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# Introduction to CAD

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What Do Those Letters Mean to  
You?

This lecture originally from Michael Young, Michigan Technological University

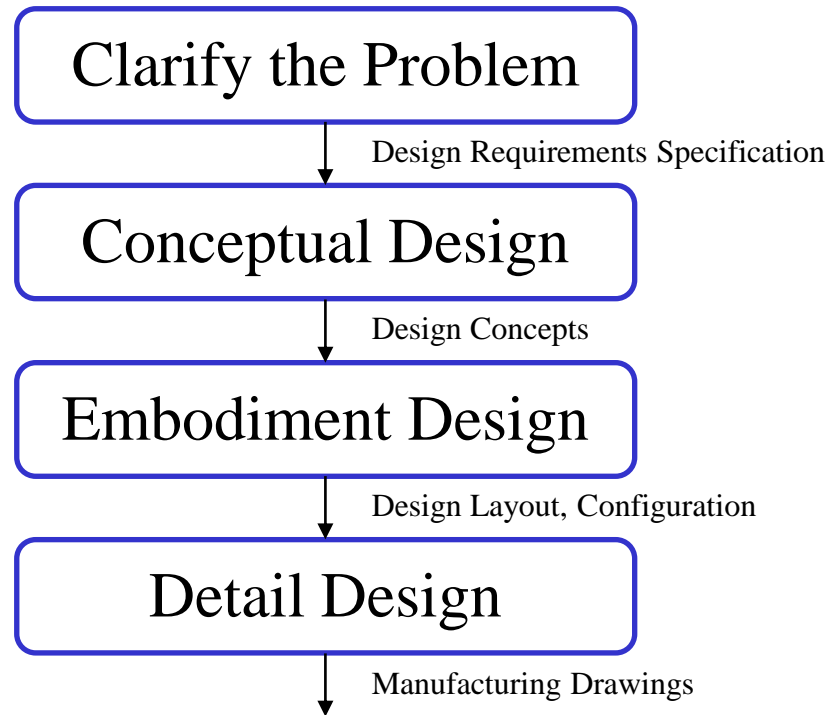
# Painting “The Big Picture”

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- What is Computer-Aided Design (CAD)?
  - Creating drawings on a computer
  - Creating 3D shapes on a computer
  - Visualization
    - Checking how things fit together to make sure they don't interfere
    - Checking how product will look to the customer
  - Doing simulations
    - Animation
    - Dynamics
    - Structural Analysis
    - Fluid Flow
    - Heat Transfer

# The Design Process

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- What is Computer-Aided Design (CAD)?

Using computers to help execute the design process.

