Lecture 3

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Spring 2003

# COMPUTER MODELING

1 Design – Problem Setting & Problem Solving

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1 Design – Problem Setting & Problem Solving

2 Drawings as Means of Communication

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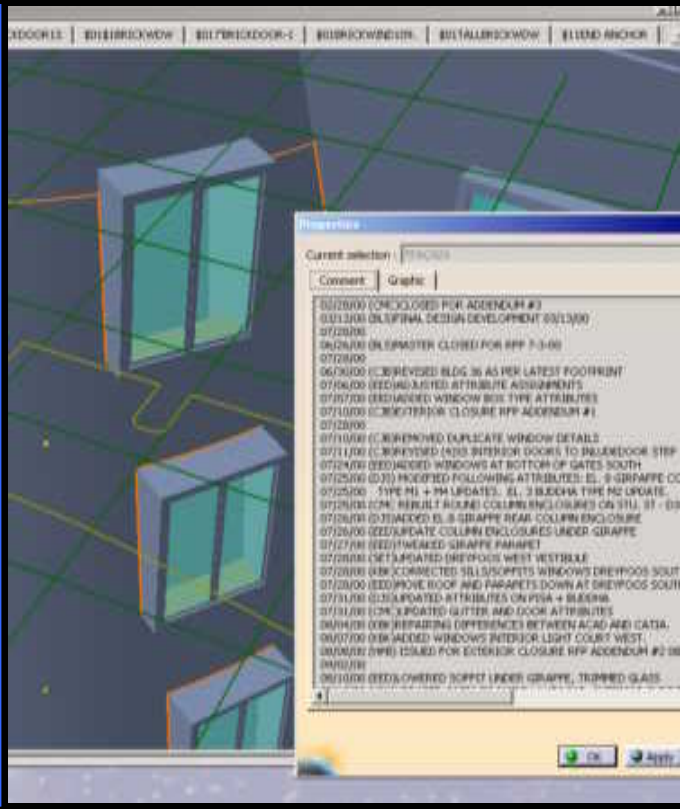
1 Design – Problem Setting & Problem Solving

2 Drawings as Means of Communication

3 Models as a source of Information



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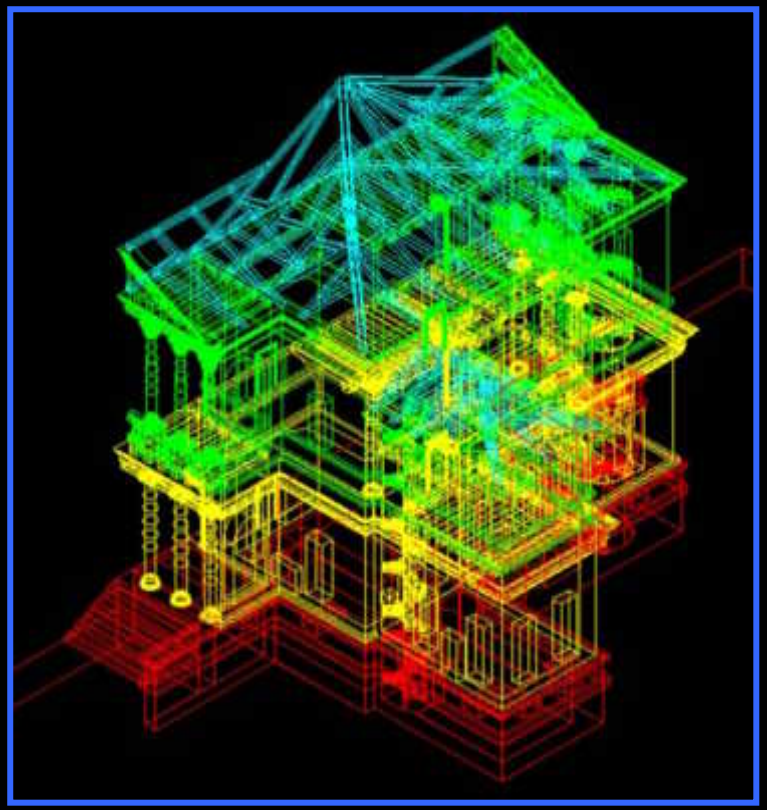
## Computer Models

1 Philosophy of Computer Modeling

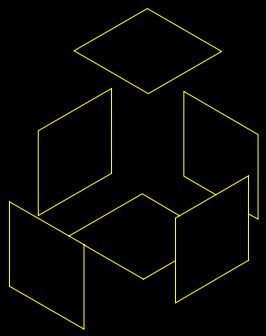
2 Operation Translations, and Objects

3 Elements of Modeling

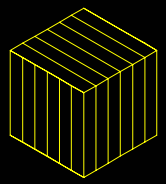
4 Complex Modeling



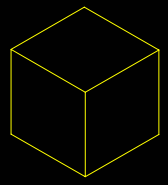
Model
Representations



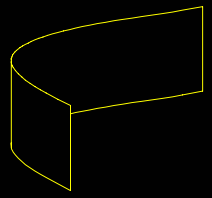
Surface Models



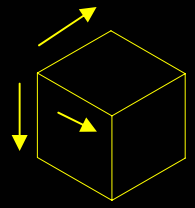
Ruled Surface



Solid Modeling

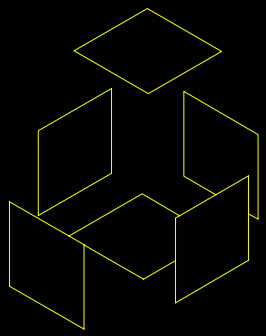


NURB Surface Modeling

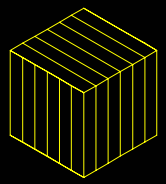


Parametric Modeling

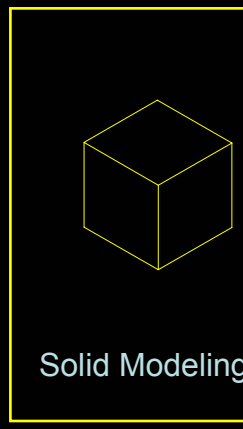
Model
Representations



Surface Models



Ruled Surface



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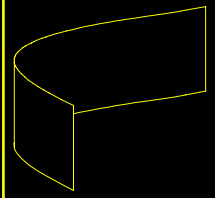
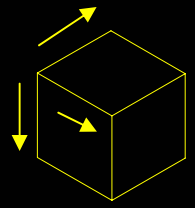
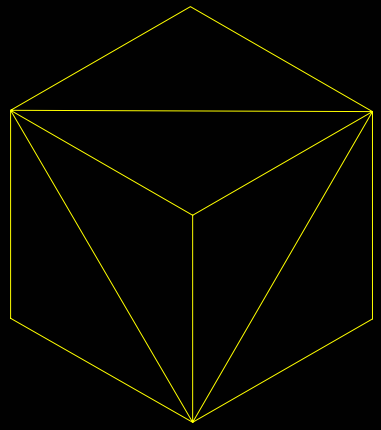


