



NFPA Curriculum Grant Awardee Review

Interactive Simulation Modules for Pneumatic and Hydraulic Circuits

Jesus Pagan, Assistant Professor

Dr. Yuqiu You, Associate Professor

Dr. William Reeves, Emeritus Professor



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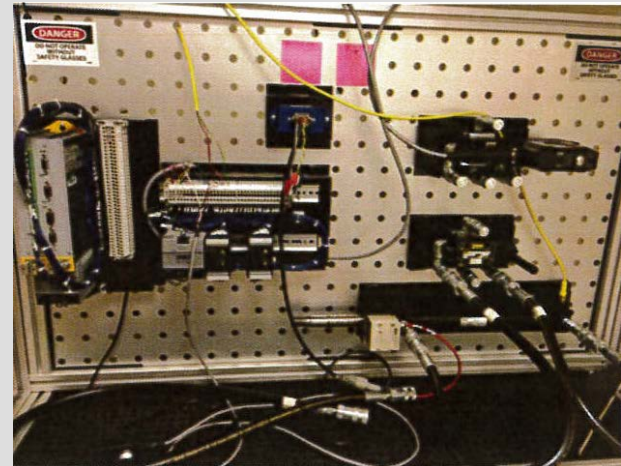


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Introduction

Background Information

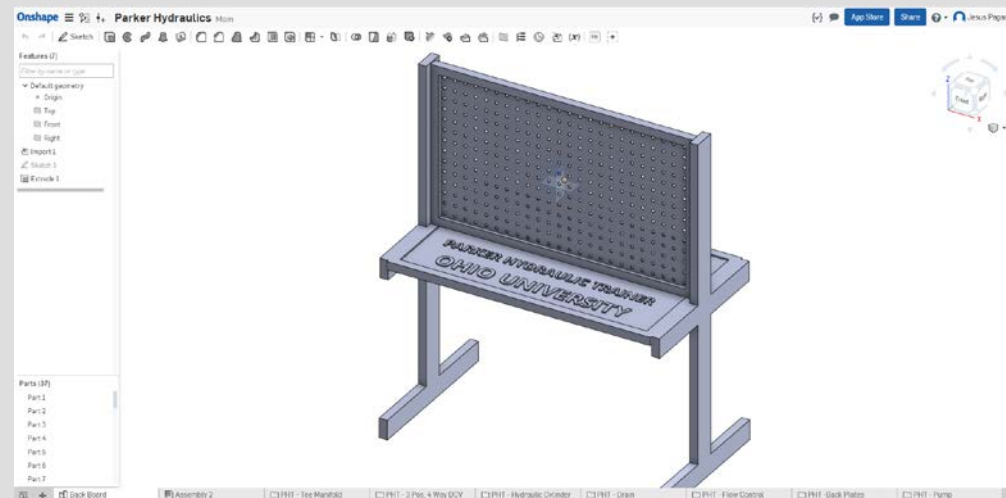
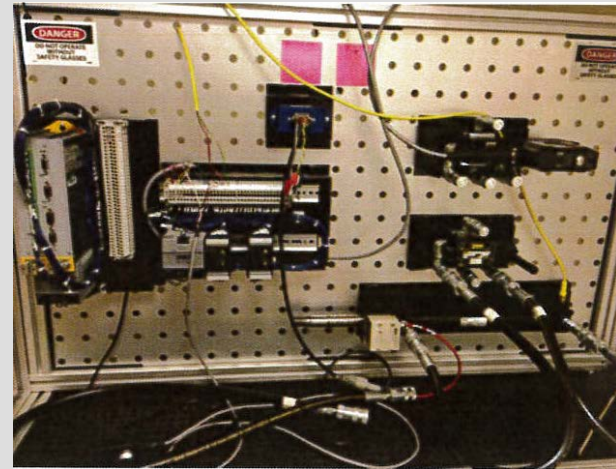
- ETM Department
 - ETM 3200 – Hydraulics and Pneumatics Course
 - 3 Credit Hours
 - Up to 40 Students
 - Lectures and Practical applications using the “Parker Hydraulic Trainer”