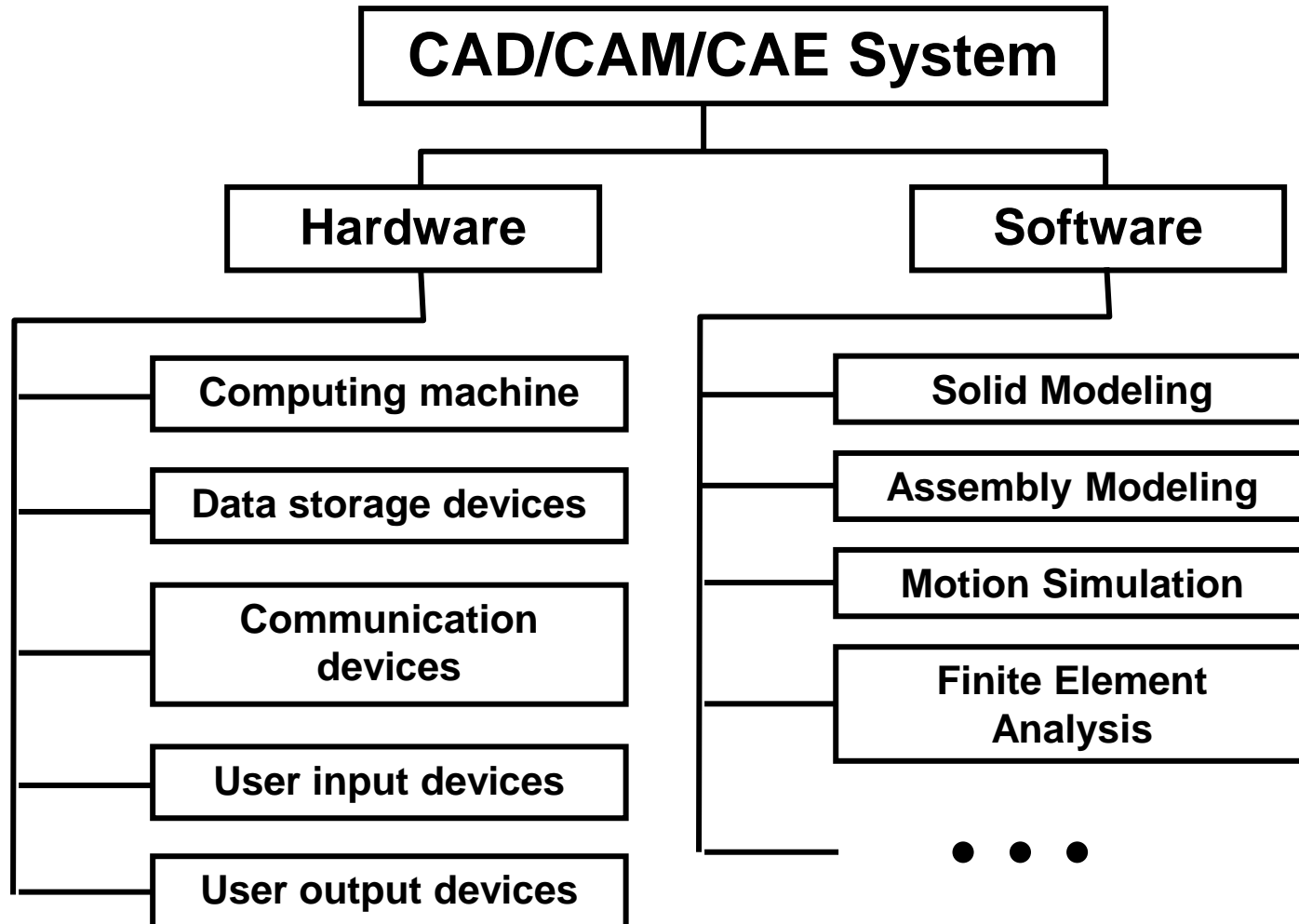
# More Specific Definitions

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- *Computer-Aided Design (CAD)* is the technology concerned with the use of computer systems to assist in the creation, modification, analysis, and optimization of a design. [Groover and Zimmers, 1984]
- *Computer-Aided Manufacturing (CAM)* is the technology concerned with the use of computer systems to plan, manage, and control manufacturing operations.
- *Computer-Aided Engineering (CAE)* is the technology concerned with the use of computer systems to analyze CAD geometry, allowing the designer to simulate and study how the product will behave.

# Components of CAD Systems

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# Components of CAD Systems

- Input Devices



Image from YouTube



Image from DesignerTechniques.com – Allan Macdonald



Image from Mitutoyo (UK) Ltd



Image from FARO

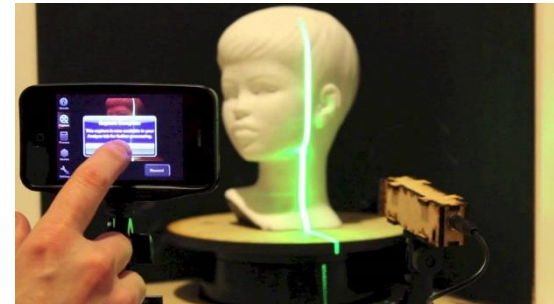


Image from YouTube

# Components of CAD Systems

- Output Devices



Image from Interworld Electronics & Computer Industries Inc.



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Image from 3D Printing Geeks

# Components of CAD Systems

- Integrated Input/Output Devices – Virtual Reality



Image from IGI | Blog



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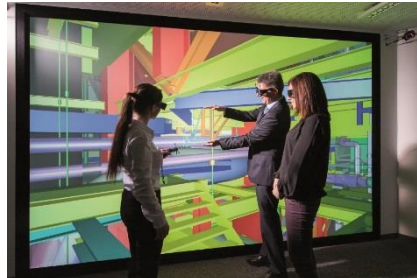


Image from Engineering.com

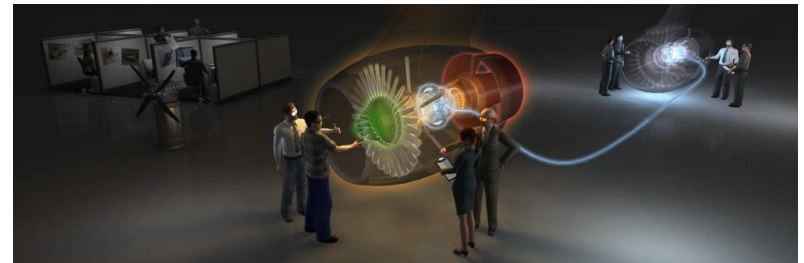


Image from Engineering.com



# Components of CAD Systems

- Integrated Input/Output Devices – Virtual Reality



Image from Thomas Publishing Company

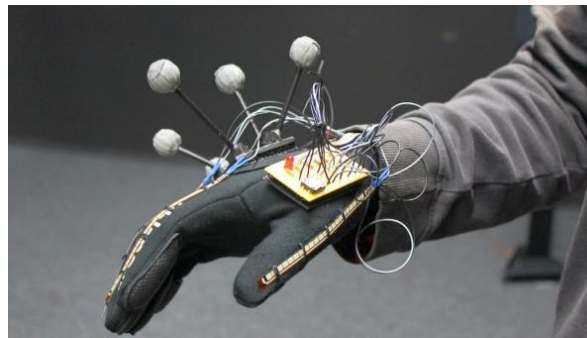


Image from AtCrux



Image from [www.middlevr.com](http://www.middlevr.com)



Image from Tech Times



Image from Geomagic



Image from IndiaMART InterMESH Ltd.



Image from Thomas Hulin

# SolidWorks versus other CAD software

	Drafting	Parametric Solid/Ass. Modeling	Integrated Simulation	Integrated Manufacturing	Very large models	More flexible /sophisticated
Siemens PLM NX Catia	●	●	●	●	●	●
Creo	●	●	●	●	●	
SolidWorks Autodesk Inventor Solid Edge Autodesk Fusion 360		●	●	●		
AutoCAD	●					

# SolidWorks vs. Autodesk Inventor vs. Solid Edge

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- Programs are similar but not equivalent:
  - Same class of software
  - Same types of tools available
  - Same general techniques used in each
  - Specific buttons, menus and input sequences different
  - Customer lists different
- Today vs. tomorrow
  - User interfaces will change
  - Fundamentals will stay the same

# Course Goals

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- Basic and Advanced Shape Modeling
- Parametric Modeling
- Working in Teams
- Advanced Top-Down Design Methodology
- Use of Solid Models for Downstream Applications
  - Design Documentation
  - Mechanism Analysis
  - Finite Element Analysis/Shape Optimization
  - Computer-Aided Manufacturing

# Course Expectations

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- Learning through doing (hands-on learning)
- Learning by studying theory
- Benefits from course
  - How to model products well, using state of the art CAD software
  - Understanding how computer is leveraged in design process