

# Informatica in Architettura

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**INFOR**av

*Istituto per lo sviluppo e la gestione avanzata dell'informazione*

roma 16 maggio 2012 P.zza Barberini

“...indispensabile e principale abilità richiesta all’architetto e cioè quella di saper disegnare...”

Adrian Forty, “Parole ed Edifici”2005

“la vera vista dell’architetto è il disegno”

“il disegno rende visibile l’invisibile”

“il disegno è l’idea ma anche la forma”

Franco Purini, “Comporre l’architettura” 2009

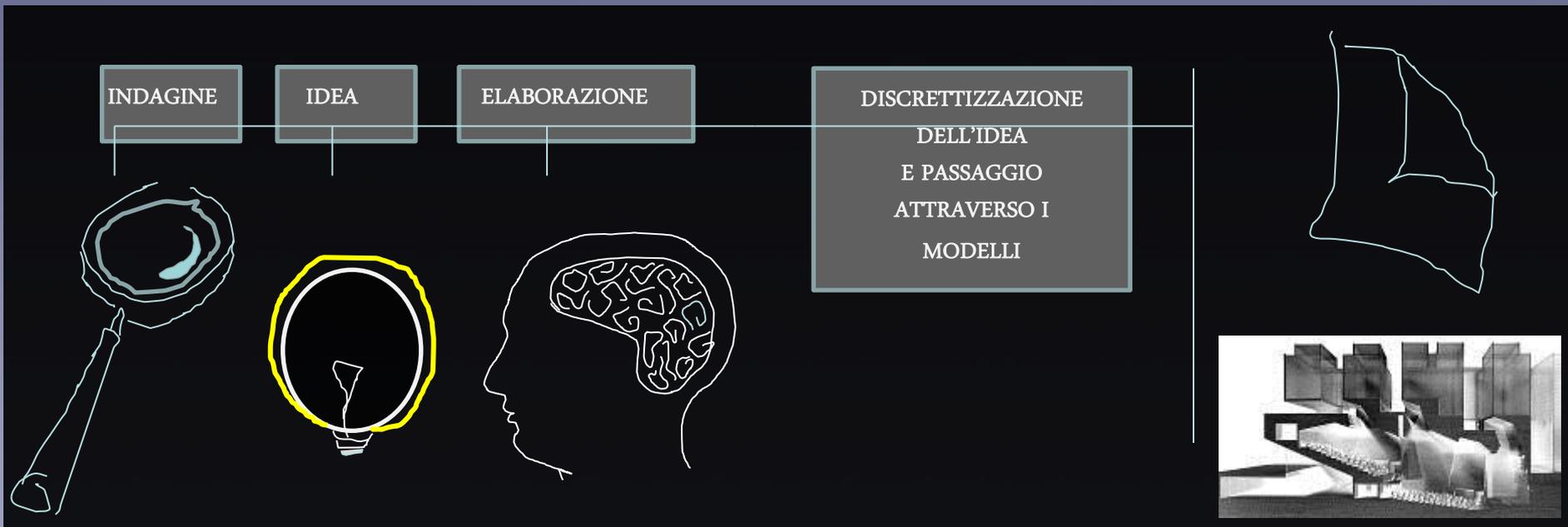
“disegno interno“, che è il “concetto formato nella mente nostra per conoscere qual si voglia cosa”

“disegno esterno“, “che altro non è, che quello circoscritto di forma, senza sostanza di corpo. Semplice lineamento, circoscrizione, misurazione, e figura di qualsivoglia cosa immaginata, e reale”.

Federico Zuccari, 1600



Il disegno ed il modello sono quindi gli strumenti che sono stato utilizzati dagli architetti per giungere alla definizione di un oggetto



## Marco Vitruvio Pollione

### De Architectura

Il trattato *De Architectura* (*Sull'architettura*), in 10 libri, dedicato ad Augusto (che gli aveva concesso una pensione), scritto probabilmente tra il 29 e il 23 a.C.

### Iconografia

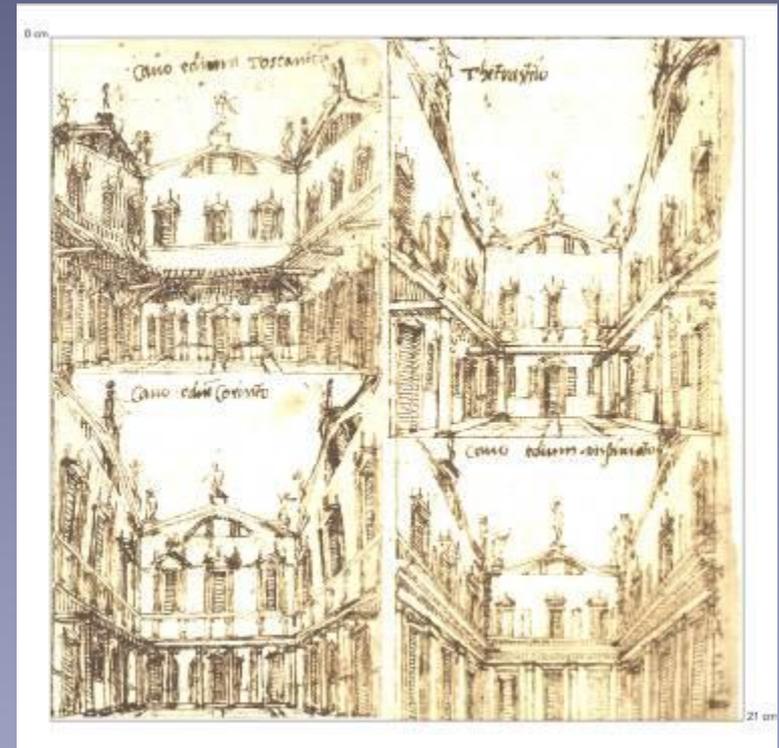
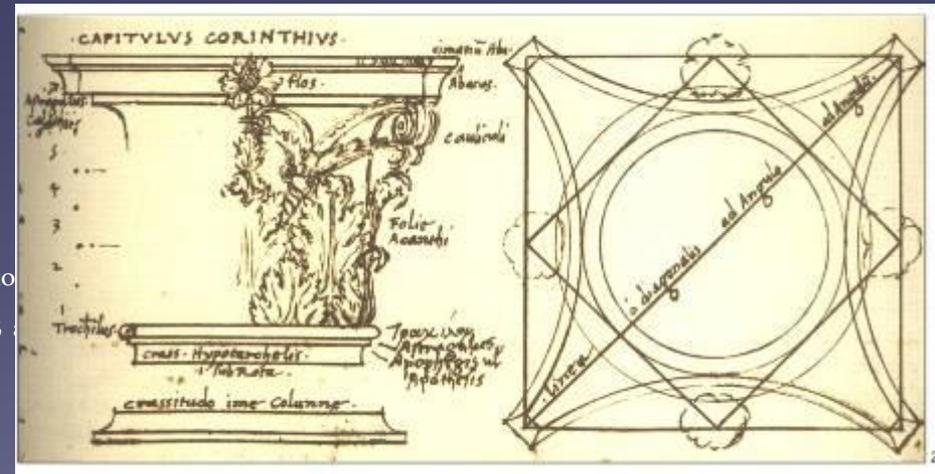
Letteralmente disegno “dell'impronta” ed indica il tracciato dell'edificio sul suolo. *Pianta*

### Ortografia

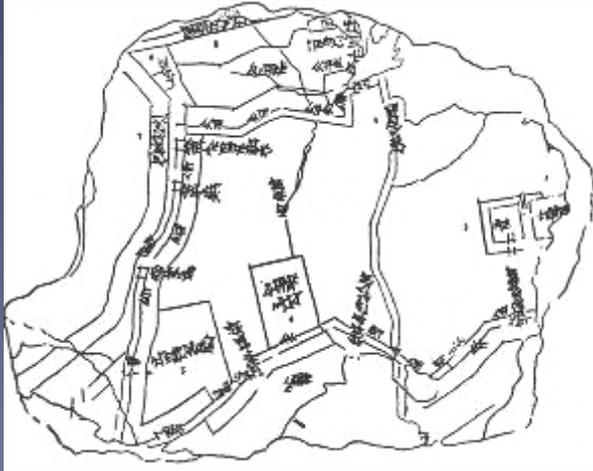
Letteralmente disegno “retto” ed indica l'alzato dell'edificio. *Prospetto*

### Scenografia

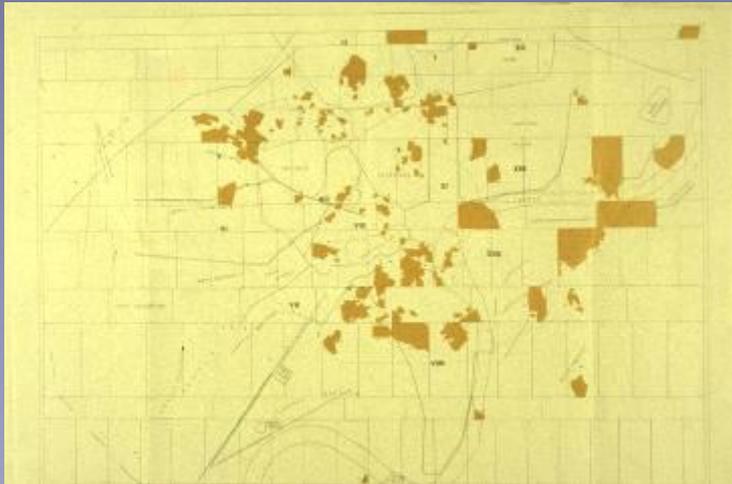
Letteralmente disegno “della scena” ed indica la restituzione dello spazio tridimensionale. *Modelli tridimensionali, viste tridimensionali*