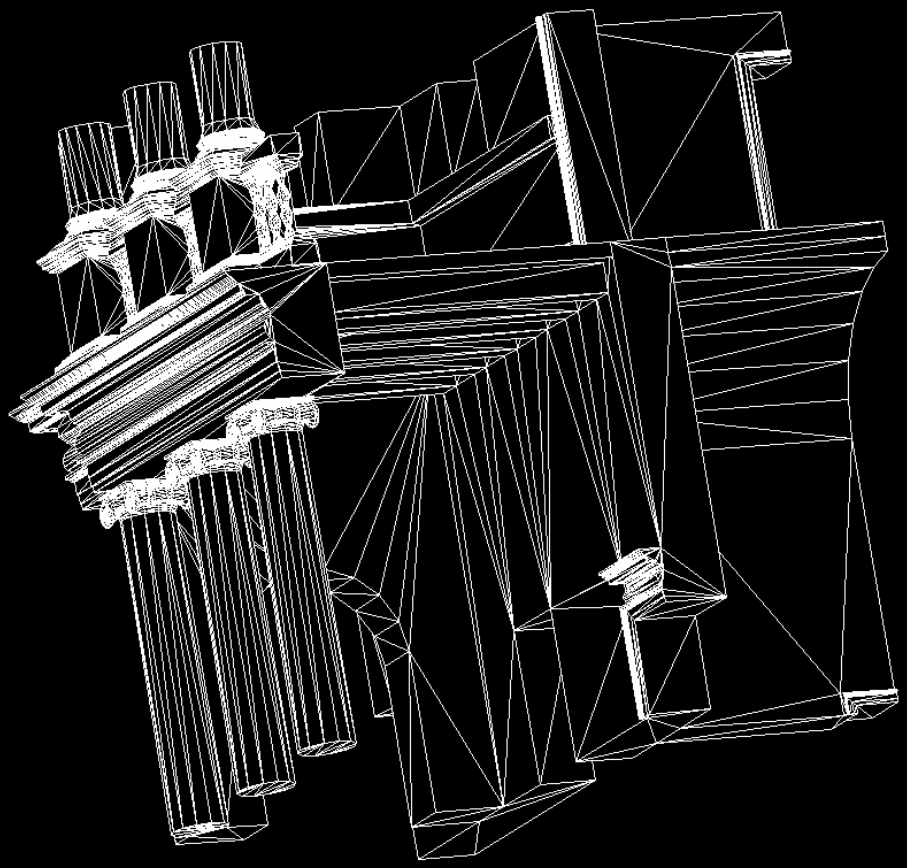
NURB Surface
Modeling

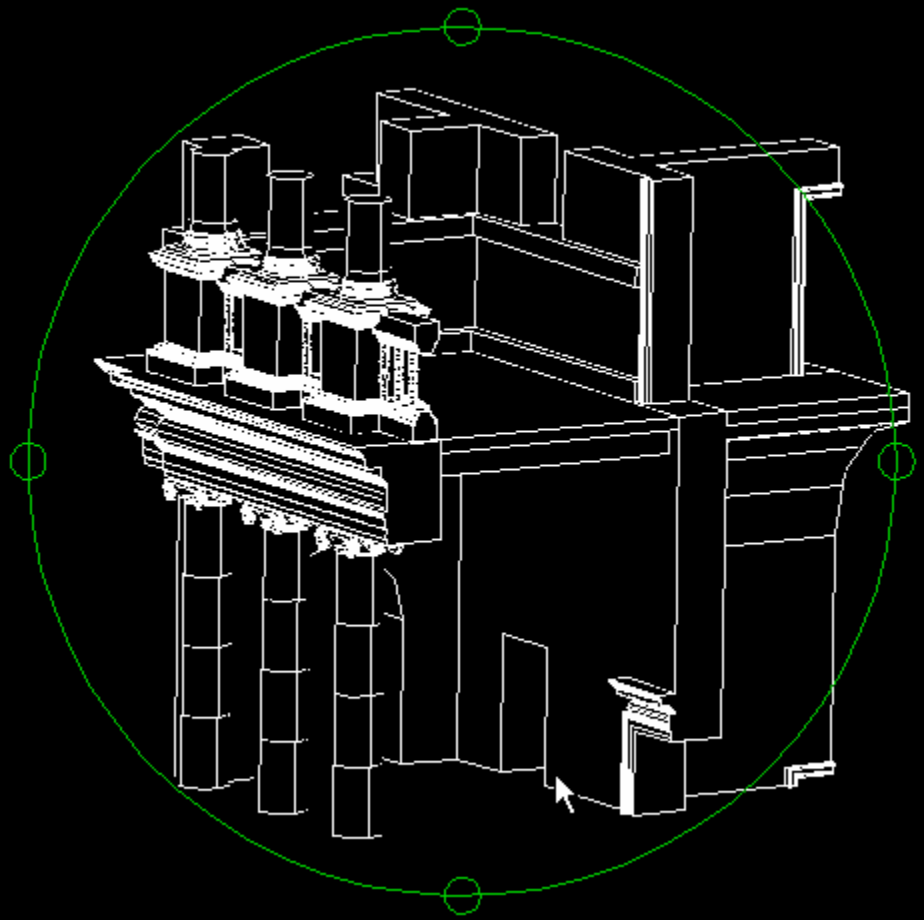


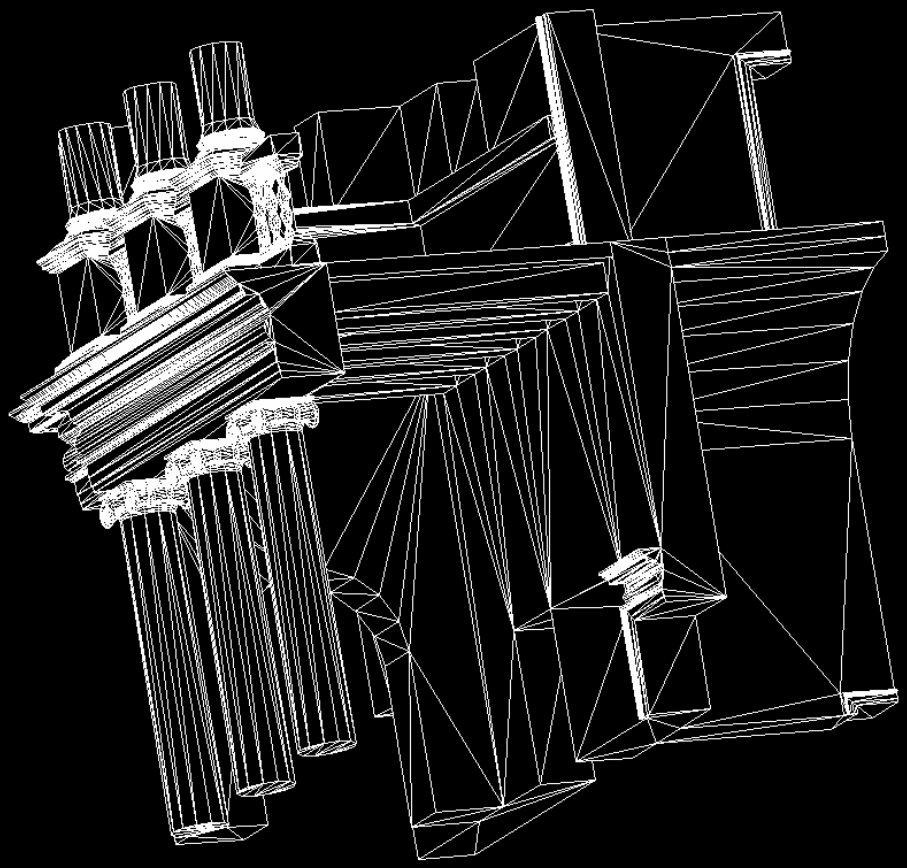
Parametric
Modeling

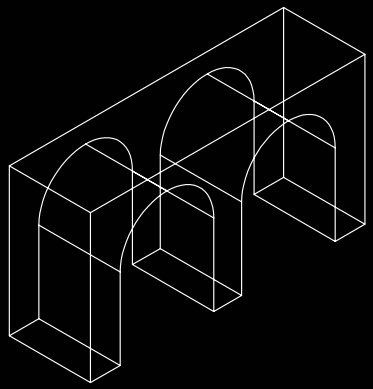
Solid Modeling

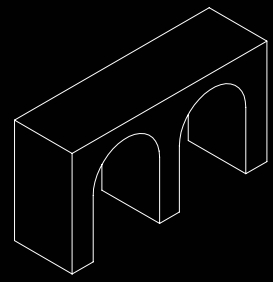


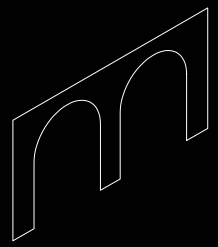


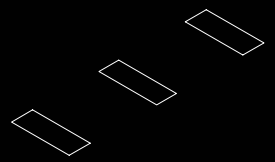

Z
Y











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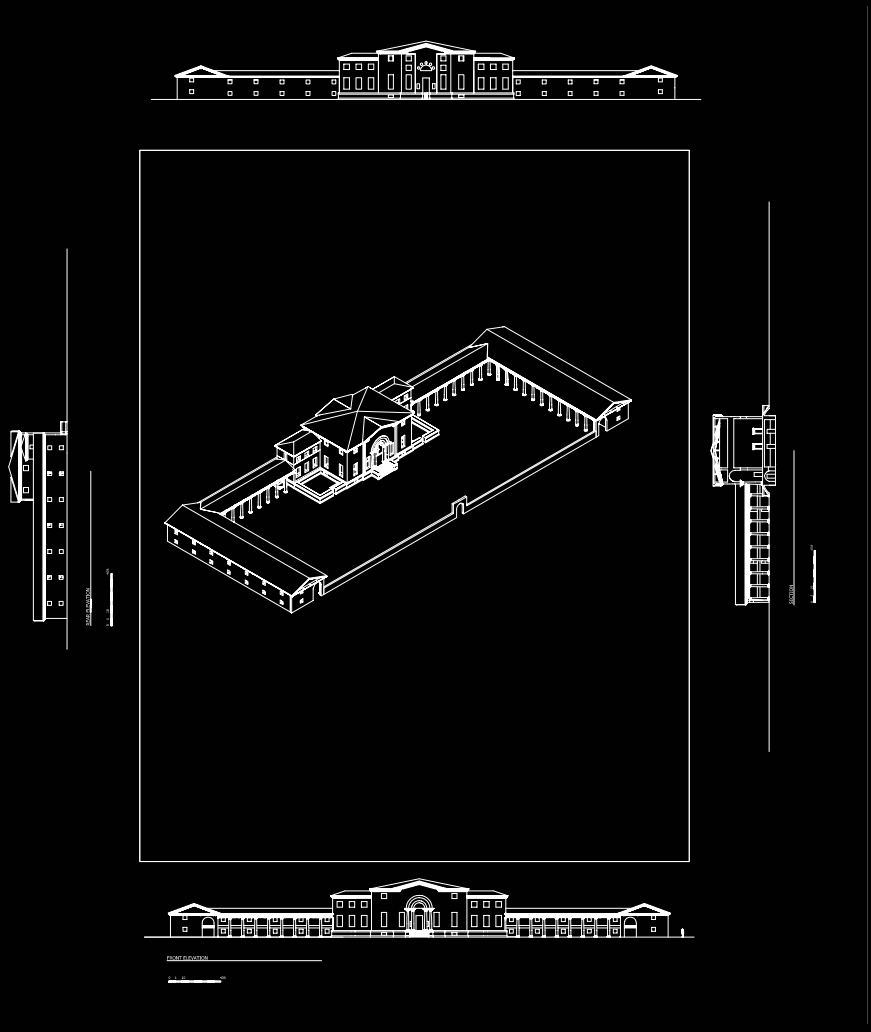

