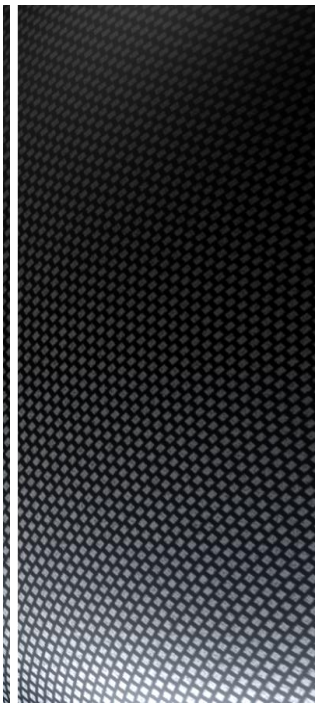
Automation (21-541)

Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session # 9

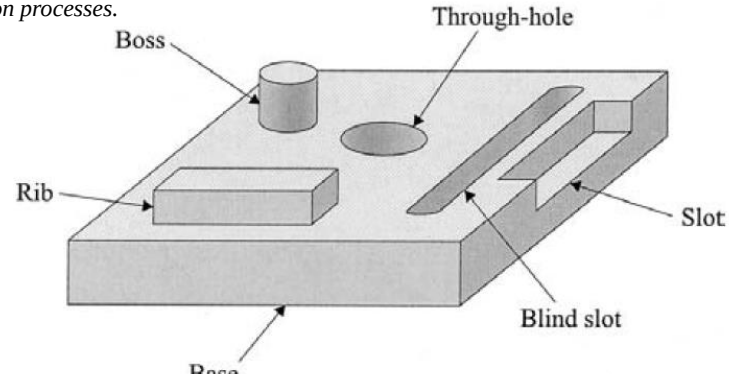


Session Schedule

- *Computer-Aided Design (CAD)*
  - *Geometric modeling*
    - *Geometric modeling techniques*
    - *Geometric data exchange*

Computer-Aided Design (CAD)

- *Geometric modeling :*
  - *Feature-Based Design*
    - *Features can be seen as specific geometric shapes on a part that can be associated with certain fabrication processes.*



Computer-Aided Design (CAD)

- *Geometric modeling :*
  - *Feature-Based Design*
    - *The objective of design by features is :*
      - *To increase the efficiency of the designer during the geometric-modeling phase*
      - *To provide a bridge (mapping) to engineering-analysis and process-planning phases of product development.*

Computer-Aided Design (CAD)

- *Geometric modeling :*
  - *Feature-Based Design*
    - *Form features can be individually modeled by*
      - *The user explicitly using a B-Rep modeler yielding unambiguous topological relationship information*
      - *Implicitly using a CSG modeler yielding a tree representation of corresponding primitives and Boolean operators.*

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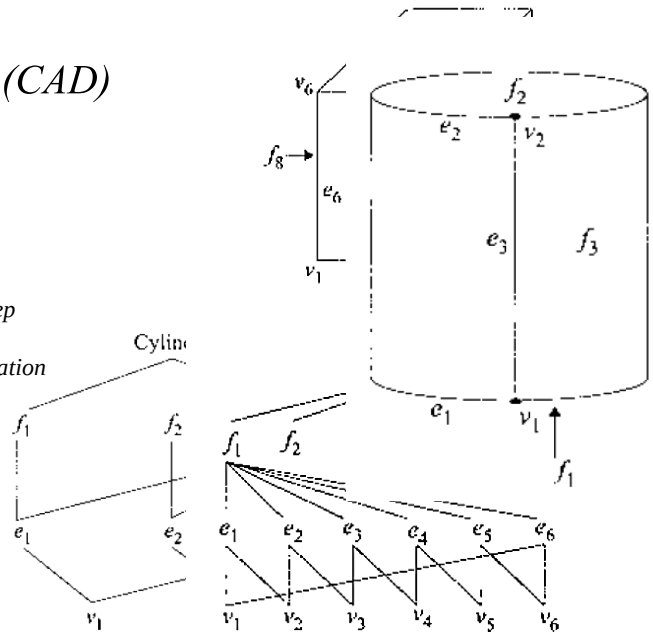

Computer-Aided Design (CAD)