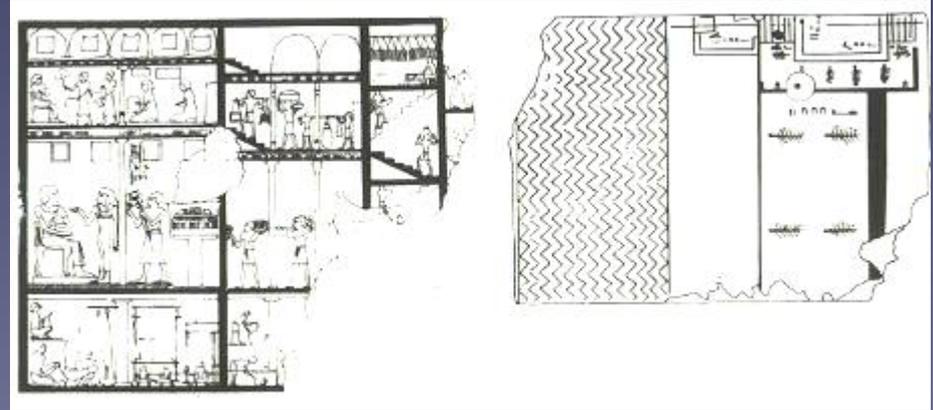
## Iconografia



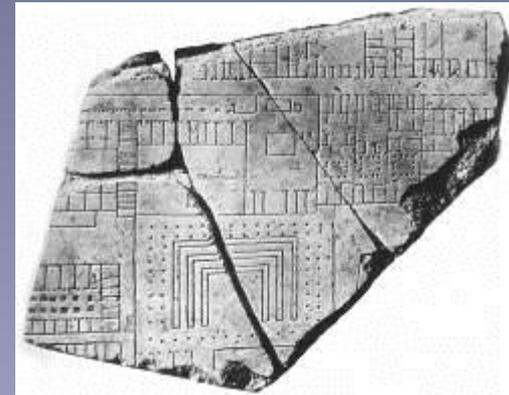
Trascrizione grafica di una tavoletta di argilla dove è rappresentata la città di Nippur 1500 ca. a.C.



## Ortografia



A sinistra: trascrizione grafica di una pittura rappresentante la sezione di una casa egizia con indicate le attività quotidiane. A destra: Rappresentazione di un edificio rurale con il territorio circostante e campi coltivati. Si osservi la rappresentazione degli alberi.



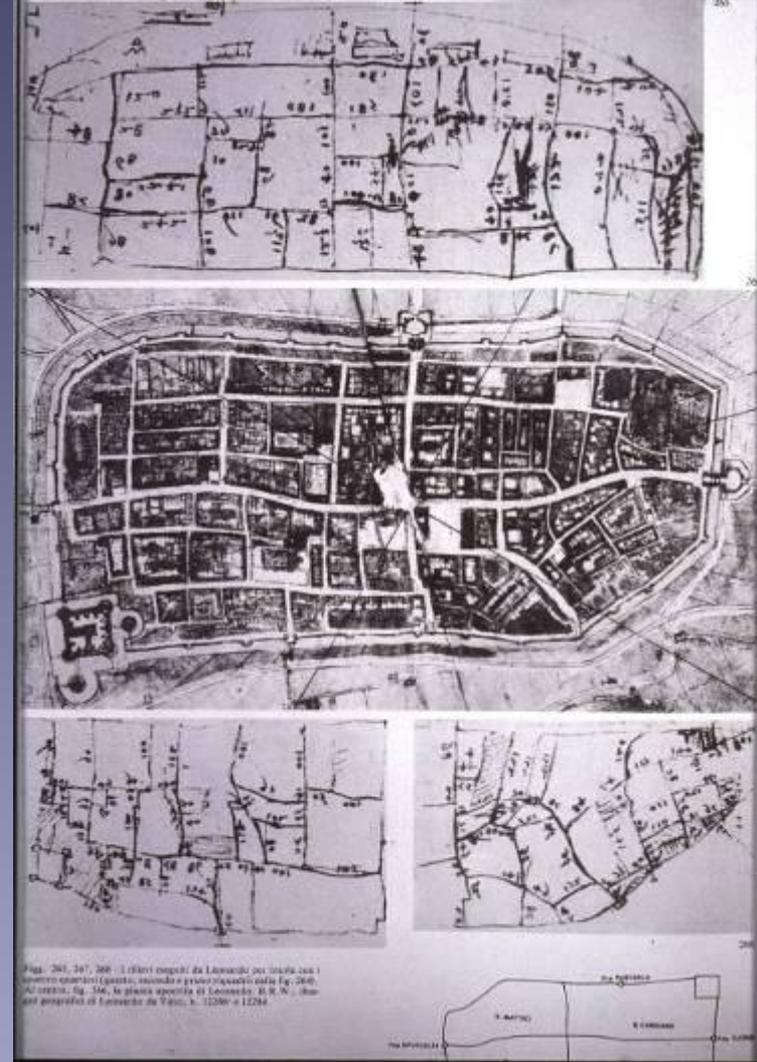
A sinistra: Quadro di unione della forma urbis marmorea con indicati alcuni reperti. Grande 18 metri (61 piedi) per 13 metri (44 piedi) rappresenta in scala, una estensione di circa 4,3 x 3,1 Km di città. A destra Forma Urbis primo quarto sec. III, frammento non identificato si osservino le varie proprietà.

## Scenographia

## Iconografia



## Ortografia



## Scenographia

Leonardo da Vinci 1502 Pianta di Imola, a raffronto gli schizzi preparatori con indicati i lati delle poligoni concatenate e delle relative misure.

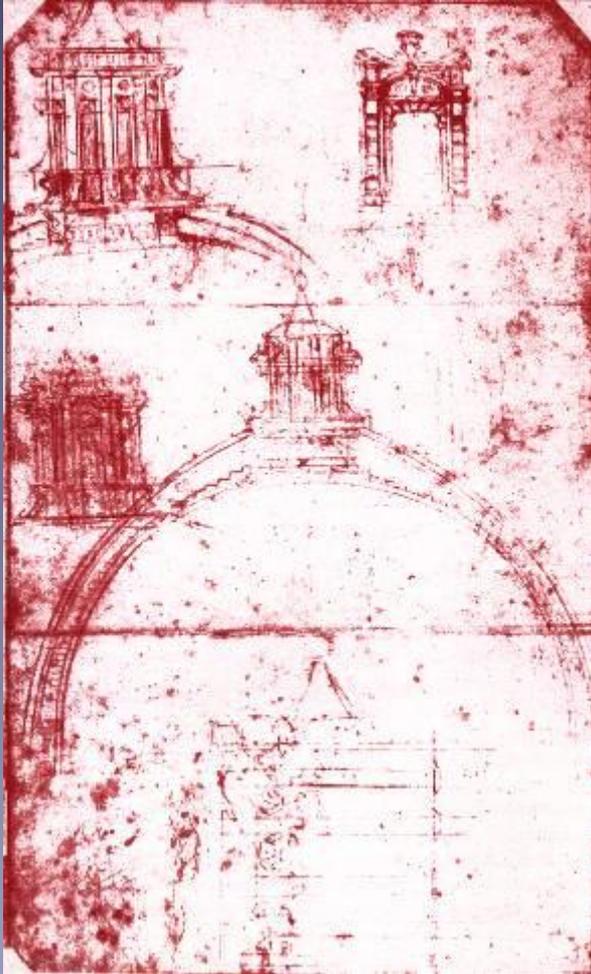
Per la realizzazione delle poligoni ha utilizzato la diottra per traguardare e di una bussola per determinare gli angoli degli allineamenti