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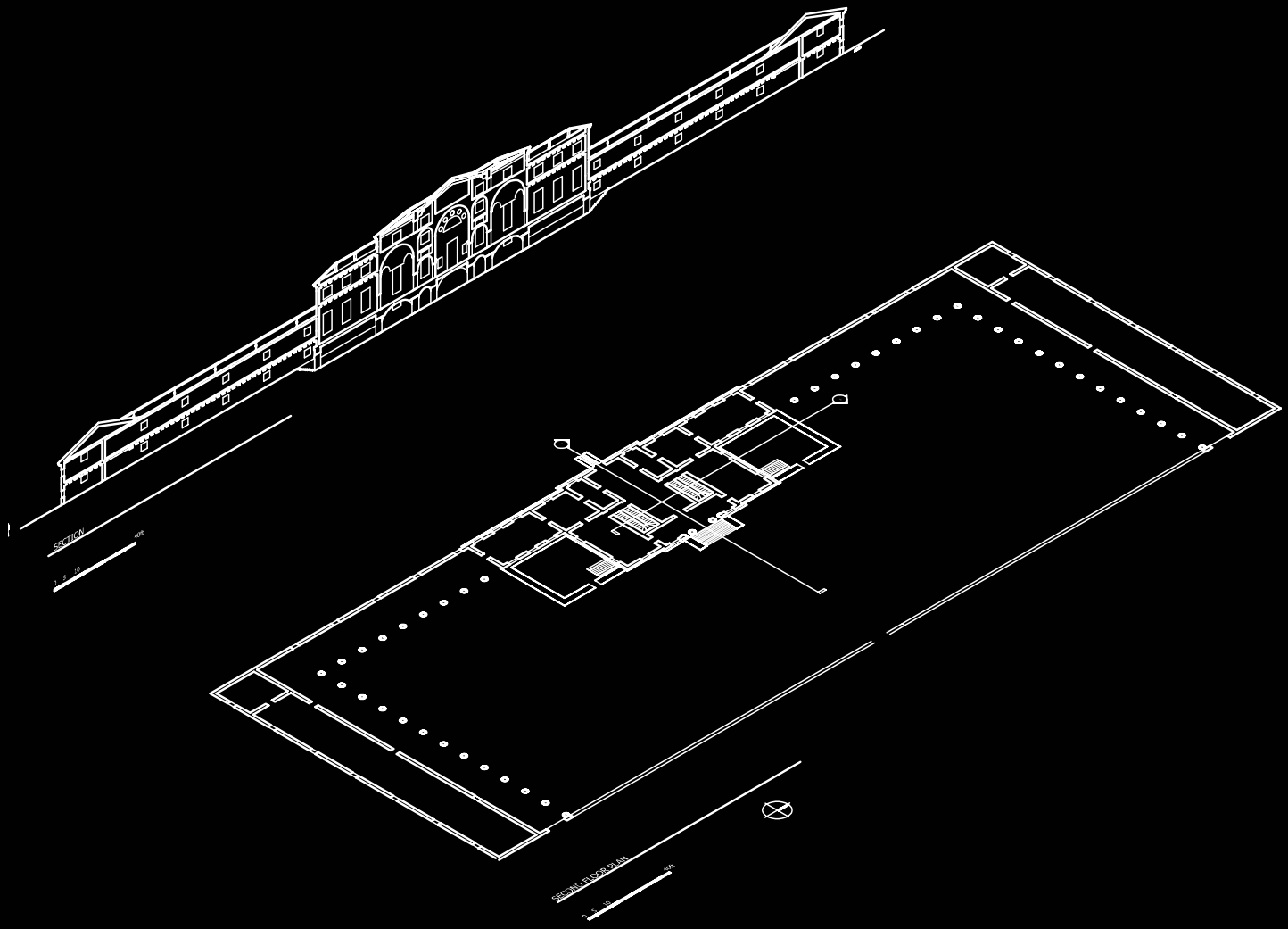
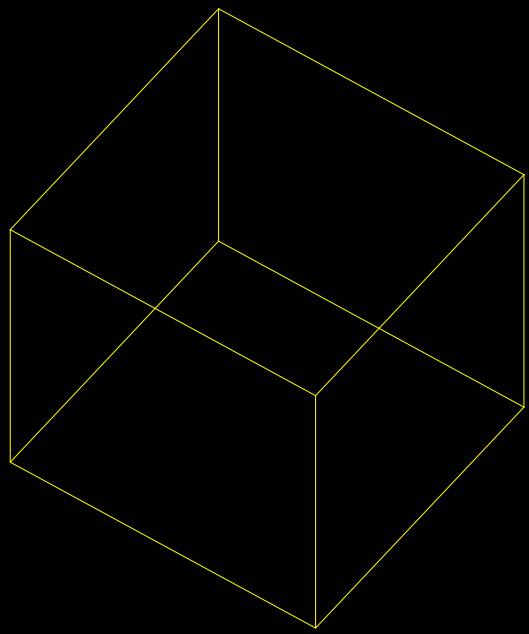


## COMPUTER MODELING

- Computer Models were used in Architectural Research in – 1980s
- Computer Models used to create renderings – 1990s
- Computer Models will be used a the building source – 2000 – 2015