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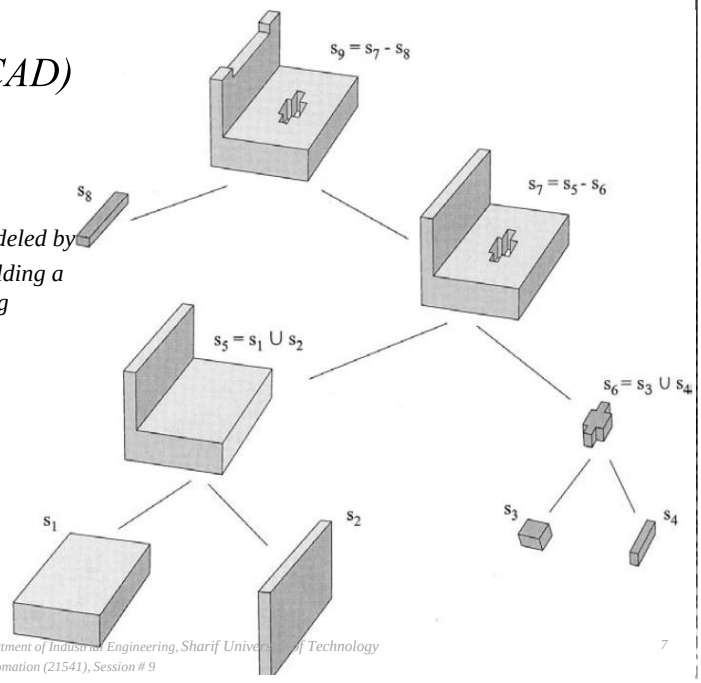
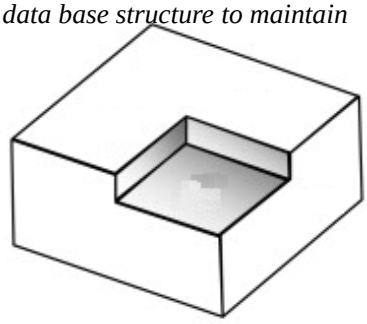


Homework : AT:G:05:#

- *Extend the simple program of HW4 for interpreting simple Features.*
  - *Consider the following simple shape. You should use your CIM data base structure to maintain the geometric data.*
  - *Provide simple structures to maintain the vertex, edge, loop and faces.*
  - *Provide a simple algorithm to recognize the step in the shape as*

  A design feature.



- *The HW should be sent to Fvalilai@Sharif.edu till Sunday, 2nd of Azar (Nov, 23rd ,2014)*
- *Email subject: "AT:G:05:#"*

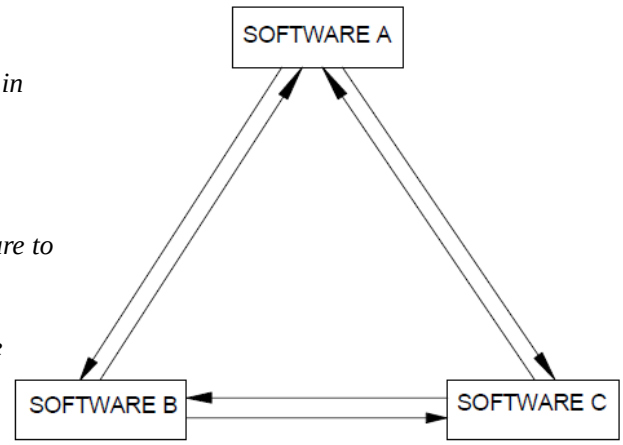
Computer-Aided Design (CAD)

- *Geometric data exchange*
  - *The heart of any CAD model is the component database.*

  This includes
  - *The graphics entities like points, lines, arcs, circles etc. and the co-ordinate points, which define the location of these entities.*
  - *This geometric data is used in all downstream applications of CAD, which include*
    - *Finite element modeling and analysis,*
    - *Process planning,*
    - *Estimation,*
    - *CNC programming,*
    - *Robot programming,*
    - *Programming of co-ordinate measuring machines,*
    - *ERP system programming and simulation.*

Computer-Aided Design (CAD)