Iconografia

Ortografia

Scenographia

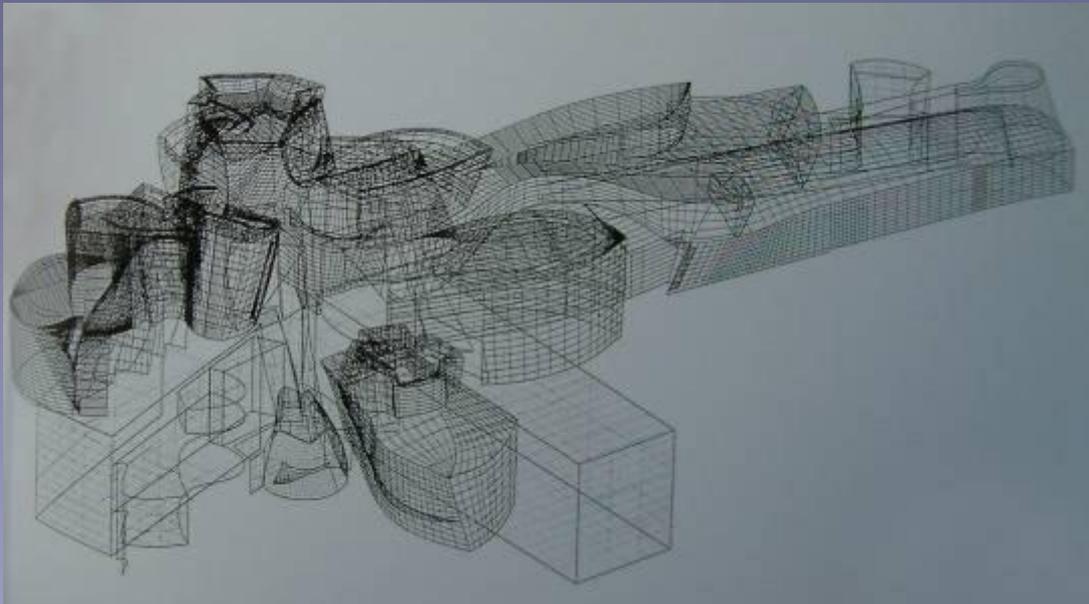


La basilica vaticana di Michelangelo, 1546

Iconografia

Ortografia

Scenographia



Frank O. Gehry – Guggenheim Museum – Bilbao, 1997

## Iconografia/ Ortografia



## Scenografia



## Scenographia

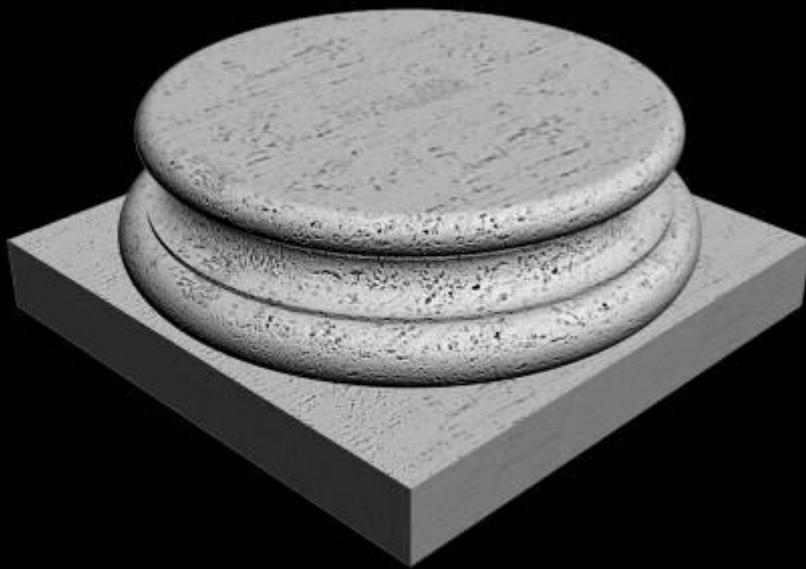


## Proiezioni/Modelli iconici

## Modelli fisici

## Modelli virtuali

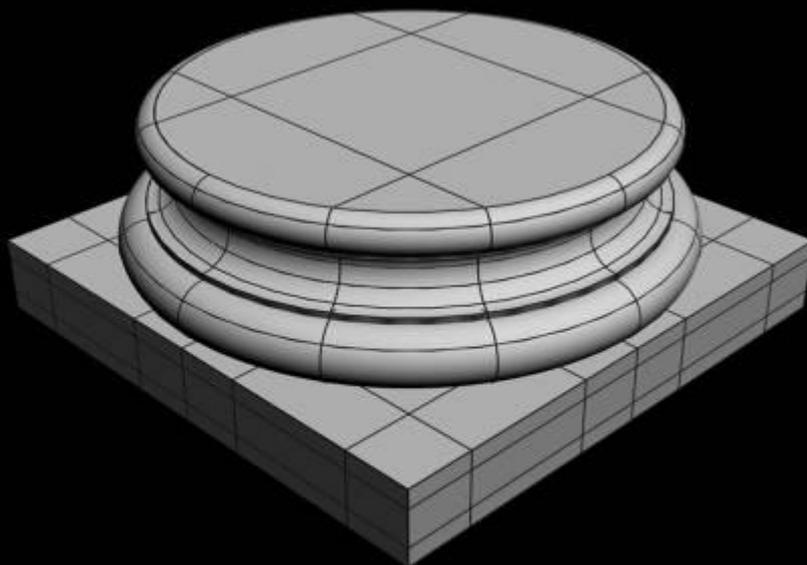
OGGETTO  
REALE

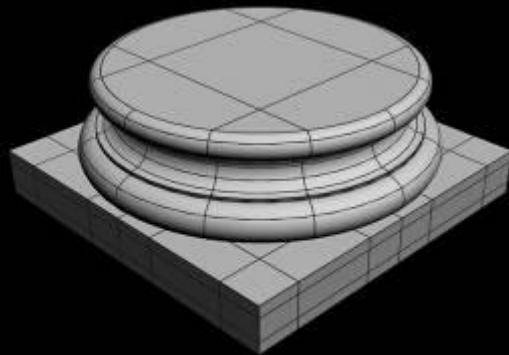
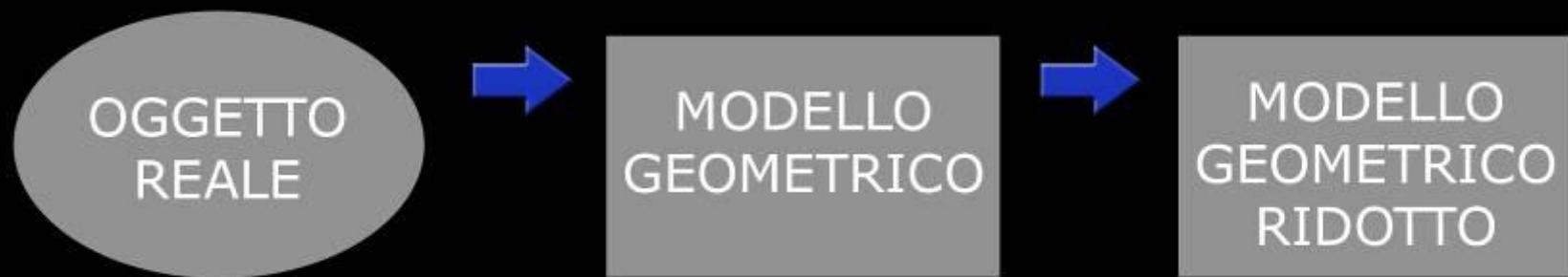


