Constructive Solid Geometry, CSG

CSG defines a model in terms of combining basic and generated (using extrusion and sweeping operation) solid shapes.

Objects are represented as a combination of simpler solid objects (primitives).

CSG uses Boolean operations to construct a model.

There are three basic Boolean operations:

**Union (Unite, join)** - the operation combines two volumes included in the different solids into a single solid.

**Subtract (cut)** - the operation subtracts the volume of one solid from the other solid object.

**Intersection** - the operation keeps only the volume common to both solids.
Lecture No 36 Topic: Boolean Operations

Subtract

Union

Intersection
Data structure does not define model shape explicitly but rather implies the geometric shape through a procedural description. E.g: object is not defined as a set of edges & faces but by the instruction: union primitive1 with primitive 2.

This procedural data is stored in a data structure referred to as a CSG tree. The data structure is simple and stores compact data easy to manage.
CSG Tree

- CSG tree
- stores the history of applying boolean operations on the primitives.
- Stores in a binary tree format
- The outer leaf nodes of tree represent the primitives
- The interior nodes represent the boolean operations performed.
More than one procedure (and hence database) can be used to arrive at the same geometry.