Purpose

Learn and Practice

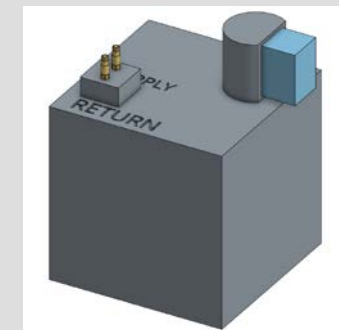
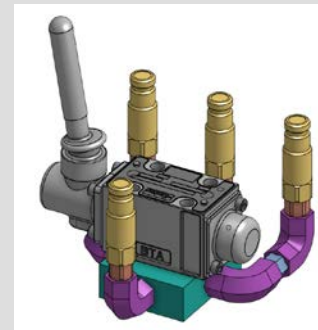
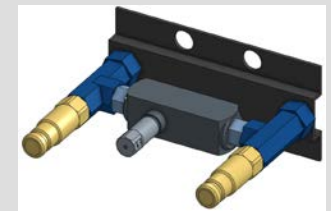
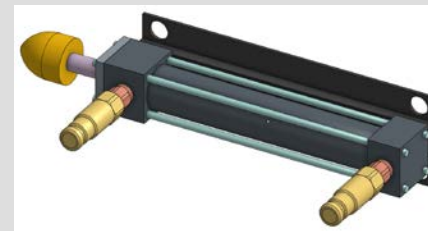
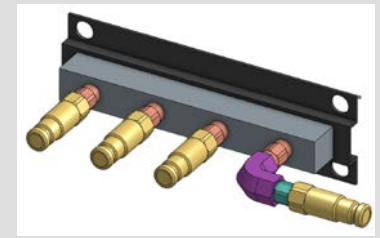
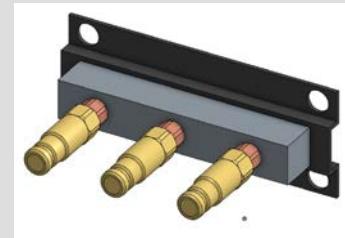
- Develop and implement interactive simulation modules that mimic the “Parker Hydraulic Trainer”
 - **Hydraulics** and **Pneumatics**
 - accessible from any location using a cloud-based system



Implementation

CAD design

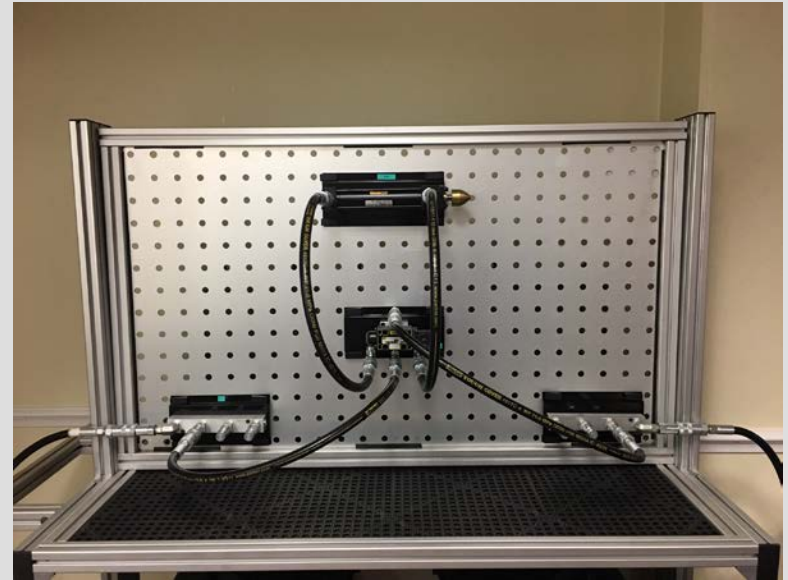
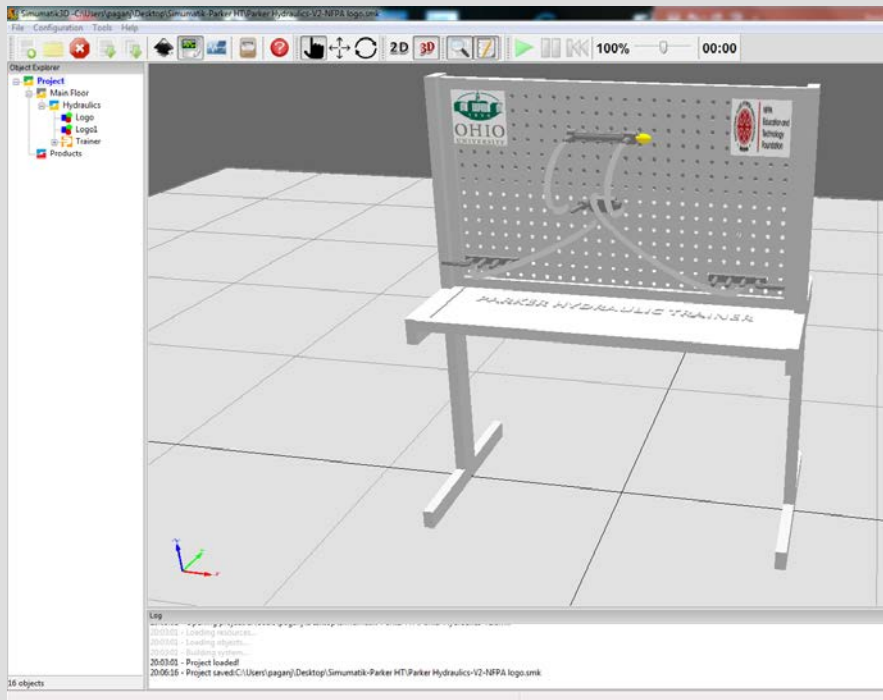
- Onshape (cloud-based CAD)
 - free Professional 3D CAD
 - Educational version
 - runs on Macs, PCs, Chromebooks and mobile devices (phones and tablets)
 - other tools/apps available