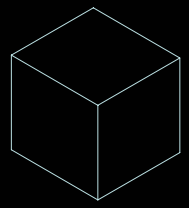


## System of Primitives

Cylinder

Cone

Torus



Square

Wedge

Sphere

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Coordinate System

0,10,10

10,10,10

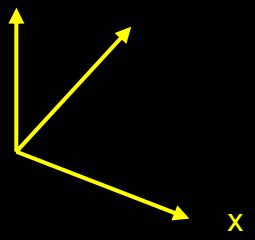
0,0,10

UCS
User Coordinate
System

10,10,0

z

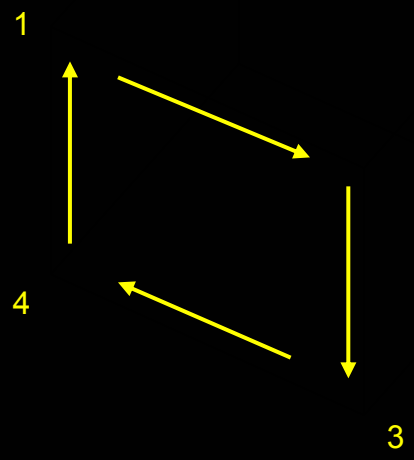
0,0,0



10,0,0

x

Direction of Faces



## Extrusion

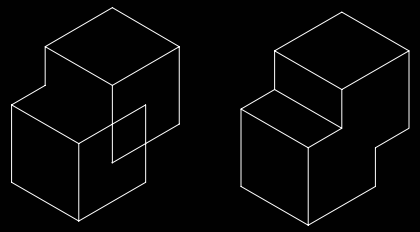
Revolution

Axis

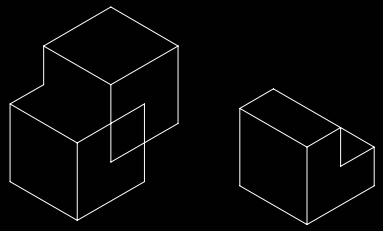
Revolution

## Boolean Operations

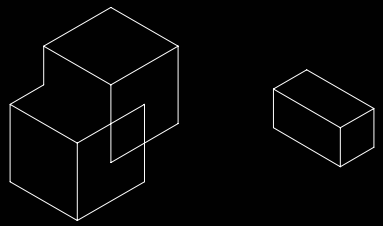
British Mathematician
George Boole



Union

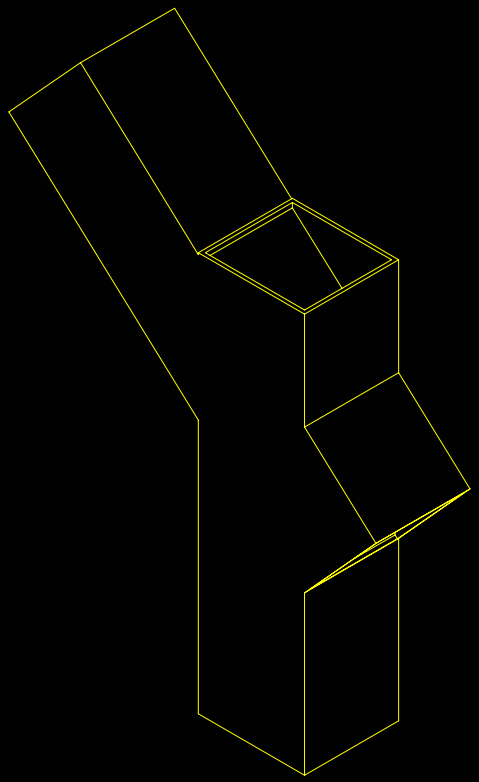


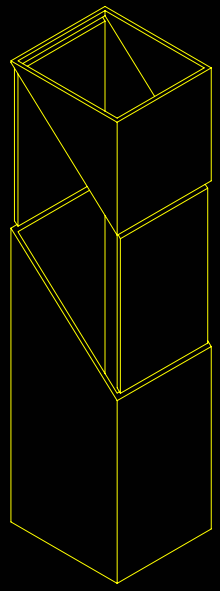
Subtraction



Intersection

