Using the 3D Experience Platform for your Project

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About Me

• Application Specialist at IIT for the 3D Experience Platform
• Started working with 3DX in 2019
• Work with students and faculty to learn software and conduct research
• Graduated IIT with Bachelor’s Degree in Mechanical Engineering
• Currently working toward my Master’s in Biomedical Engineering
• Out of office due to pandemic, email is best (I will respond within 1-2 business days)
3D Modeling

• Useful for
  • Prototyping
  • Creating intricate parts
  • Visualization
  • Creating engineering drawings

• A skill any engineer should have

• Can model anything from a block to a spaceship

• Often necessary for fabrication of parts
Simulation

- Useful for
  - Calibrating Experiments
  - Predicting Results
  - Comparing Variables
- Often requires 3D models
- Very important for Engineers
3D Modeling and Simulation in Biomedical Engineering

- Prosthetics
- Diagnosis of Diseases
- Studying cell and tissue
- Studying diseases
What is 3D Experience?

• Released by Dassault Systemes
• “A cloud based business experience platform.”
• Combines many different applications you may know
• Project management
• Spans life of the product, from initial prototypes to wide scale releases
• Collaboration tools
Who is Dassault Systemes?

• French Software company founded in 1981
• Began developing CAD software and released CATIA in 1982
• Focused in Aerospace and Mechanical Engineering
• Works with companies such as Boeing, NASA, General Dynamics
• Released 3D Experience in 2014, began focus in Life Sciences
• Learning Labs all over the world working on Projects with 3DX
3DX in BME at IIT

• IIT has been working with Dassault Systemes since 2017
• 3DX is used for education and research in BME
• Last year 3DX was introduced in 6 BME classes, more on the way
• 3DX is currently being used for a number of research projects
• Illinois Tech was just announced as the Learning Center in Life Sciences in July 2020
Capabilities

• 2D sketching
• Part Design
• Generative Shape Design
• FEA (Finite Element Analysis)
• CFD (Computational Fluid Dynamics)
• Electrical Systems
• Material Science
• Project Management in ENOVIA
• Chemical and Bioscience simulation in BIOVIA
Neural Prosthesis Simulation Validation

Implant-Tissue interaction (hard prosthesis inserted in soft brain tissue)

- **Main developer**
  - Nicolas Gallo, PhD Student, Dassault System Intern
  - Dylan Sokol, Application Specialist
  - Carlota Molhoek Baleri, Visiting Scholar
Research Example – Neural Prosthesis

• Goal: to determine the long term and short term wear and tear on a neural implant
• Single Electrode is inserted into gray matter of the brain and surrounded by CSF (cerebral spinal fluid)
• Simulation: Oscillating forces are applied and dynamic FEA analysis and creep analysis are performed
• Data is extracted to MATLAB for post processing
Brain Virtual Twin Validation of Novel Diagnostic Protocol

- **Principal investigator:** Dr. John Georgiadis, Chair of BME
- **Main developer**
  Nicolas Gallo, PhD Student, Dassault System Intern
  Dylan Sokol, Application Specialist
Research Example – Virtual MRE

• Goal: to develop a virtual MRE (magnetic resonance elastography)
• MRI ATLAS data of the Corpus Collosum imported into 3DX for simulation
• Oscillating displacement is applied to the Corpus Collosum and dynamic FEA analysis is performed
• Data is extracted to MATLAB for post processing
Research Example – Pulmonary Project

• Goal: to model ventilation on the lung and develop a virtual twin to better communicate between the ventilator and the medical professional
• Developed in partnership with the Paris Dassault Learning Hub
Research Example – COVID-19 Adhesion

• PI: John Georgiadis
• Goal: to better understand the adhesive properties of COVID-19, specifically on human tissue
• Viral particle modeled as “spiky ball”
• MATLAB code generates Brownian Motion path of the particle
• Interaction between the particle and the cell modeled as a non linear spring
• Next stage: model the macro scale
A Cloud Based Platform

• 3D Experience is a cloud based platform, meaning all of your data is saved to the cloud instead of on your computer
• Simulations are done locally, results are saved to the cloud
• Takes up less storage on your computer
• Can access from anywhere
• Allows for easier collaboration
Web Browser App

• Can be accessed from any browser on any machine (Windows, MAC, chromebook, phone or tablet, etc)
• Allows access to collaboration and project management tools
• Basic 3D Modeling & simulation (FEA)
Client App

- Requires Windows OS and decent graphics card
- More complex modeling and simulation
- Full access to 3DX tools
Getting Started

• All enrolled BME students as of 8/24/2020 have been invited to the platform
• Must accept invitation to the IIT platform ASAP or you will not have access
• Must accept invitation to the ALWAYS ON Platform ASAP
• Log in to make sure you have access
• As long as you have accepted BOTH invitations, you will be set to use the platform (takes 5-10 mins)
• Email me at dsokol1@iit.edu with any questions
At First Glance

• Compass: holds all your apps
• Roles: allows access to certain apps
• Apps: applications included with your package. Either web app or client app
  • Mac/chromebook/tablet etc users will only see web apps
• Dashboard: basically a home page for your class/group to collaborate in
Mini Modules

• Activities designed for learning how to use the software
• Vary from 1-4 hours depending on experience with 3D modeling
• Usually include an instructional video and detailed protocol to follow
• Usually end with the submission of a deliverable e.g. a 3D file
**xDesign – Online CATIA and SOLIDWORKS**

- xDesign is a web application for 3D modeling and some basic FEA analysis
- Can be used on any OS e.g. Windows, Mac, Chromebook, tablet, etc.
- Does not require any downloading or installation
Electronic Notebook

• Uses web app “Bookmark Editor”
• Traditional File system with folders called “Bookmarks”
• Each team will have their own electronic notebook with bookmarks to organize (see right image)
End