Implementation

Simulation/Emulation

- Simumatik3D Demo

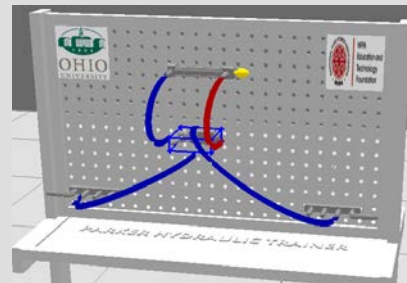
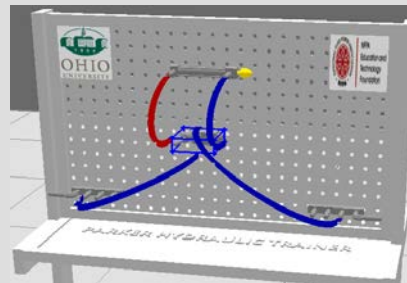
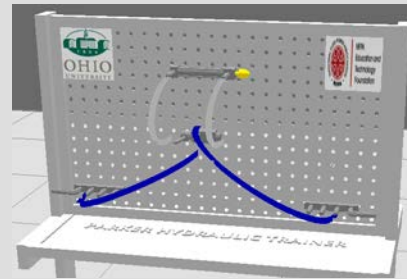


- Actual Lab Setup

Implementation

Simulation/Emulation

- Simumatik3D is a Virtual World where you can:
 - build real systems
 - interact using virtual HMI panels
 - test your PLC code
 - actuate pneumatics, hydraulics and electrical systems.



Object Explorer

- Project
 - Main Floor
 - Hydraulics
 - Logo
 - Logo1
 - Trainer
 - 3/4 Valve
 - Cylinder1
 - Drain
 - Pipe_1
 - Pipe_2
 - Pipe_3
 - Pipe_4
 - Pump

Color Coding

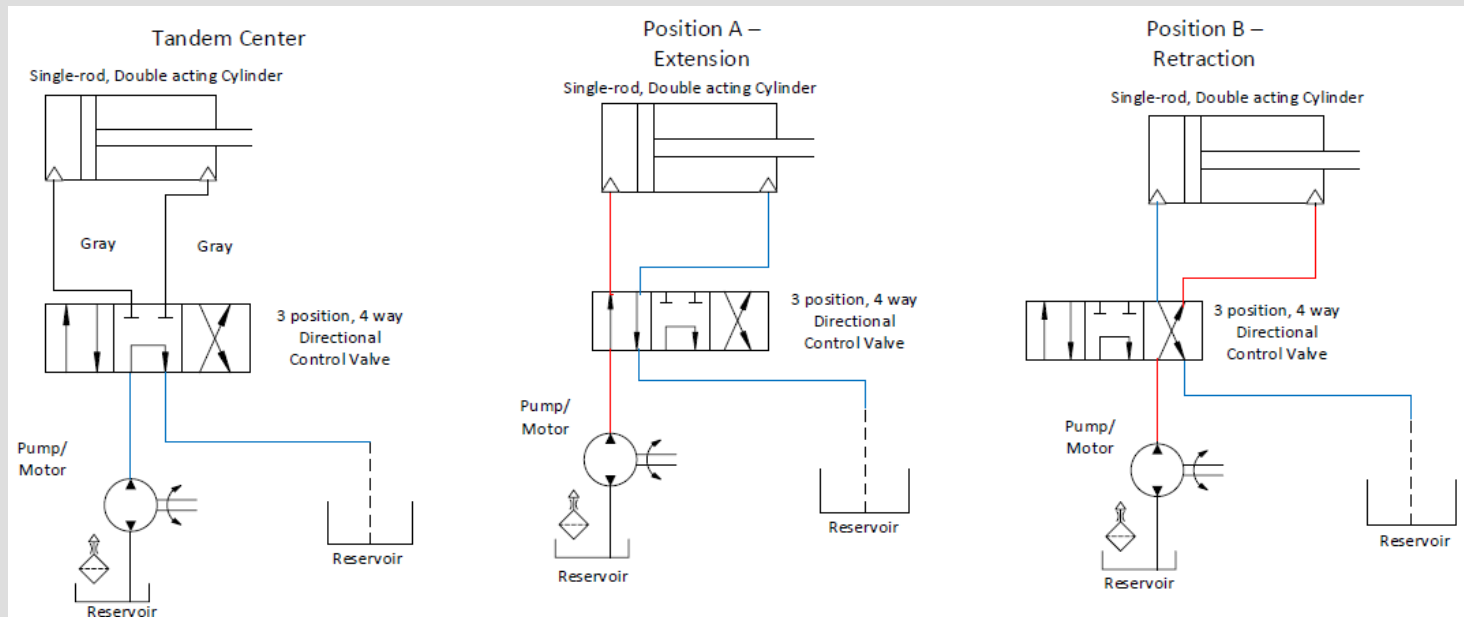
Pressurized fluid
Exhaust fluid
Supply fluid
Volume or flow controlled fluid
Fluid under reduced pressure or pilot fluid
Fluid drainage or leakage
Inactive fluid
Fluid under intense pressure