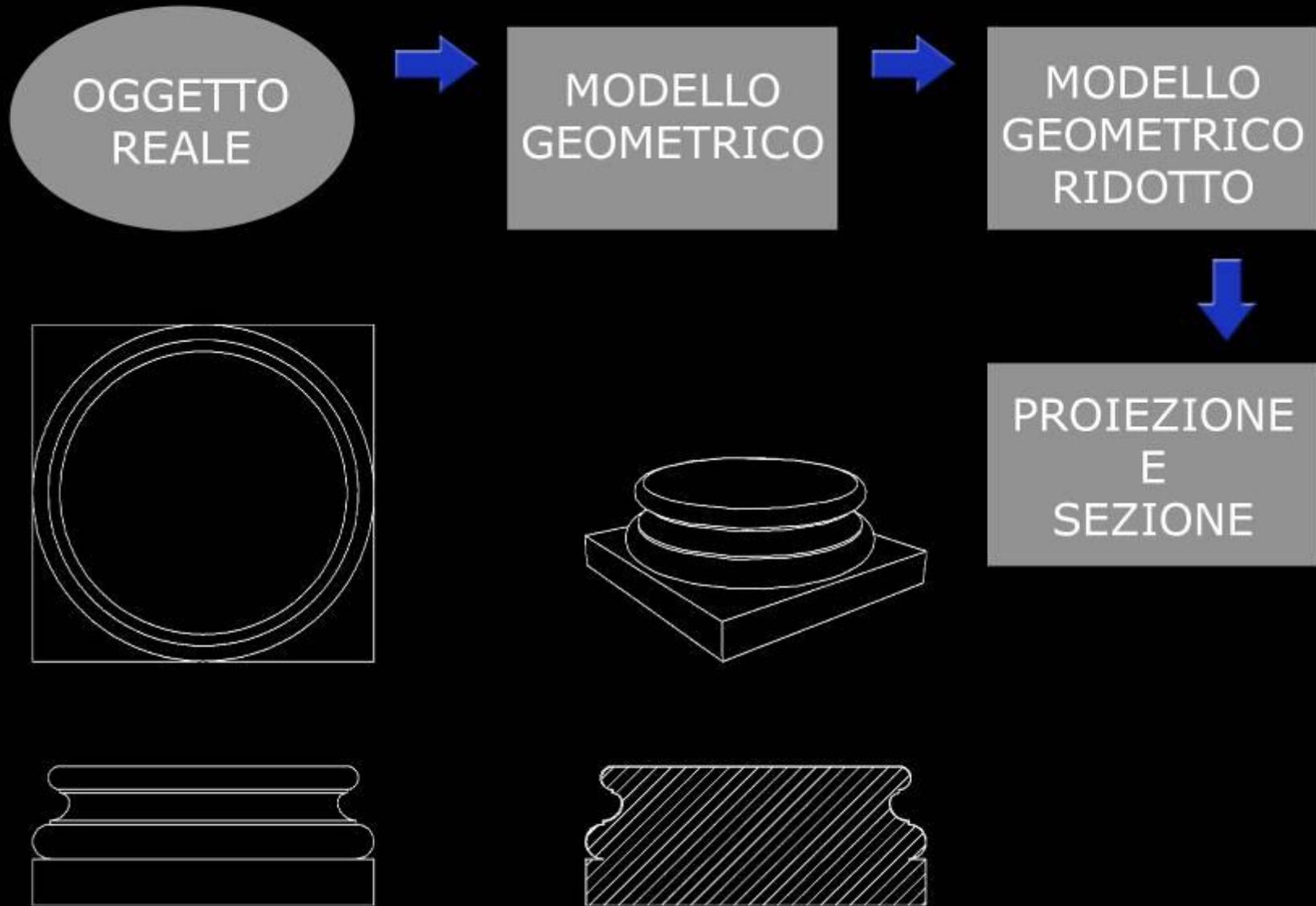
OGGETTO  
REALE

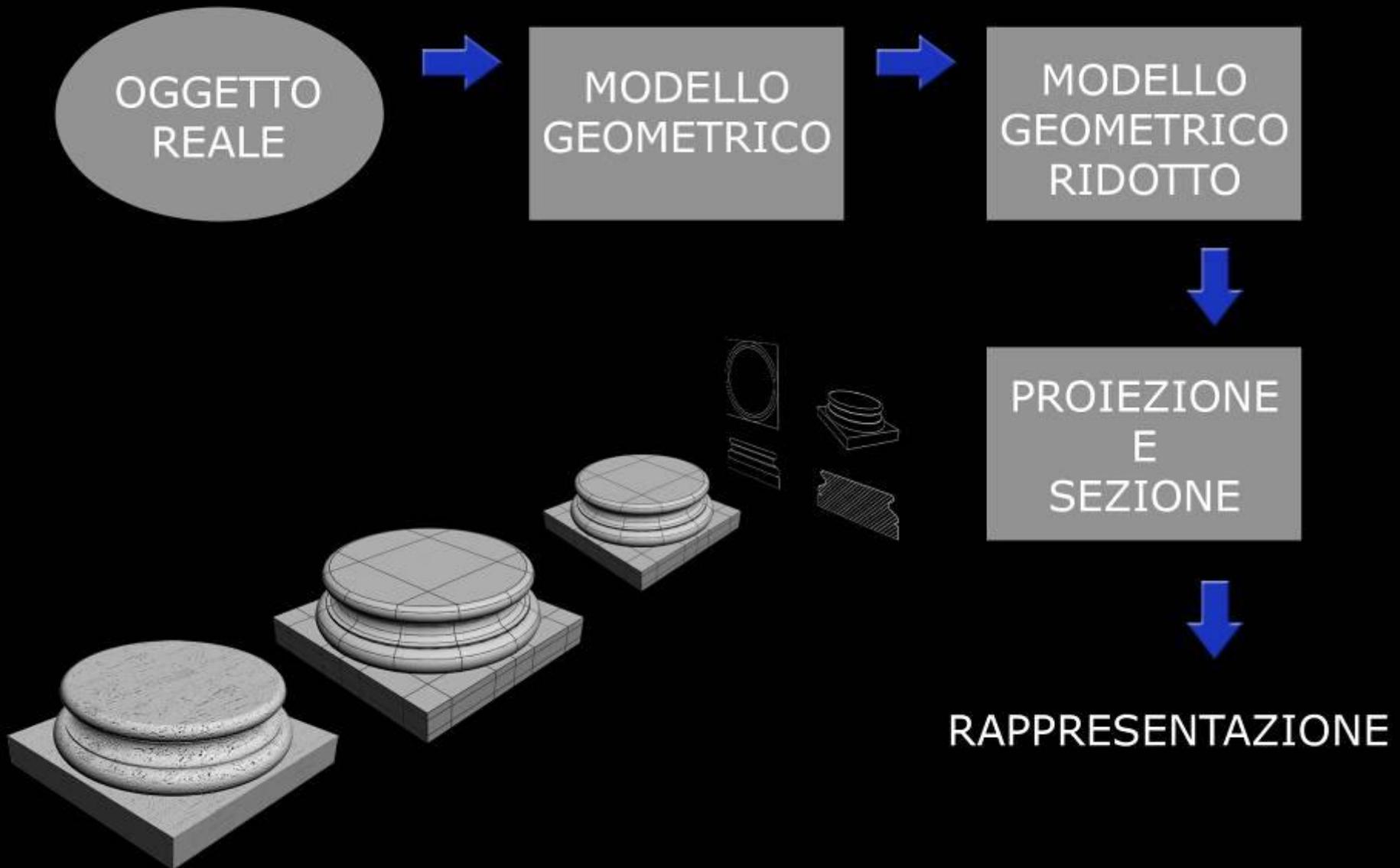


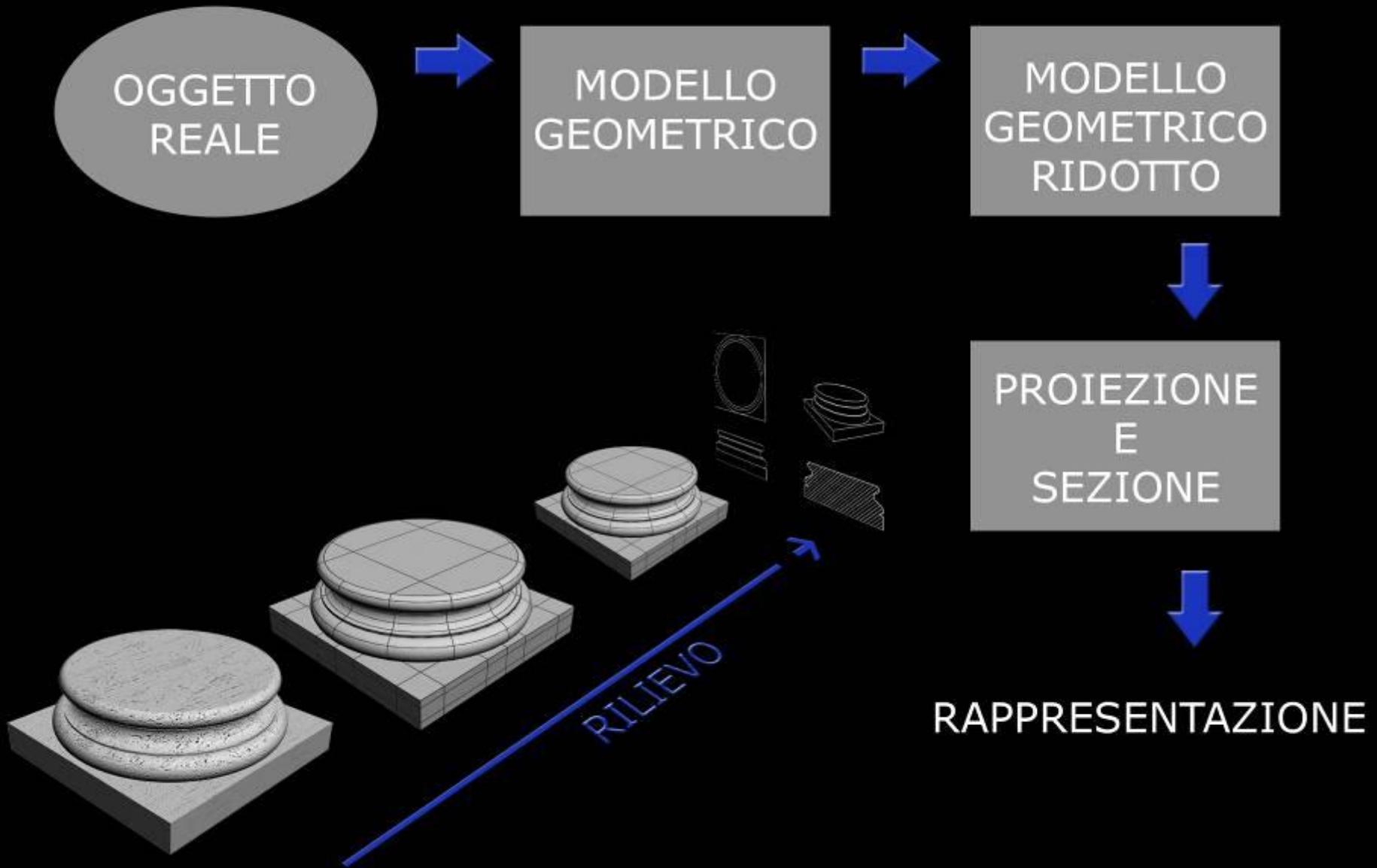
MODELLO  
GEOMETRICO

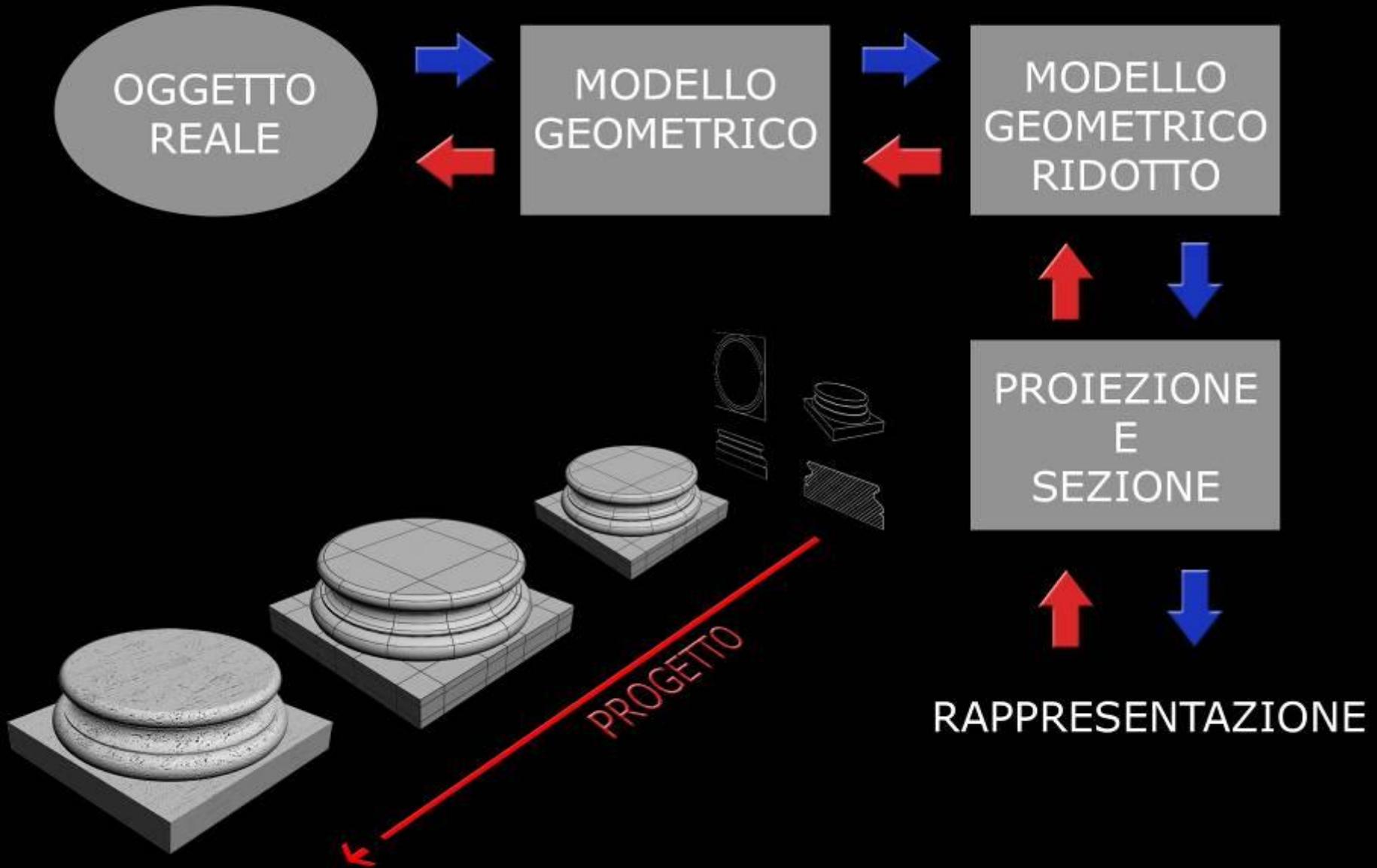












SCHIZZO A MANO LIBERA

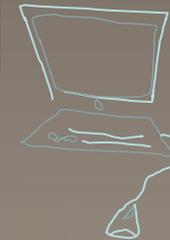


SOLO DIGITALE



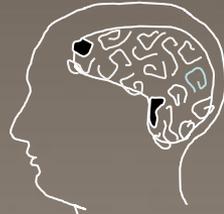
