

Computer Aided Geometric Design

Introduction

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PDPM
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY,
DESIGN AND MANUFACTURING JABALPUR
(An Institute of National Importance (INI) established by MHRD, Govt. of INDIA)

Introduction:

Objective, scope, overview, CAD software,
Mathematical background, applications

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COMPUTER AIDED DESIGN

What is design?

An act of working out the form of some thing by making sketch or outline or plan.
An act of converting functional requirements into products.

Examples:
Greeting cards, web-page, highway, gear box etc.

What is Computer Aided Design?

Use of Computer system to assist in creation, modification, analysis and optimization of designs.

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Geometric Modeling

- Geometric modeling refers to computer compatible mathematical representation of geometry. It deals with representation of curves, surfaces and solids.
- Geometric modeling is the basis for creation, representation, manipulation and storage of designs in today's CAD system.
- Geometric model also forms the basis for integrating design with other life-cycle activities such as manufacturing.

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CAD/CAM

- CAD/CAM refers to use of Computers to assist design and manufacturing activities when they are performed in an integrated manner and not as islands of automation.
- Benefits of integration are many fold compared to use of computers in a non-integrated manner.

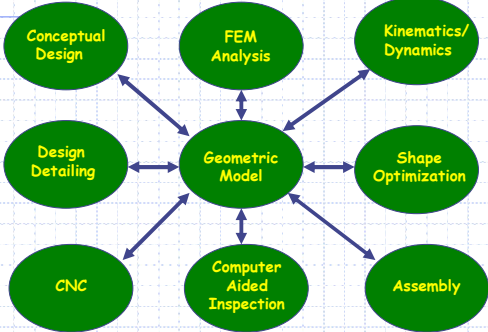
CAD/CAM > CAD + CAM

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Integration of Design & Manufacturing



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Benefits of Design-Manufacturing Integration

Time of Design Change	Cost
During Design	x
During Design Testing	10x
During Process Planning	100x
During Test Production	1000x
During Final Production	10000x

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Integration of Design & Manufacturing

- Geometric model driven integration has limitations.
- Tighter integration of Design and Manufacturing activities is possible if information exchange goes beyond geometry.

Geometric Model

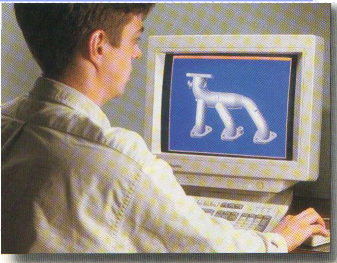
Product Model

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Integration of Design-Manufacturing



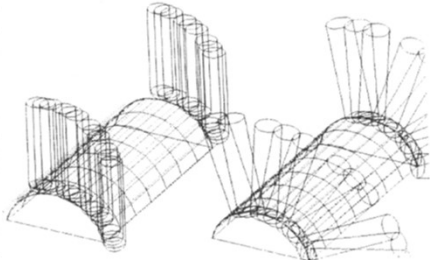
How much this is going to cost ?

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CAD to CAM



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Rotary table attachment

(Courtesy of Fadal Machine)

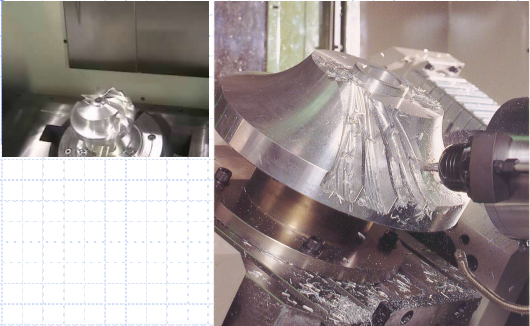


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Five Axis Machining



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Programming Languages

- ◆ C
- ◆ C++
- ◆ C#
- ◆ Java
- ◆ MATLAB
- ◆ Python
- ◆ Delnet
- ◆ Visual Basic
- ◆ AutoLISP

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CAD/CAM/CAE Software

- ◆ AutoCAD, ZW CAD
- ◆ ProEngineer, Catia, SolidWorks
- ◆ Unigraphics, Nastran, Ansys, Deform, Abacus, Dynaform
- ◆ WorkSpace
- ◆ EdgeCAM, MasterCAM, DelCAM
- ◆ PolyWorks