Implementation

Simulation/Emulation

Modules

1. **Basic Linear Circuit**
2. Regenerative Circuit
3. Pressure Controlled Sequence Circuit
4. Linear Circuit with Flow Control
5. Traverse and Feed Circuit



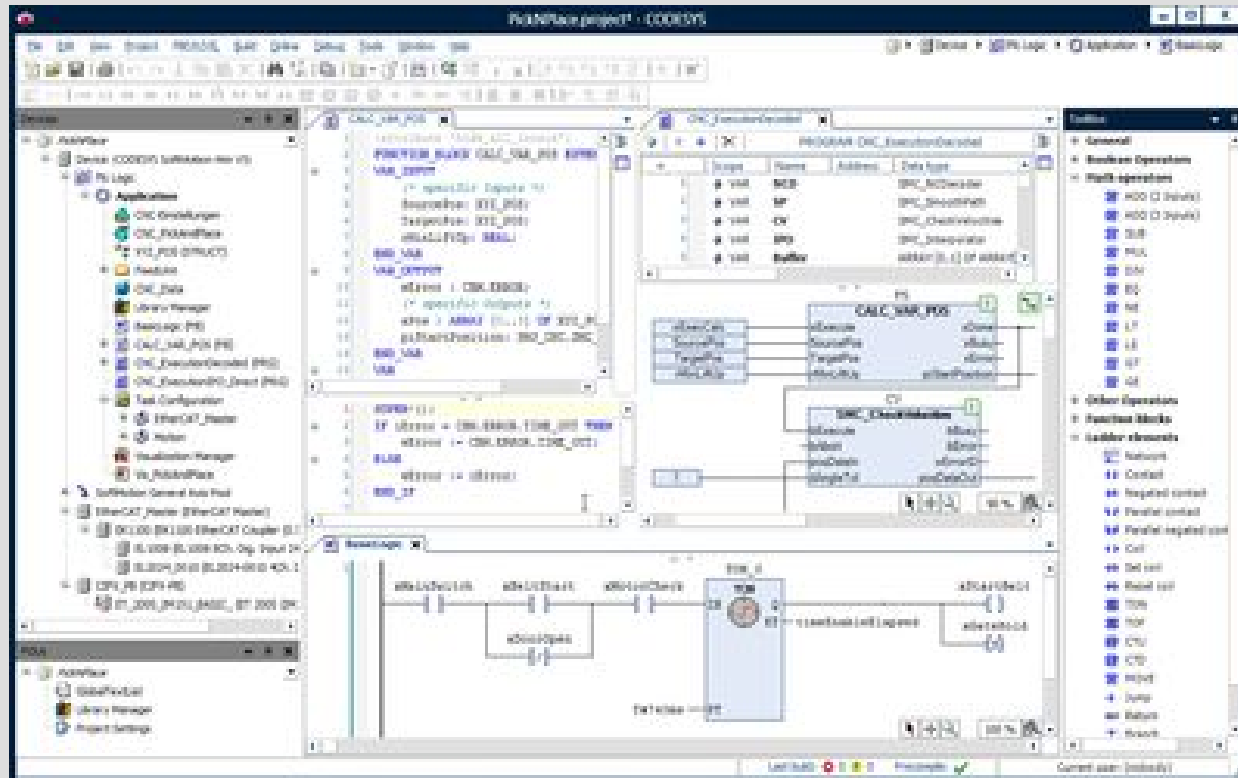
Demonstrations

- Onshape
- Simumatik3D

Future Work

CoDeSys

- Programmable Logic Controllers (PLC)
- IEC 61131-3
 - Classic PLC Programming
 - Object Oriented Programming
 - Easily integrates with Simumatik3D





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Thank You

Questions?