- *Geometric data exchange*
  - *Necessity to translate drawings created in one drafting package to another often arises.*
  - *Moreover, it may also be necessary to transfer geometric data from one software to another.*
  - *One method to meet this need is to write direct translators from one software to another. This means that each system developer will have to produce its own translators.*



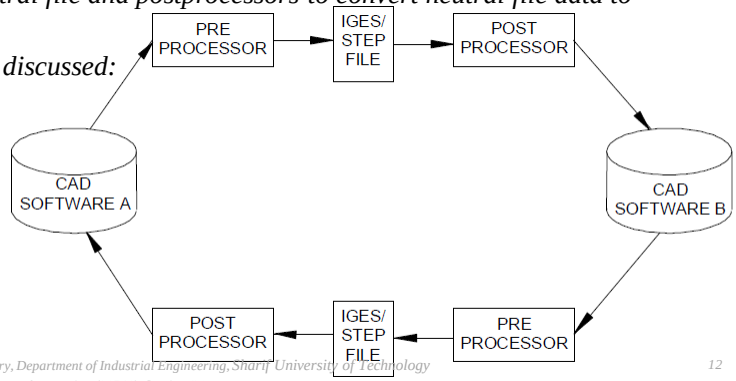
Homework : AT:G:06:#

- *In this HW you will try the direct translation of geometric data related to HW8*
  - *We consider the following chain for providing the geometric data translation:*
  - *Group1 → Group 2 → Group 3 → ... → Group 5 → Group 6 → .... → Group n*

- *The HW should be sent to Fvalilaisharif.edu till Sunday, 9th of Azar (Nov, 30th ,2014)*
- *Email subject: "AT:G:06:#"*

Computer-Aided Design (CAD)

- *Geometric data exchange*
  - *A solution to the problem of direct translators is to use neutral files.*
  - *These neutral files will have standard formats and software packages can have pre-processors to convert drawing data to neutral file and postprocessors to convert neutral file data to drawing file.*
  - *Three types of neutral files are discussed:*
    - *Drawing exchange files (DXF)*
    - *IGES files*
    - *STEP files*



Computer-Aided Design (CAD)

- *Geometric data exchange*
  - *Drawing exchange files/formats (DXF)*

  is a CAD data file format developed by Autodesk for enabling data interoperability between AutoCAD and other programs.

  - *The basic organization of a DXF file is as follows:*
    - *HEADER section*
    - *CLASSES section*
    - *TABLES section*
    - *BLOCK section*
    - *ENTITIES section*
    - *OBJECTS section*
    - *THUMBNAILIMAGE section*
    - *END OF FILE*

```
0
SECTION
2
HEADER
9
.
.
.
.
AcDbEntity
8
0
100
AcDbLine
10
.
.
.
.
LINE
5
12D
.
.
.
.
.
ENDSEC
0
EOF
```


Computer-Aided Design (CAD)

- *Geometric data exchange*
  - *Drawing exchange files/formats (DXF) structures:*

    - *HEADER section – General information about the drawing. Each parameter has a variable name and an associated value.*

    - *CLASSES section – Holds the information for application-defined classes whose instances appear in the BLOCKS, ENTITIES, and OBJECTS sections of the database.*

    ✖ *Generally does not provide sufficient information to allow interoperability with other programs.*

Computer-Aided Design (CAD)

- *Geometric data exchange*
  - *Drawing exchange files/formats (DXF) structures:*
    - *TABLES section – This section contains definitions of named items.*
      - *Application ID (APPID) table*
      - *Block Record (BLOCK_RECORD) table*
      - *Dimension Style (DIMSTYPE) table*
      - *Layer (LAYER) table*
      - *Linetype (LTYPE) table*
      - *Text style (STYLE) table*
      - *User Coordinate System (UCS) table*
      - *View (VIEW) table*
      - *Viewport configuration (VPORT) table*

Computer-Aided Design (CAD)

- *Geometric data exchange*
  - *Drawing exchange files/formats (DXF) structures:*
    - *BLOCKS section – This section contains Block Definition entities describing the entities comprising each Block in the drawing.*
    - *ENTITIES section – This section contains the drawing entities, including any Block References.*
    - *OBJECTS section – Contains the data that apply to nongraphical objects, used by AutoLISP and ObjectARX applications.*
    - *THUMBNAILIMAGE section – Contains the preview image for the DXF file.*