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Computational Geometry

Mathematical background

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Application areas

- ◆ Area of irregular polygon
- ◆ Containment problems
- ◆ Visibility problems
- ◆ Path planning
- ◆ Boolean operations

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Programming assignments

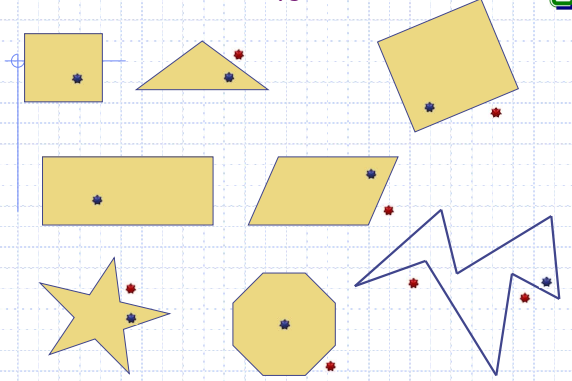
1. Status of Point in the Polygon
2. Calculating Area of a irregular Polygon
3. Finding Convex or Concave Polygon
4. Calculating Intersection of Polygon with a Plane
5. Performing Boolean Operation on two Polygons
6. Generate higher order polygons
7. Voronoi diagrams
8. Writing STL files

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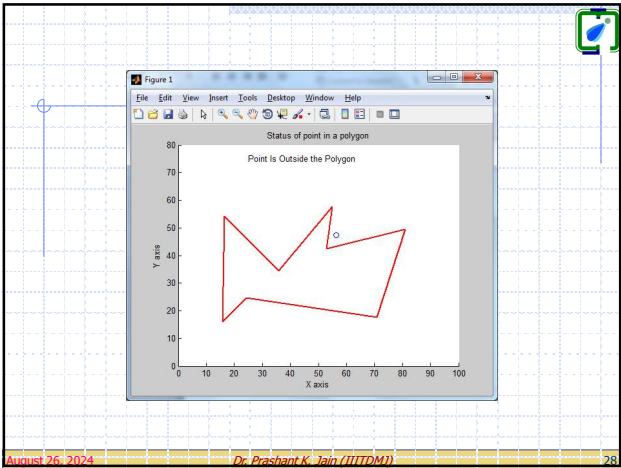
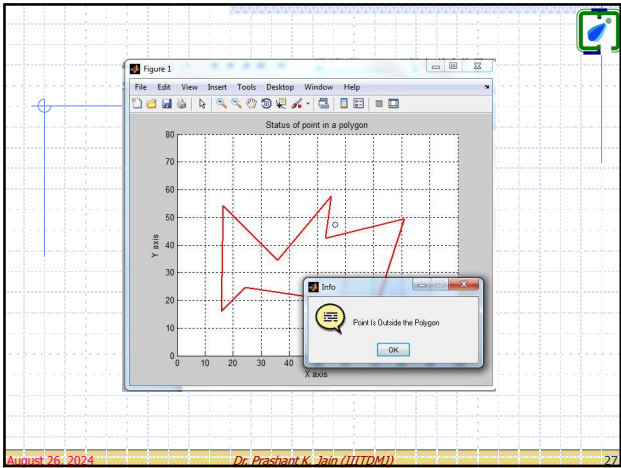
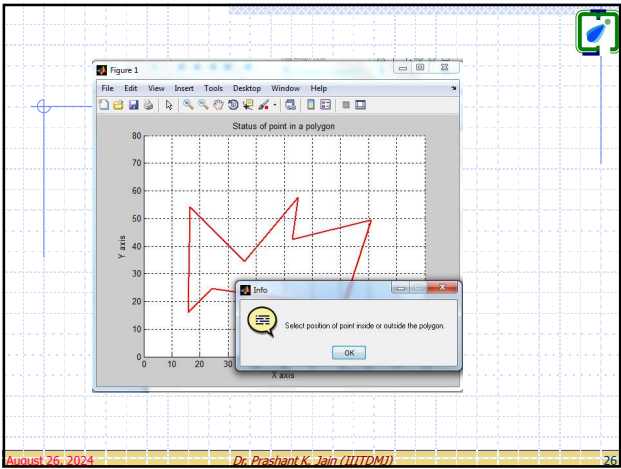
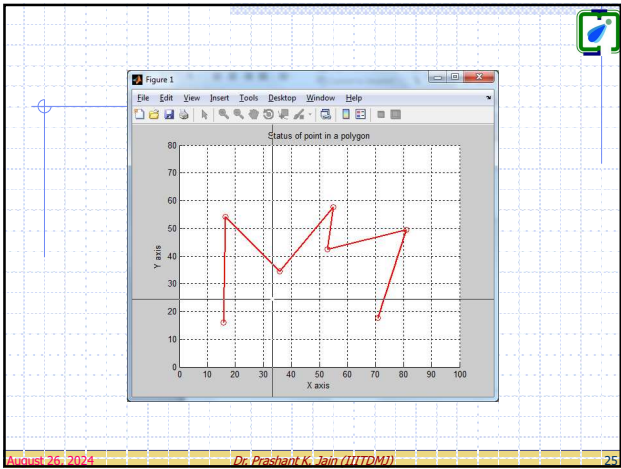
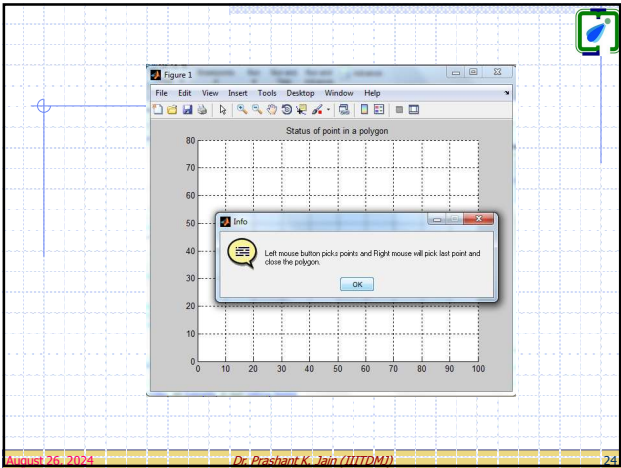
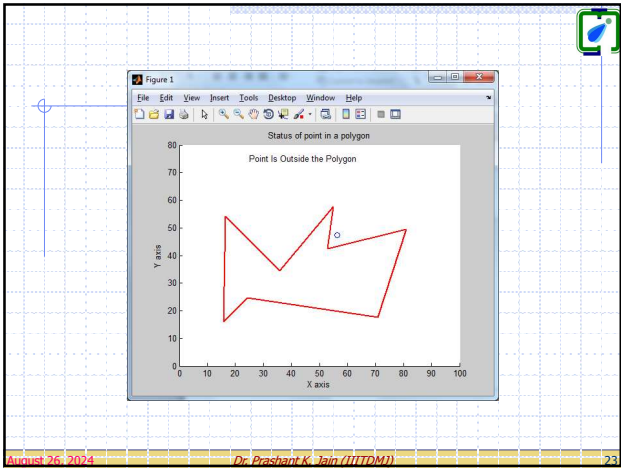
Status of Point in the Polygon