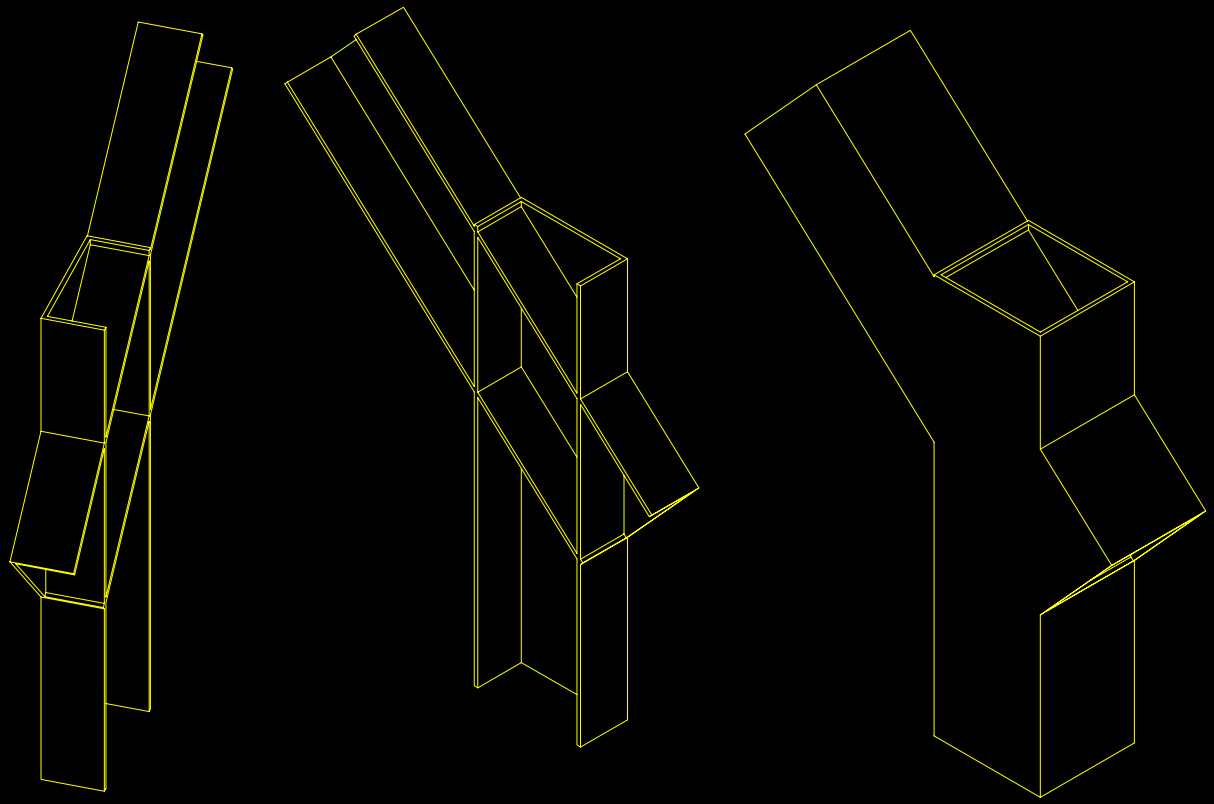
## Boolean Operations



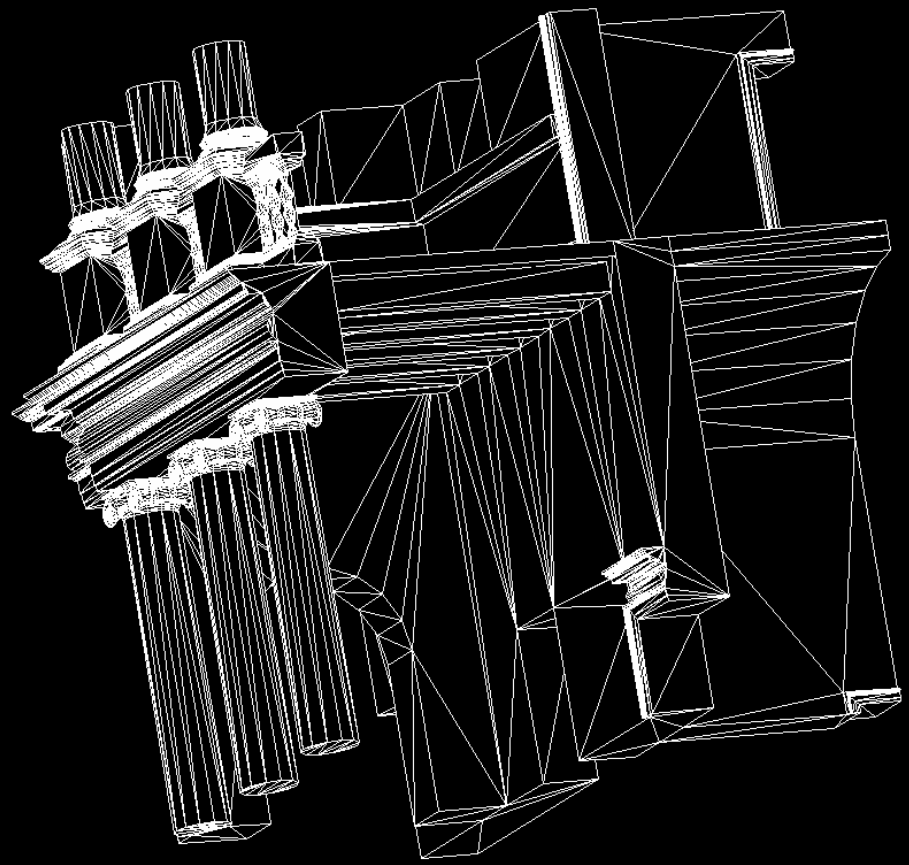


Subtraction

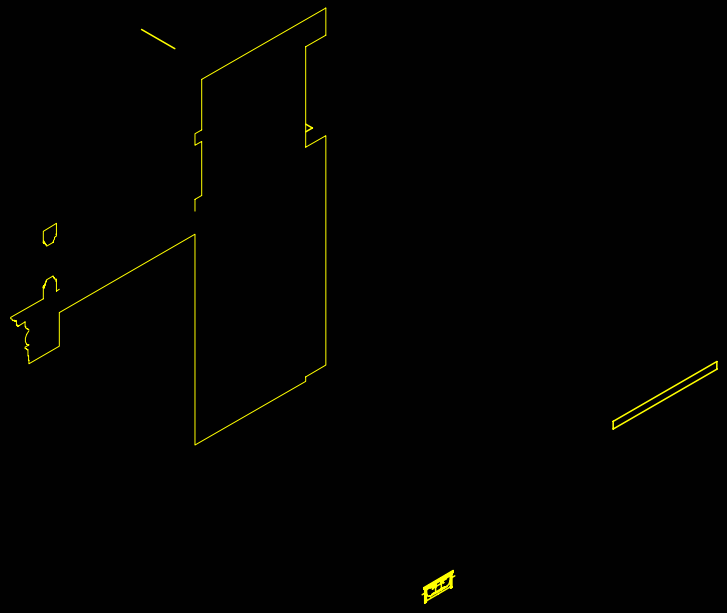
Boolean Operations



## Presentation

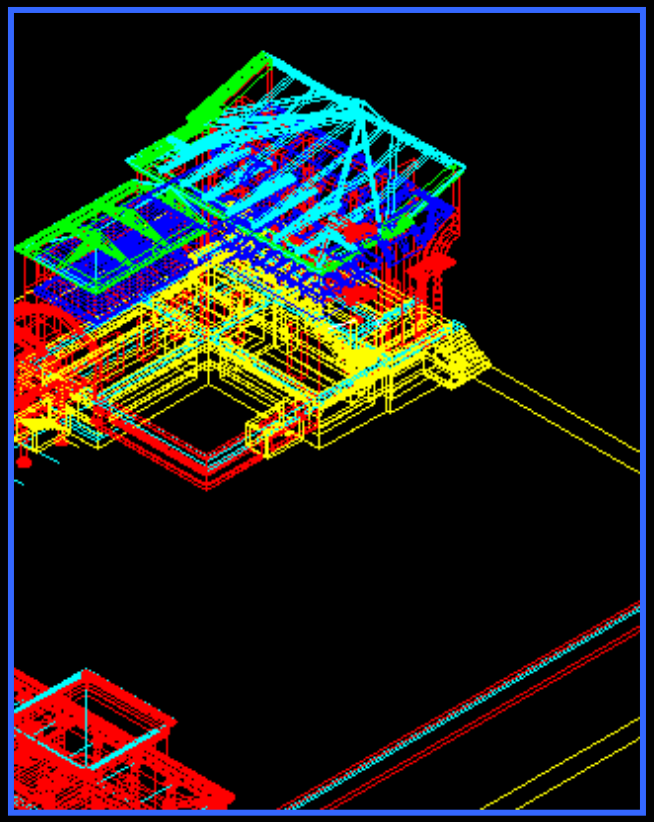


## 2D Projections



## PROBLEMS WITH COMPUTER MODELING

- Slow
- Solid Modeling is Hard to Manipulate
- Data Representation is heavy



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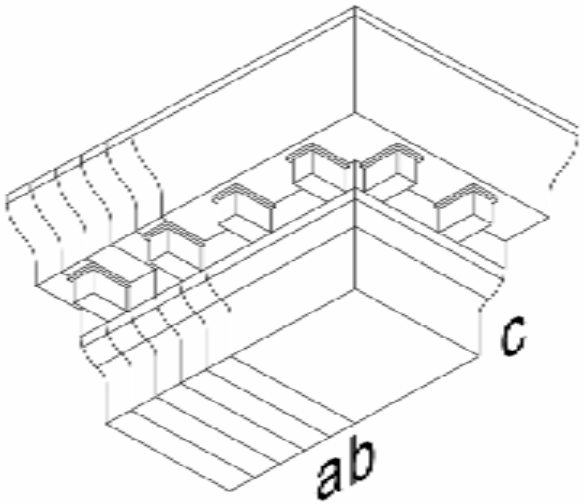
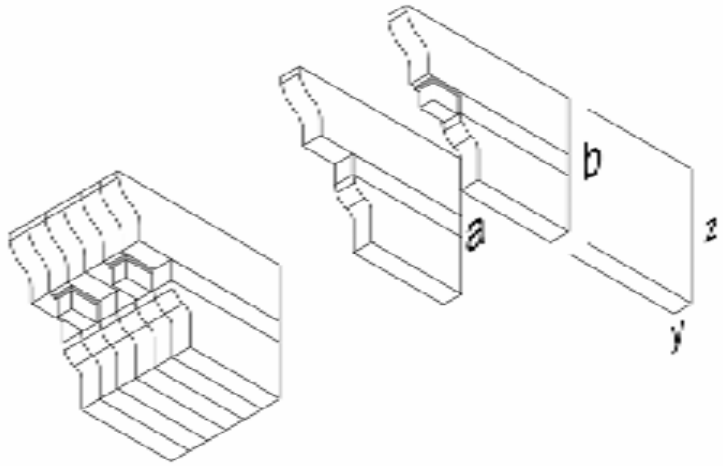
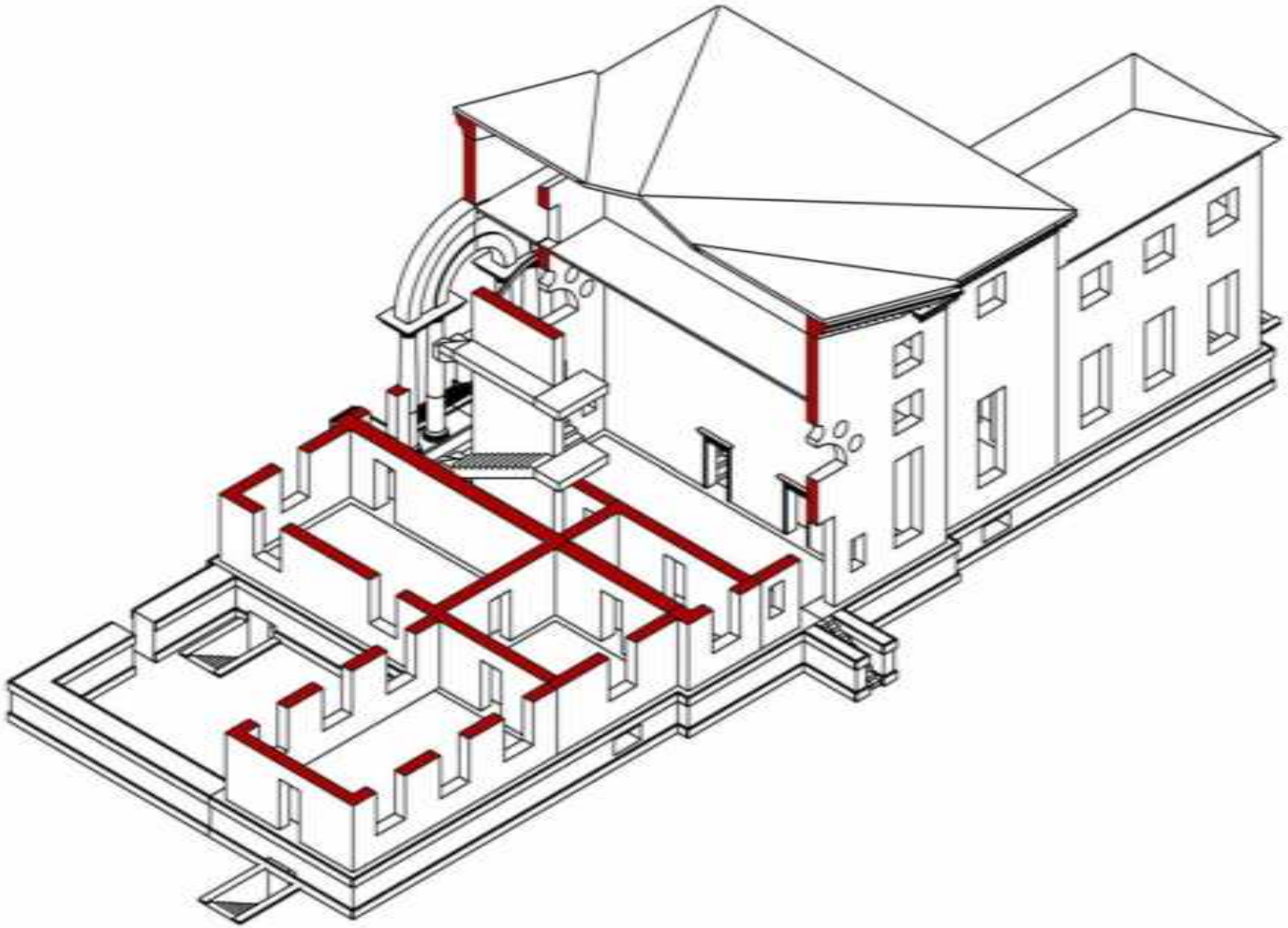

c
ab


b
a



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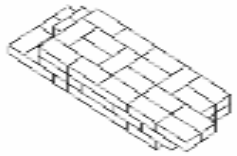
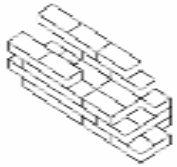
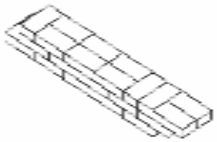


