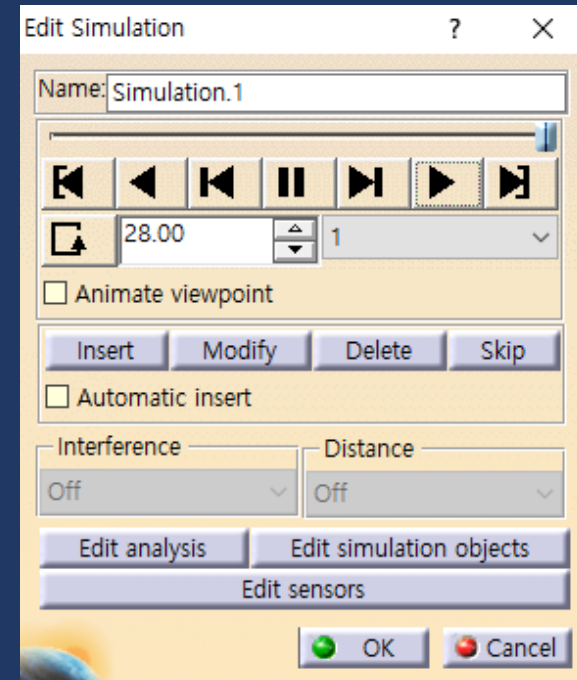
- Command 5 = Excavator 병진운동
- Command 6 = Main body 회전운동
- Command 7 = Arm 1 회전운동
- Command 8 = Arm2 회전운동
- Command 9 = Head 회전운동

Dump truck

- Command 10 = Dump truck 병진운동

Simulation

[Crane system \(Using CATIA V5\) - YouTube](#)



- Simulation 하나, 28장면으로 구성
- 각 Product와 Part가 간섭받지 않는 각도, 이동 길이를 확인하여 제작

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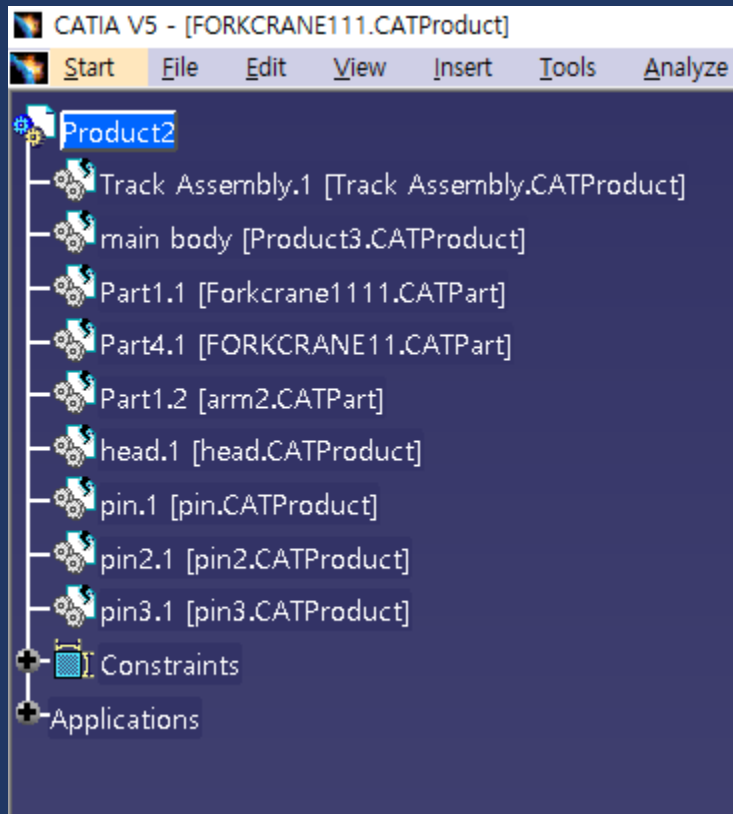
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Kinematics

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Conclusion



- 각자 맡은 차량을 합치는 과정에서 Part와 Product 저장 경로가 정확하지 않아 시간 소비
- Part와 Product의 저장이 체계적이지 않아 시간 소비
- 각 Part의 구체적 수치가 없어 비율을 맞추는데 어려움을 겪음
- 바퀴가 회전하는 Kinematics를 구현하지 못함
- Crane의 도르래 부분을 구현하지 못함