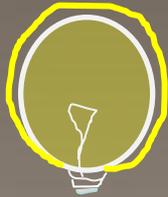
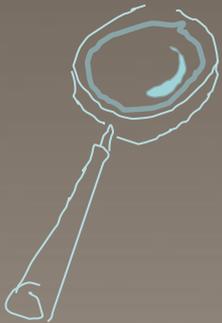
REALIZZAZIONE DI MODELLI

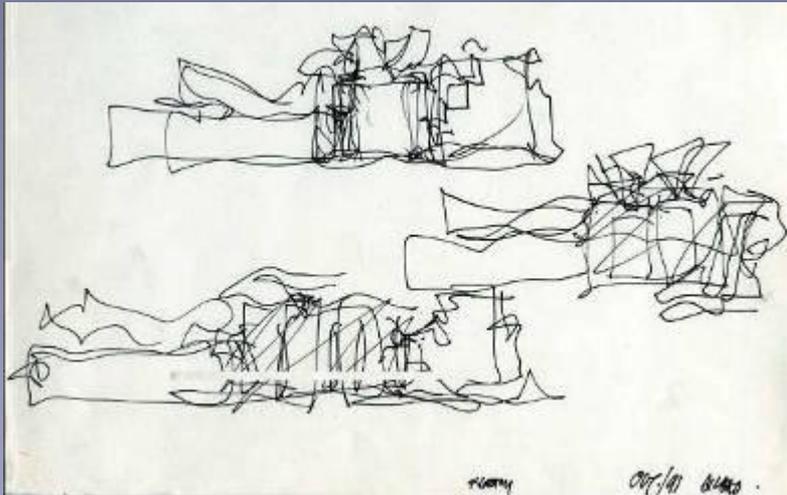
2D - 3D



MODELLI 3D

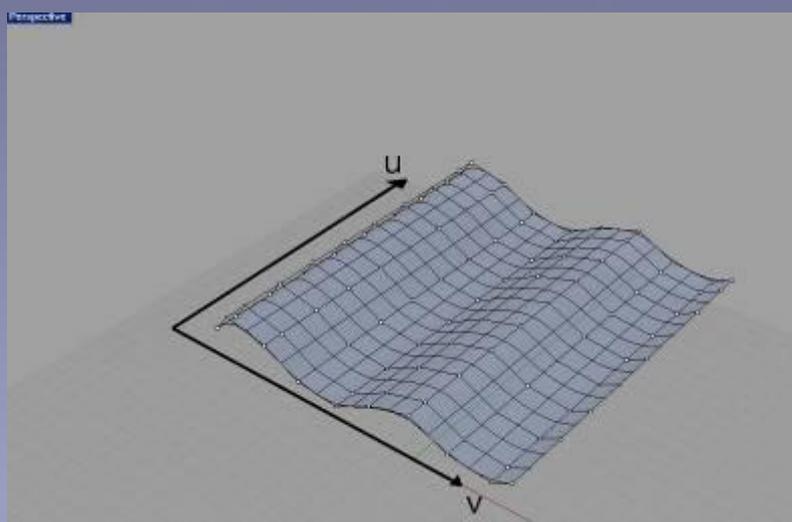
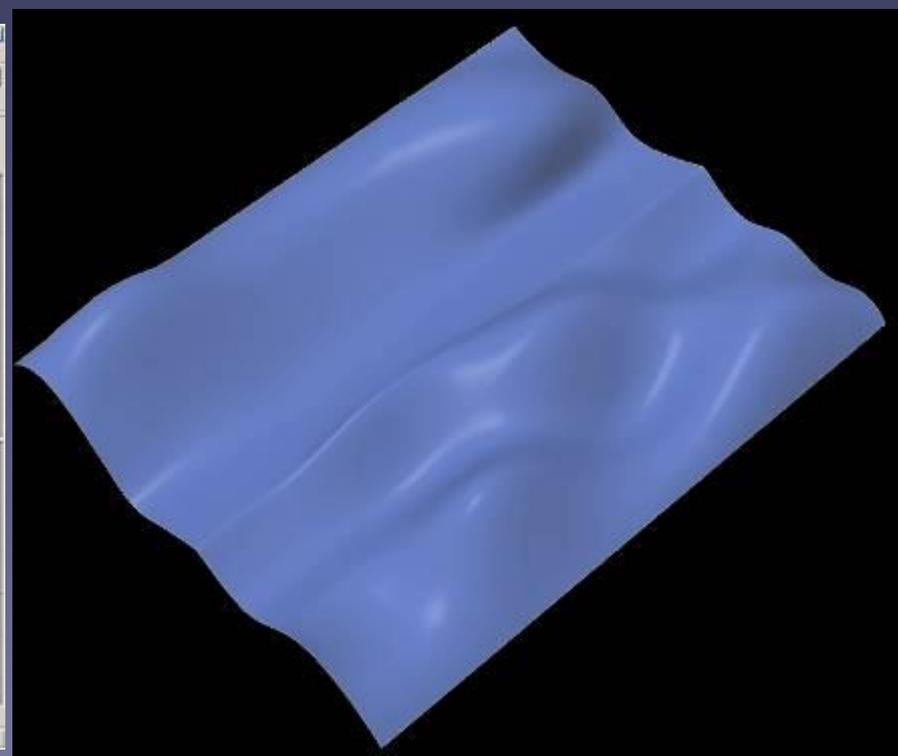
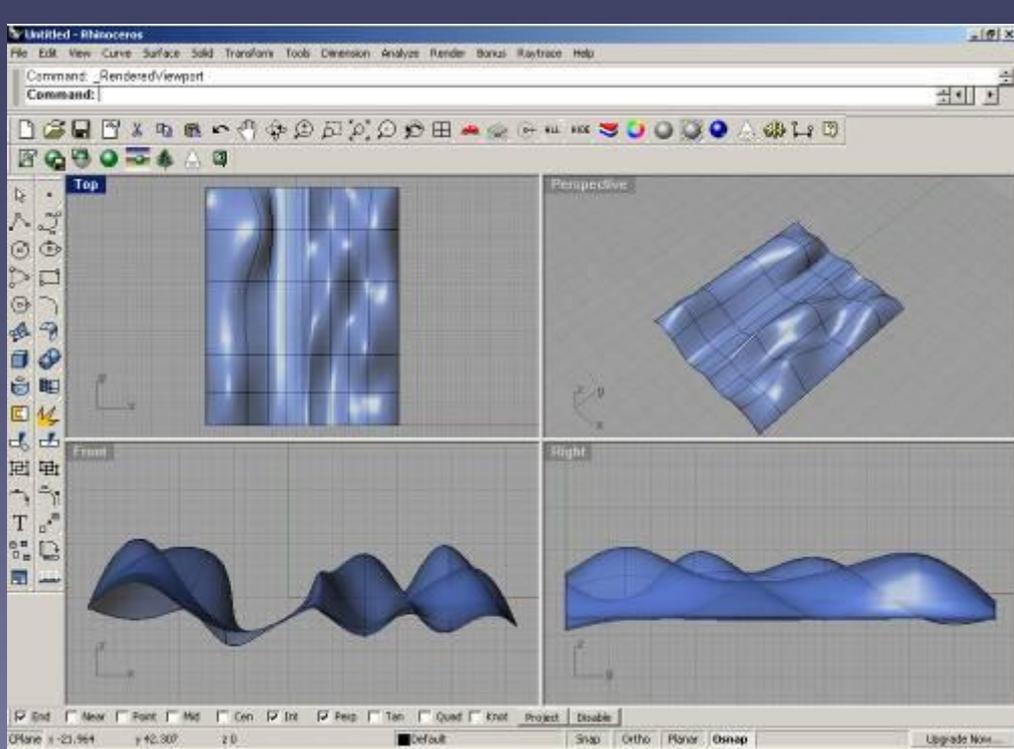
DA FISICO A DIGITALE