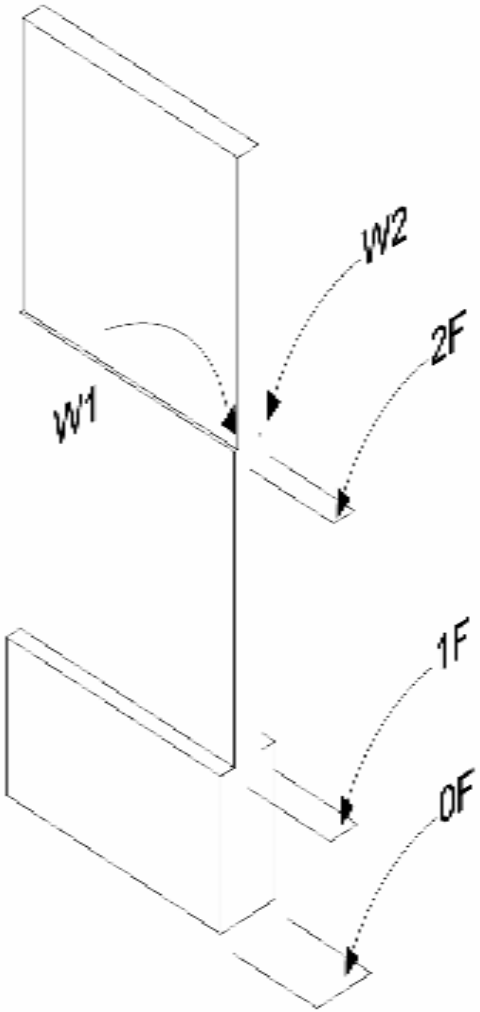
24" Wall

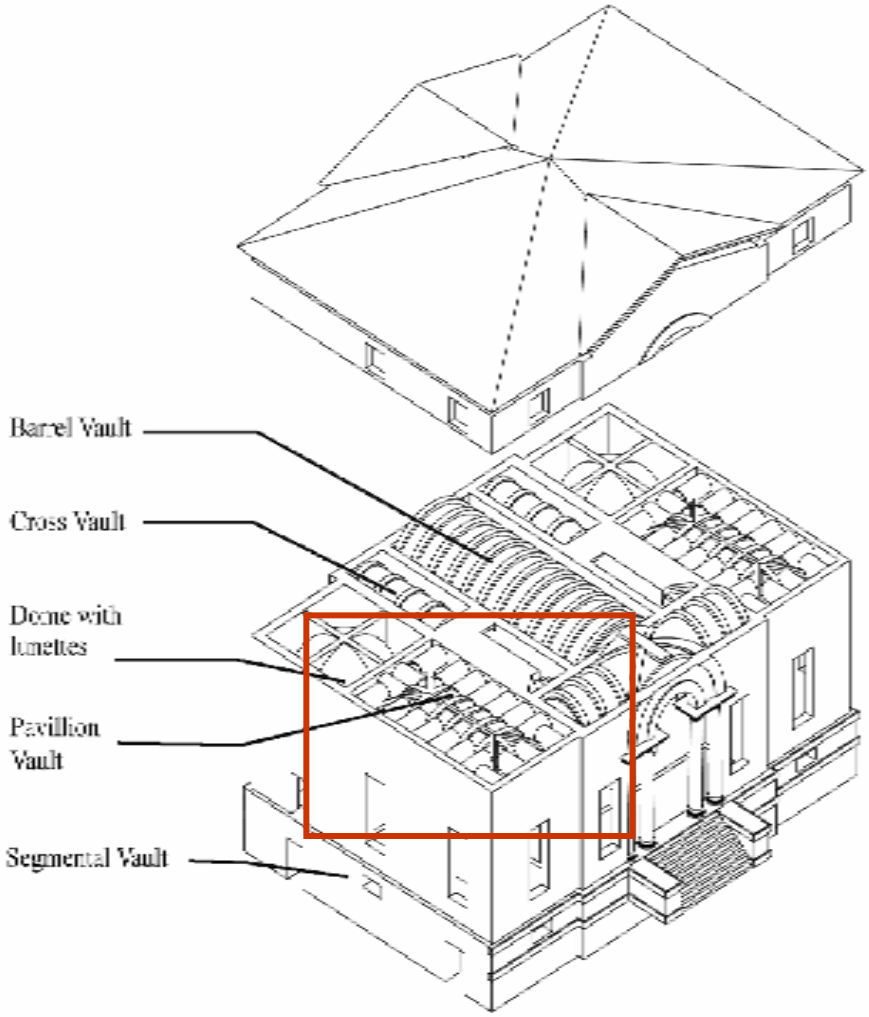


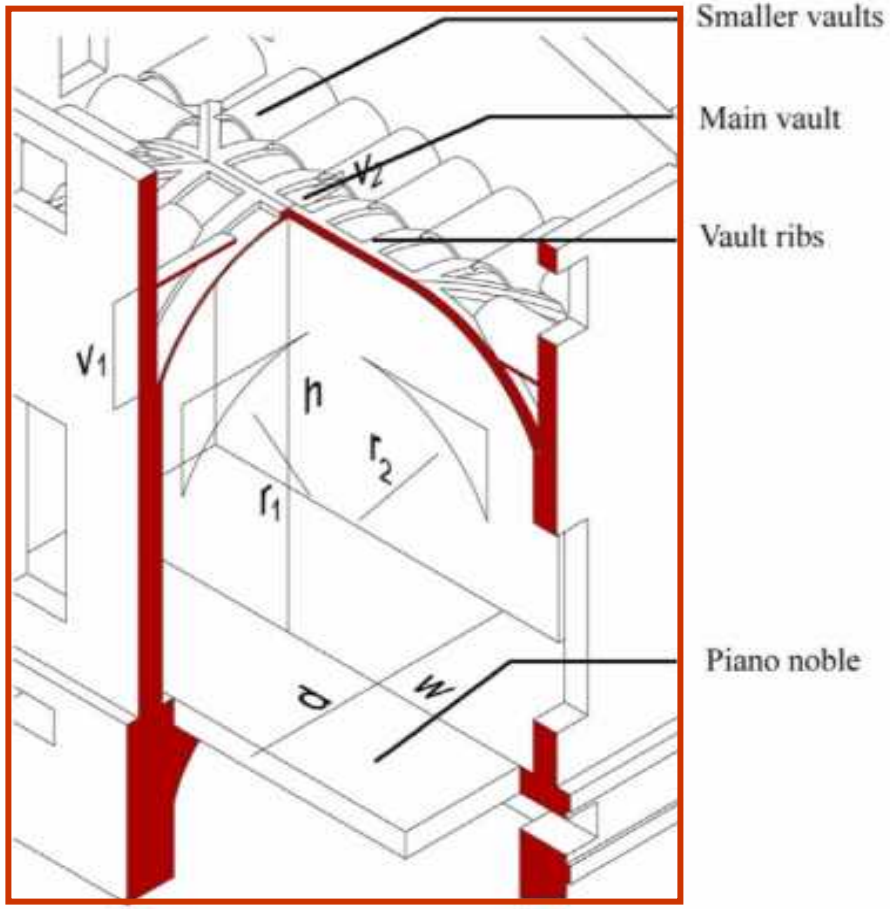
18" Wall



12" Wall


W2
2F
W1
1F
0F


Barrel Vault
Cross Vault
Dome with lunettes
Pavillion Vault
Segmental Vault


Smaller vaults
Main vault
Vault ribs
Piano noble
v2
v1
