Assembly Modeling
• Many modelers have been used to create models of single components.
• Previous design procedure was to assemble the actual components or prototype later in the design cycle.
• Physical distance between design teams in global corporations and the need for electronic transfer fueled the need for computer-based assemblies.

Assembly Modeling
• Automotive and aerospace industries among the first to make extensive used of assembly modeling.

Assembly Modeling
• Provides a logical structure for grouping and organizing components into assemblies.
• Structure permits:
  – identification of components
  – control of associated data (e.g. BOM)
  – control of relationships between components and sub-assemblies

Assembly Modeling
• Most assembly modelers work by creating a file which includes only:
  – pointers to the individual components used
  – the constraints used to position the components with respect to one another
  – multiply occurrences of the same component are handled by instancing

Assembly Modeling
• Relationship data includes
  – Constraint information
    • orientation and location of components with respect to one another
    • variational relationship between features of different parts
  – Instancing information
    • multiple occurrences of the same component
  – Tolerance and fit information
    • part interference and clearance

Assembly Modeling
• Inter-part dimensions provide control when an assembly depends upon key dimensions (e.g. hole patterns)
• Provides a mechanism for propagating a design change throughout all components of an assembly without modifying each component individually.
Assembly Model Uses

- Creation of orthographic assembly drawings.
- Creation of exploded assemblies.
- Facilitate packaging
- Perform interference and clearance checks.

Assembly Modeling

- Most modern feature-based, constraint-based systems have assembly capabilities.
- In addition to the Sketcher, Constraint Engine and Feature Manager, they include an Assembly Manager.

Assembly manager

- Permits creation of:
  - sub-assemblies from parts
  - assemblies from sub-assemblies and parts
- Controls relative placement of parts/sub-assemblies (constraints)
- Controls regeneration of assemblies/subassemblies after modification

Part/sub-assembly placement

- Examples of constraints applied to assemble components
  - alignment
    - surfaces, axes
    - with offset distances
  - mating
    - surfaces, edges
  - coincidence
    - points, edges

Simplified Representation

- Large assembly models can seriously stain the processor capabilities of the hardware system being used.
- In these cases, many assembly modelers provide means for simplifying the assembly.
- The use of instancing helps reduce complexity.

Simplified Representation

- Another technique used is aggregation.
  - Grouping components and sub-assemblies into a single static definition.
- Many systems also support the use of simplified representations.
  - complexities such as fillets/rounds removed
  - representation may simply be the "envelope" of the part with mating features.