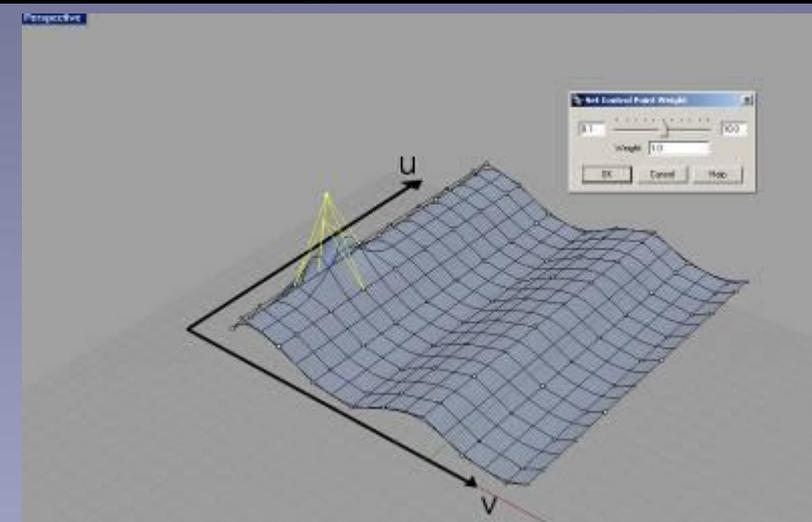


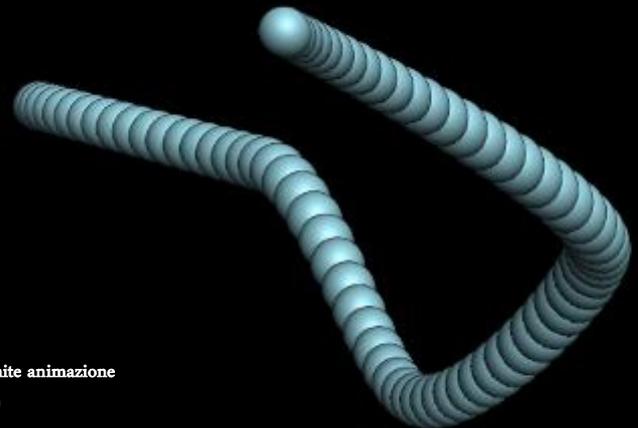
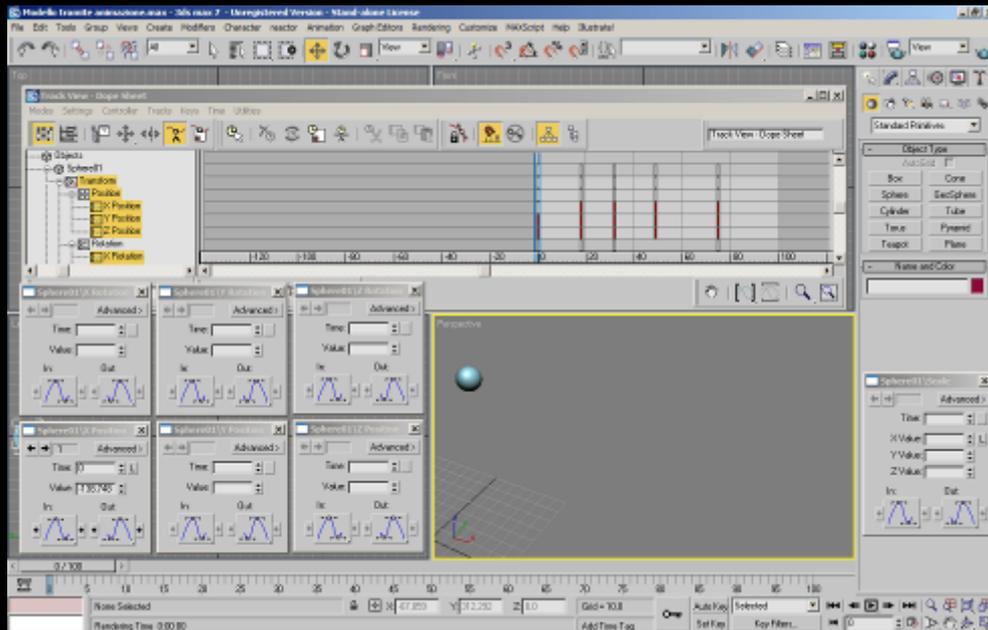
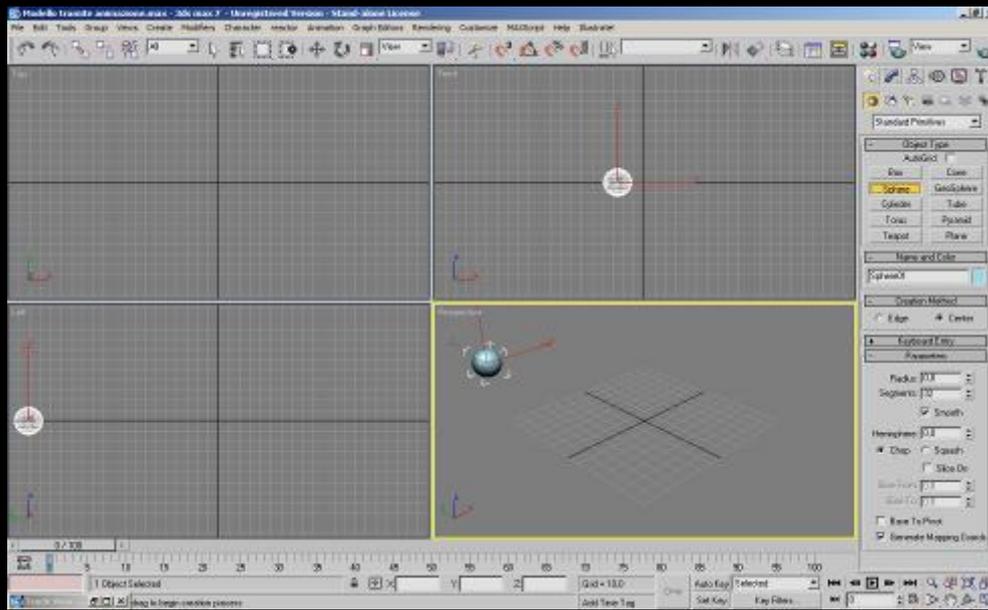
“nel passato c'erano più passaggi tra il mio schizzo e la realizzazione finale: la spontaneità del progetto poteva andare persa prima dell'arrivo in cantiere. Mi sembrava di parlare una lingua straniera, ora invece l'artigiano mi capisce: in questo caso il computer non disumanizza, ma diviene interprete”  
Frank Gehry