h
r2
r1
d
w

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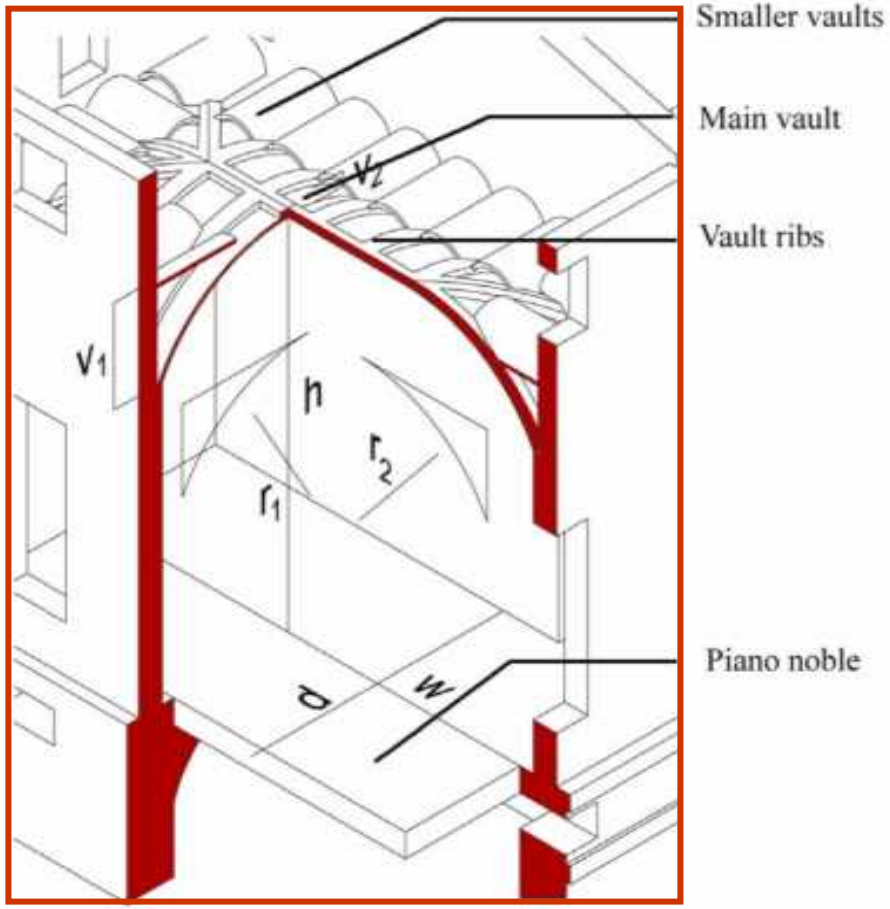
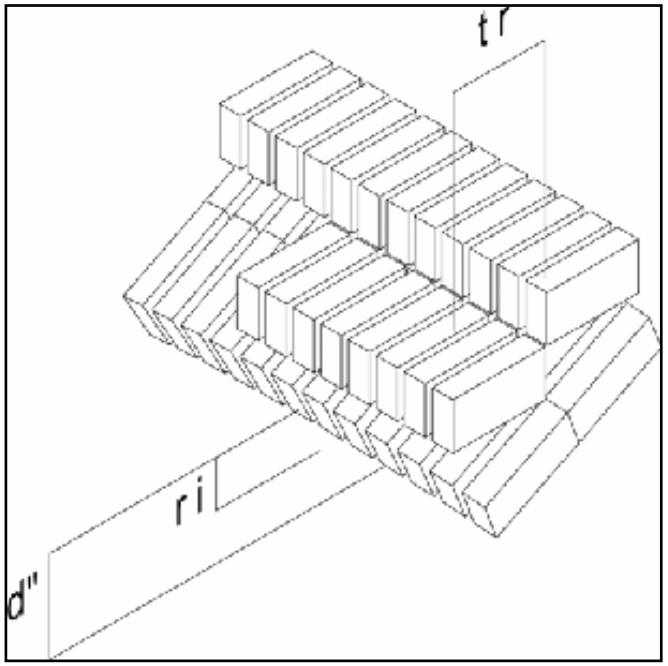
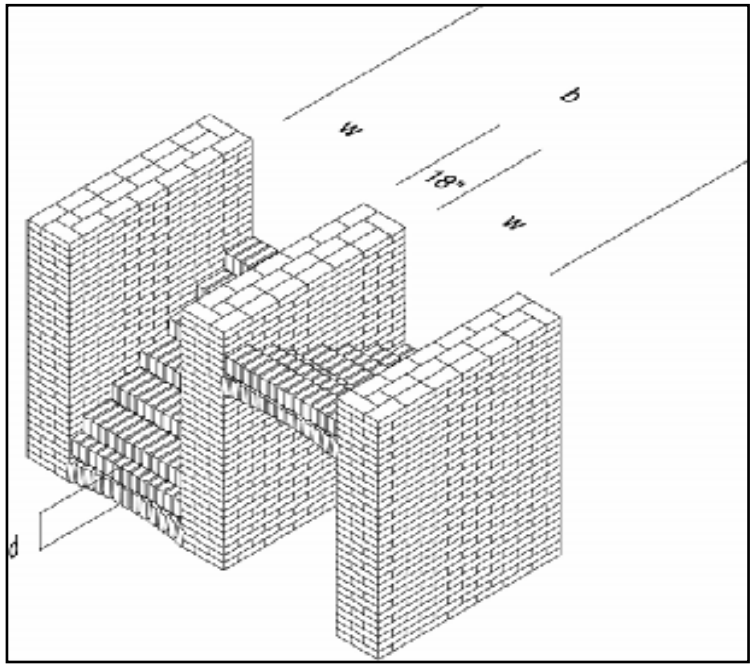

Smaller vaults
Main vault
Vault ribs
Piano noble
v2
v1
h
r2
r1
d
w

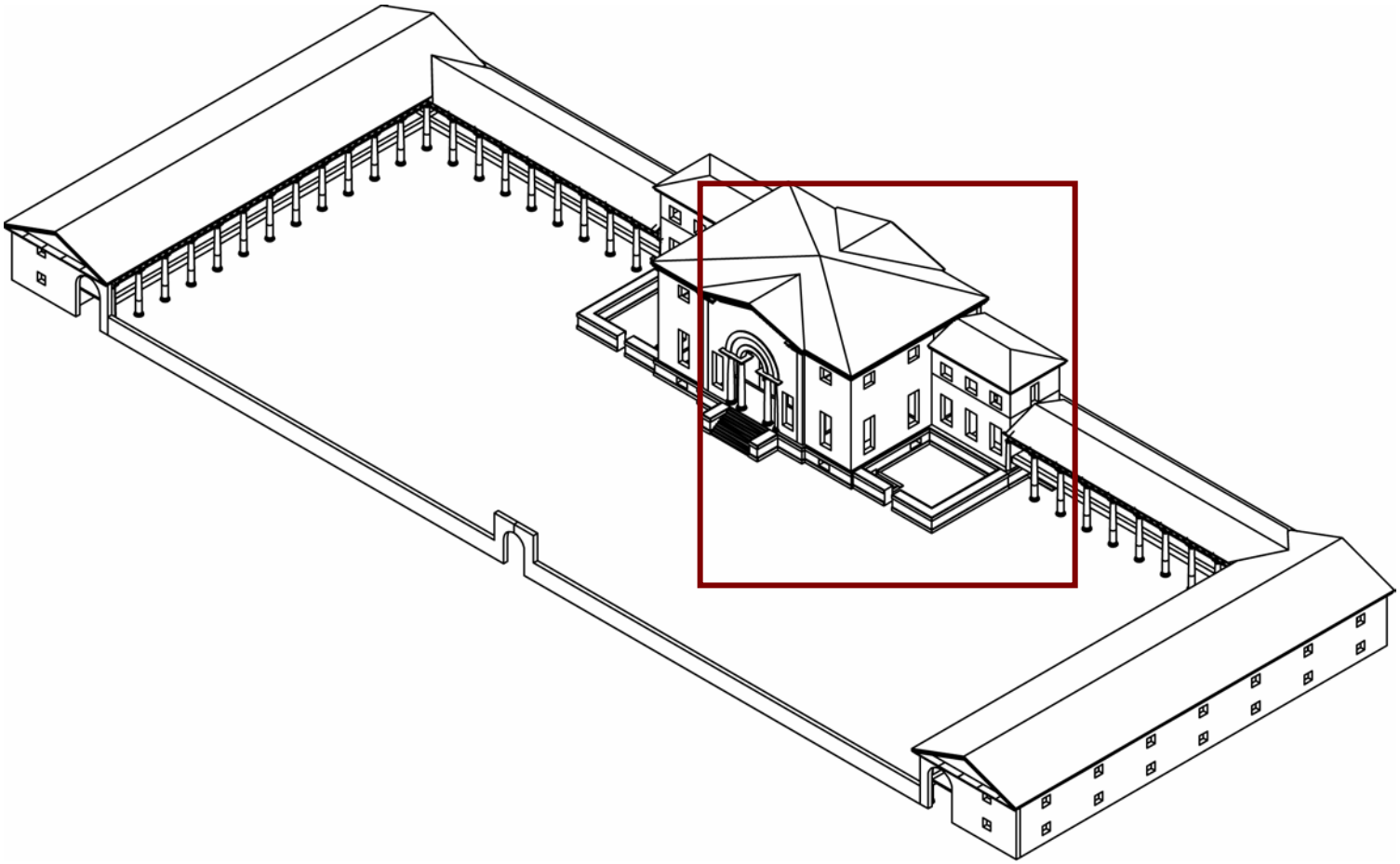

tr
ri
d"