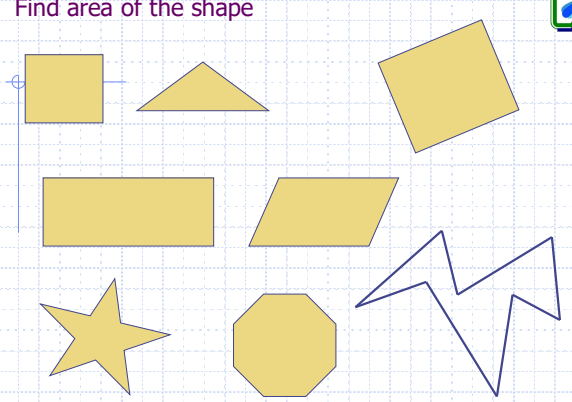
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Find area of the shape

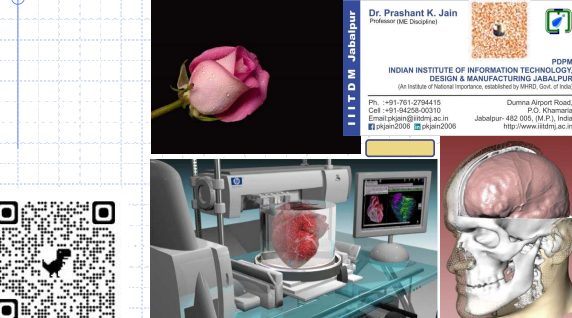


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THANK YOU



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