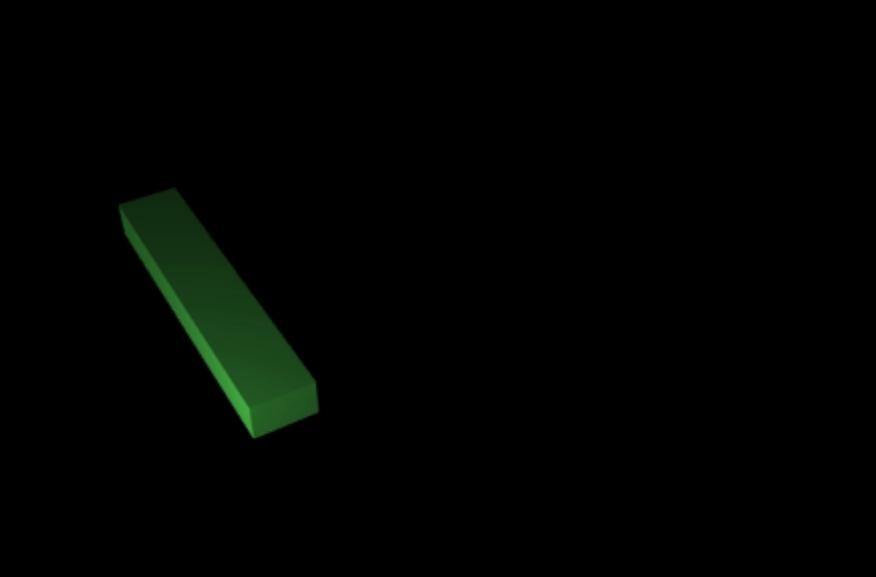
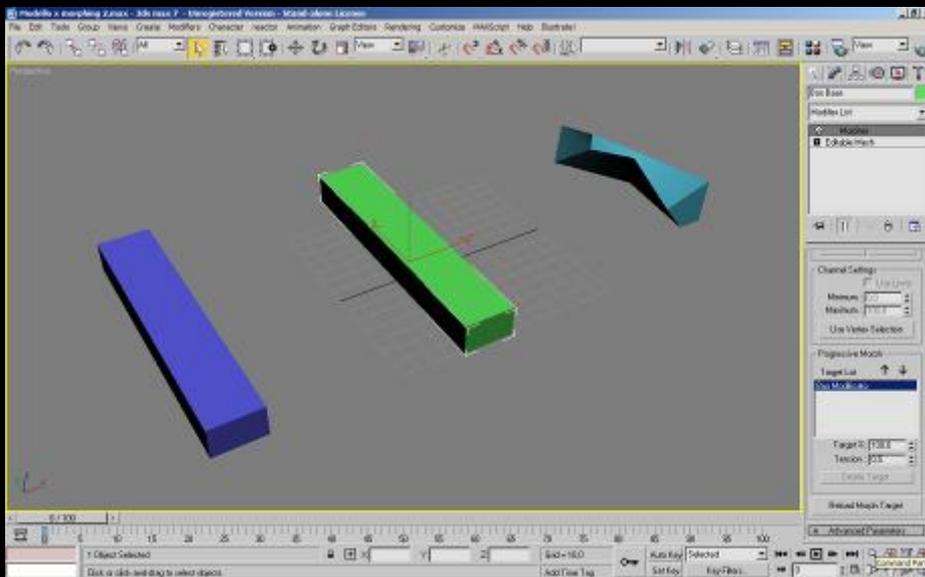
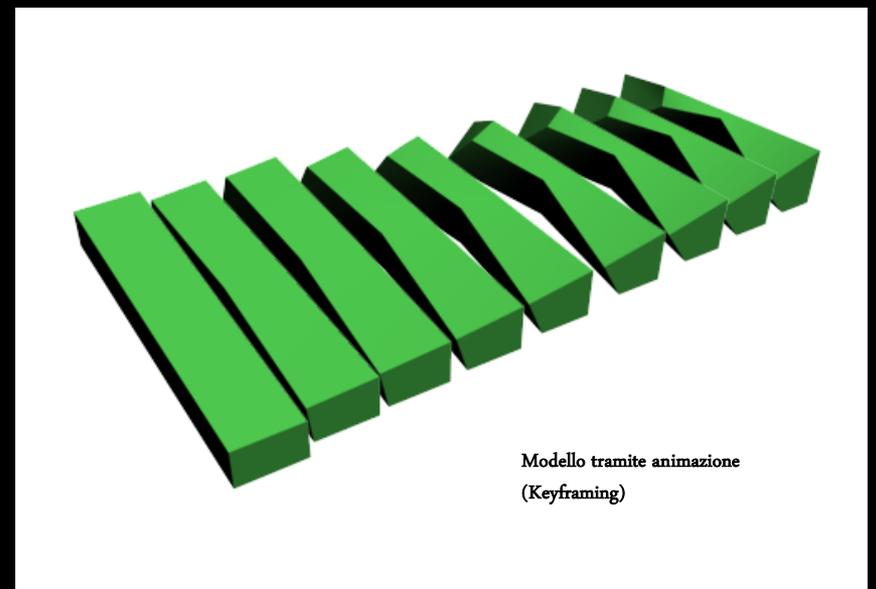
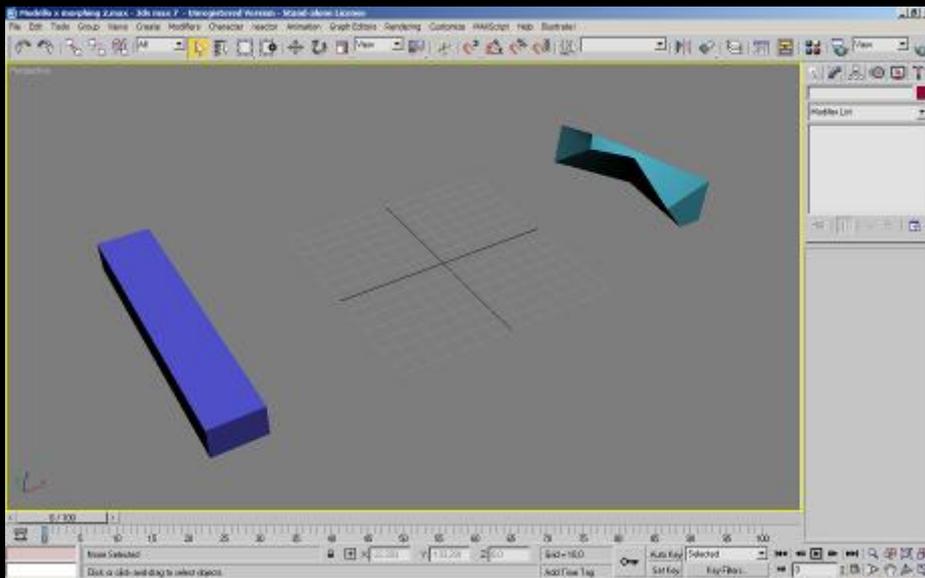