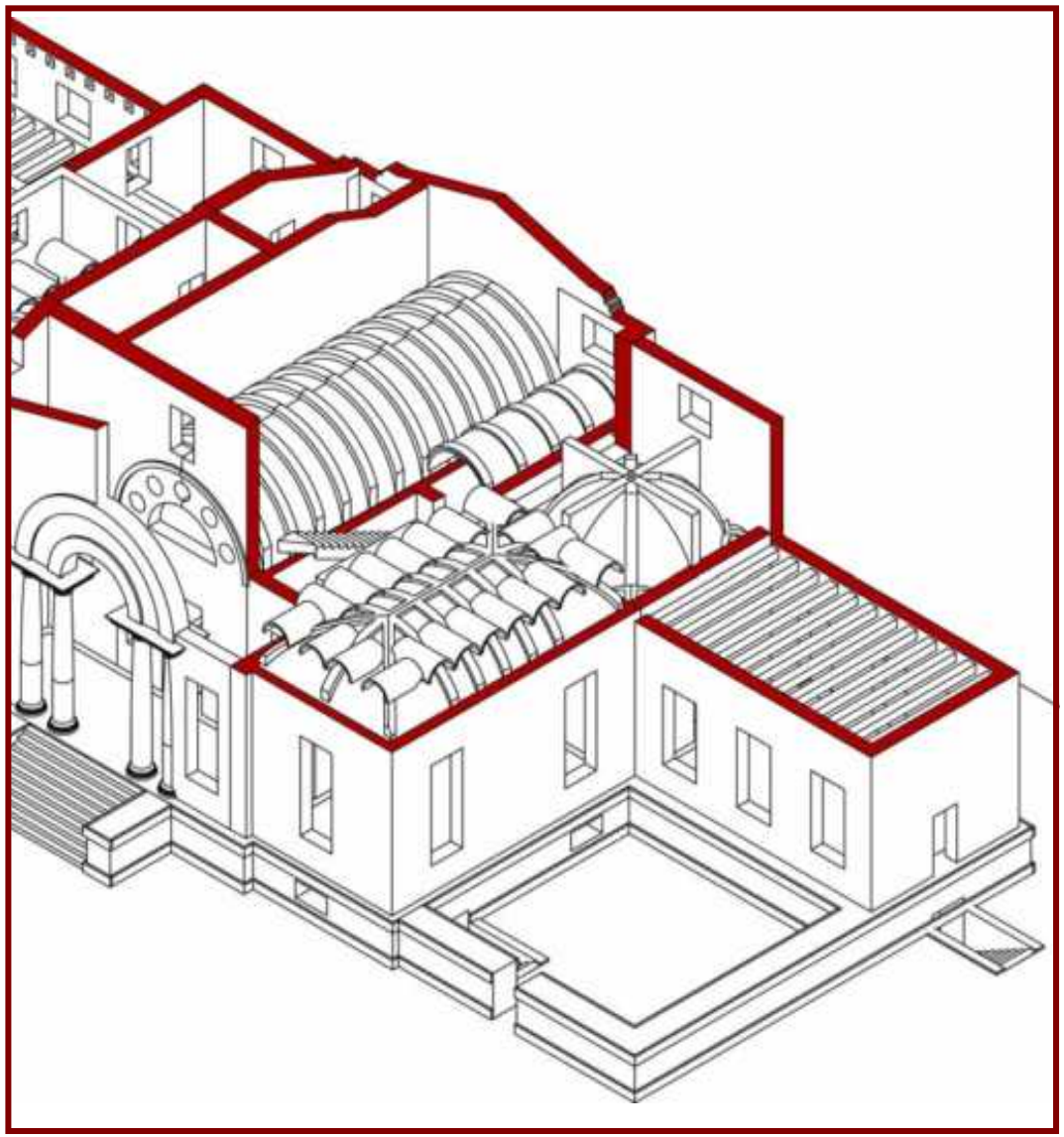


**Lecture 3**

4.206/4.291
VISUALIZATION

Spring 2003





## ELEMENTS OF MODELING

- Select Key Places to Model in Detail
- Break parts into layer categories
- Hide often to check for intersections
- Accuracy = Reality

## Complex Computer Models

1. Most Complex Models are NURB Surfaces

2. Futuristic architects are working with curved surface modeling programs

3. Computer model becomes the building

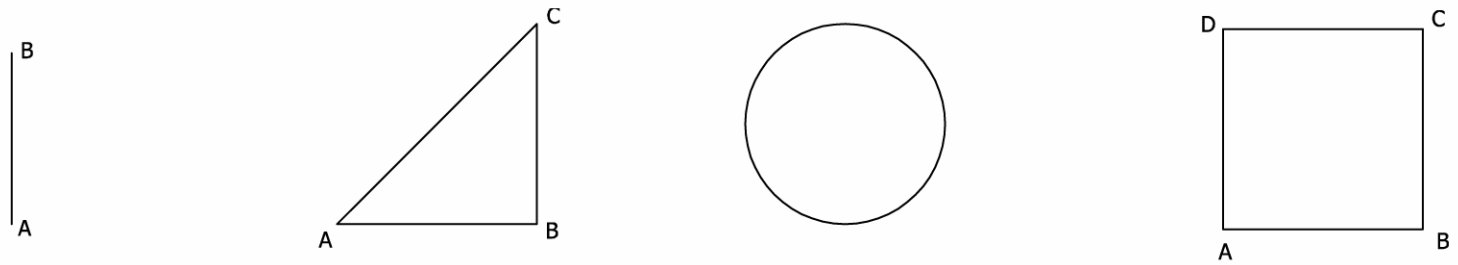
# EUCLIDIAN GEOMERY LANGUAGE

## Euclidian Geometry – 300 BC

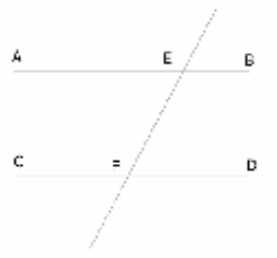
Geometric Descriptions

13 Elements

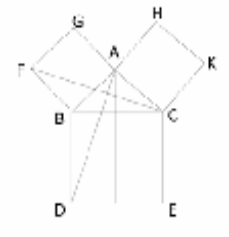
Points, Lines and Sha



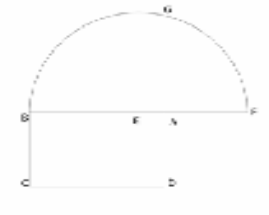
# EUCLIDIAN GEOMERY




The Theory of Parallels

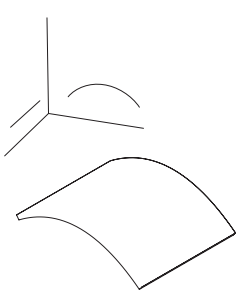



The Theorem of Pythagoras

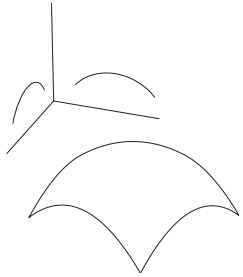


The Theory of Rectangles (Palladio)

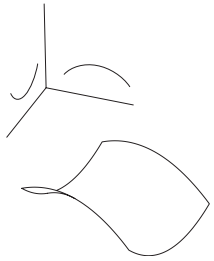
## Controlled Implicit Surface



Developable
(Surfaces)

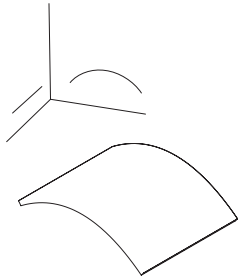


Two dimensional
(Synclastic)



Two dimensional
(Anticlastic)

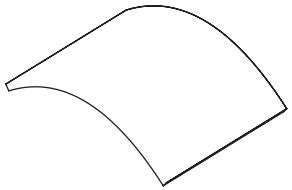
Developable
(Surfaces)



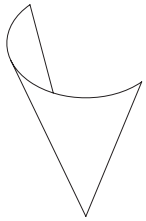
Classes

Shapes

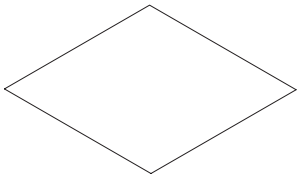
Normal Developable

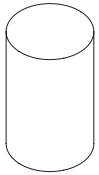


Binormal Developable

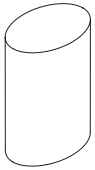


Tangent Developable

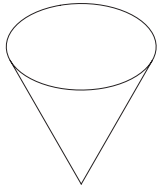




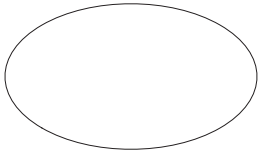
Cylinder



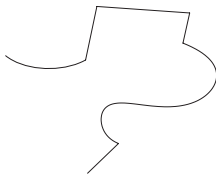
Elliptic



Cone

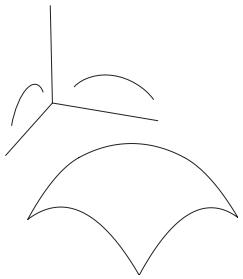


Circular Flat



Irregular Flat

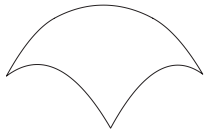
Two dimensional
(Synclastic)

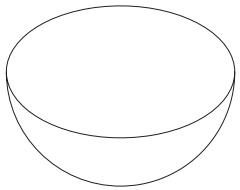


Classes

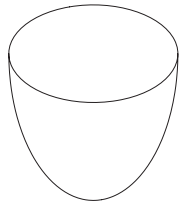
Shapes

Complex Convex



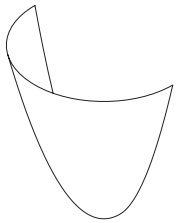


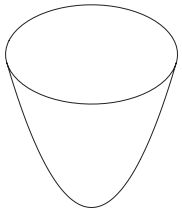
Spherical



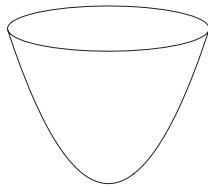
Ellipsoid

Normal





Paraboloid



Elliptic
Paraboloid