Superfici NURBS  
Non Uniform Rational B-splines

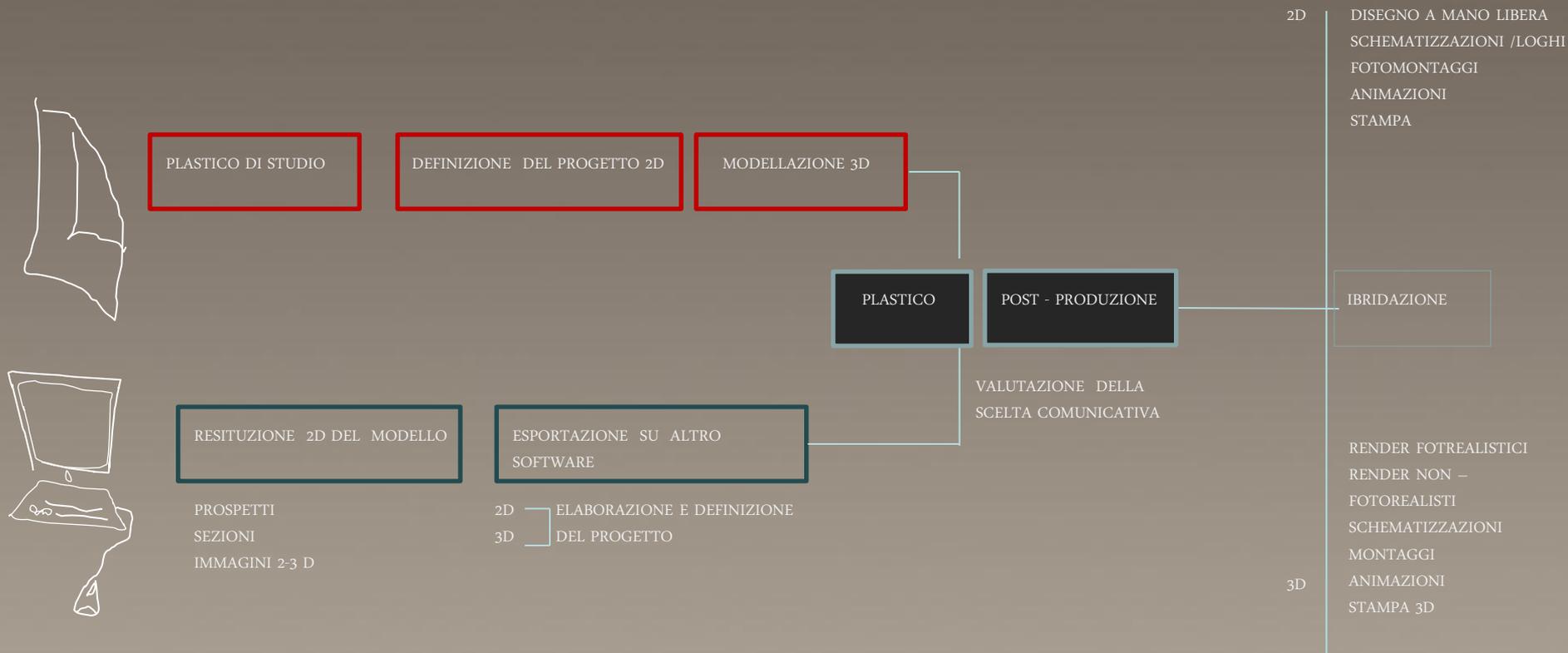


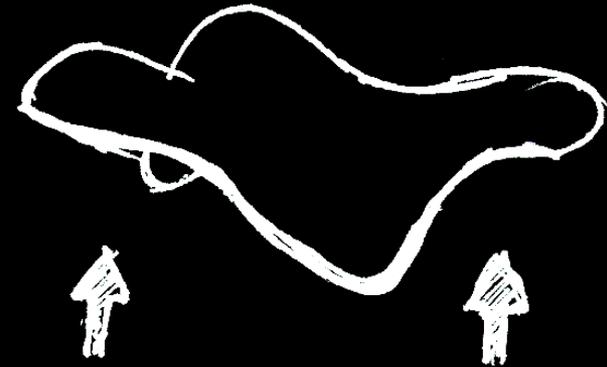


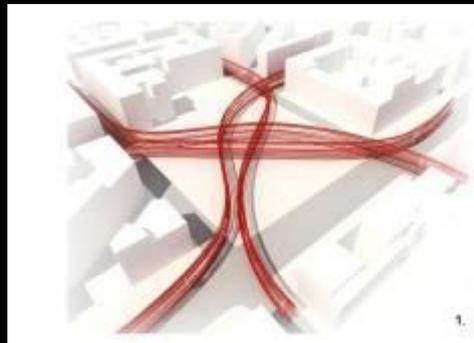
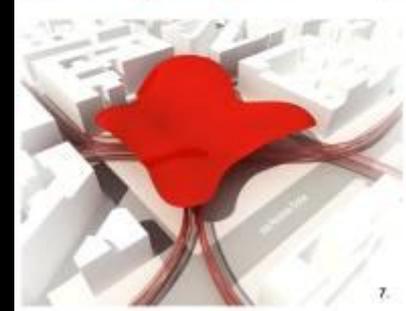
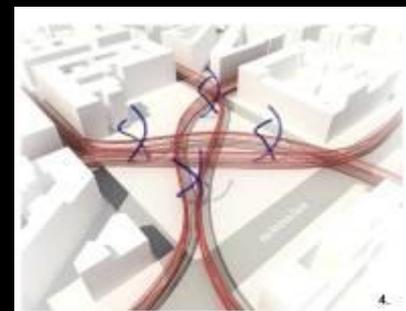
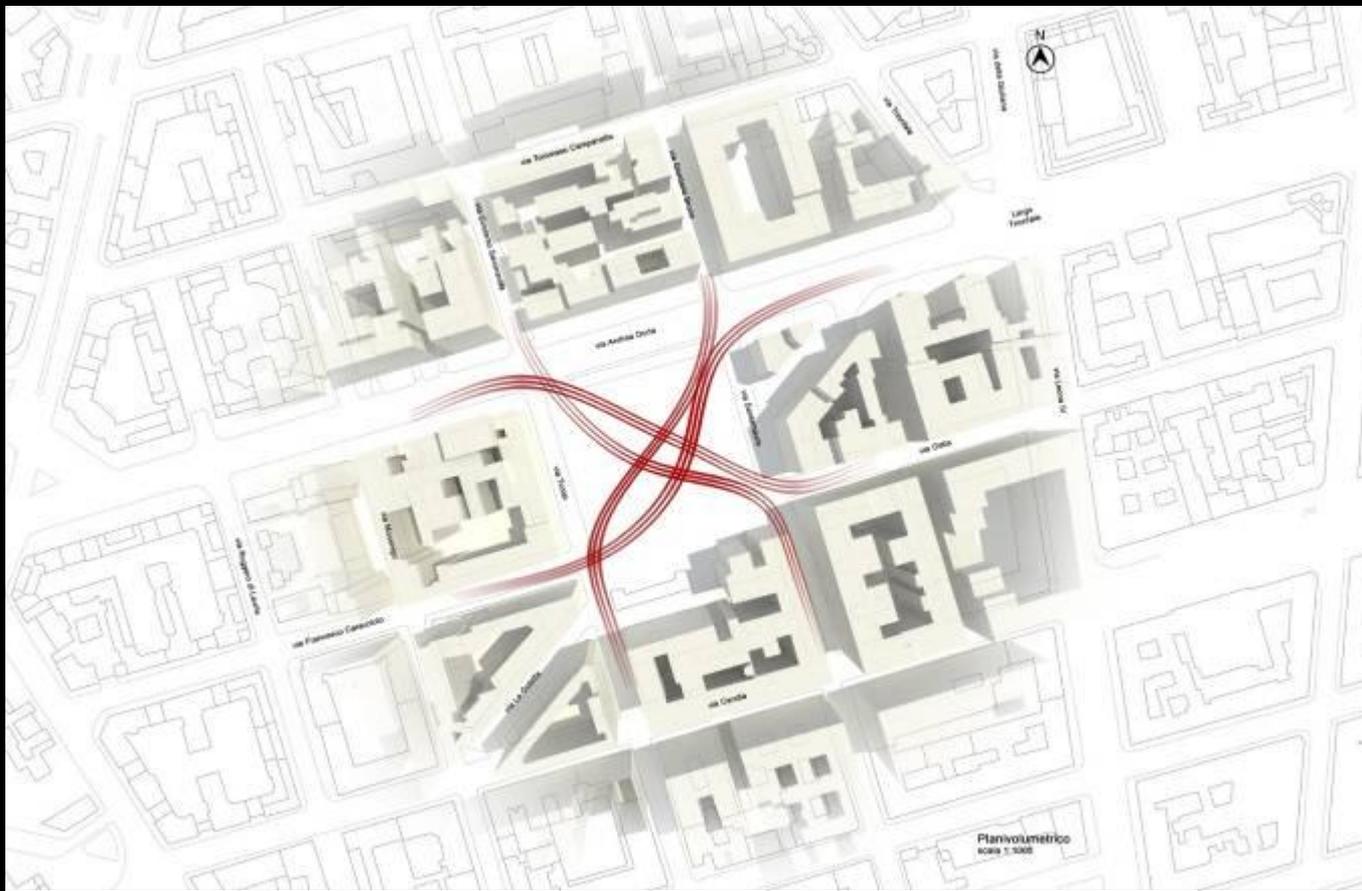
Modello tramite animazione  
(Keyframing)



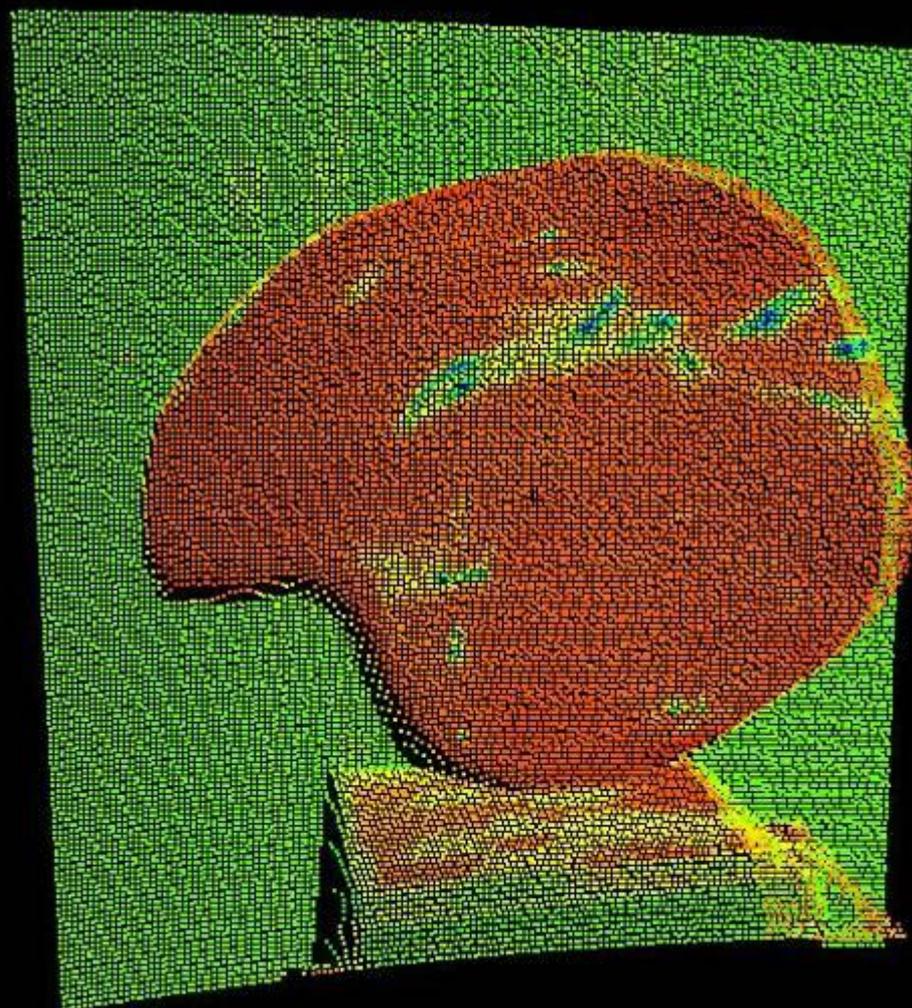
# Sperimentazioni

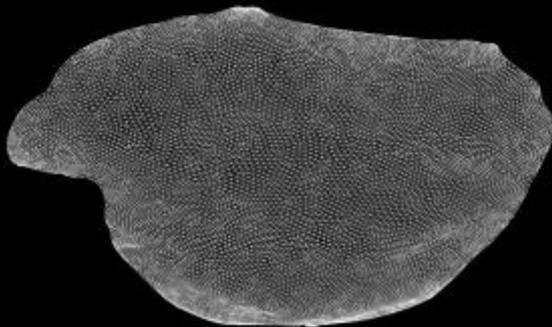




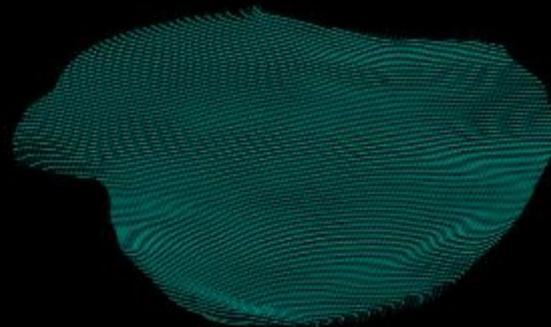




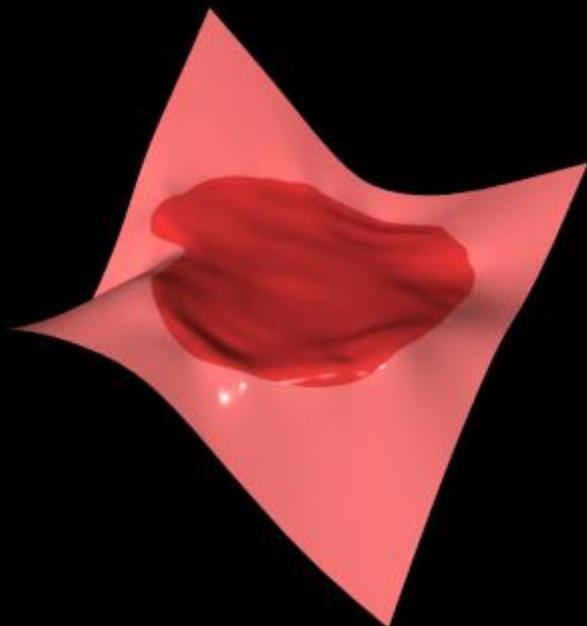




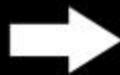
Superficie Mesh scansione 3.  
Vista Wireframe.



Sezioni trasversali e longitudinali della superficie Mesh.

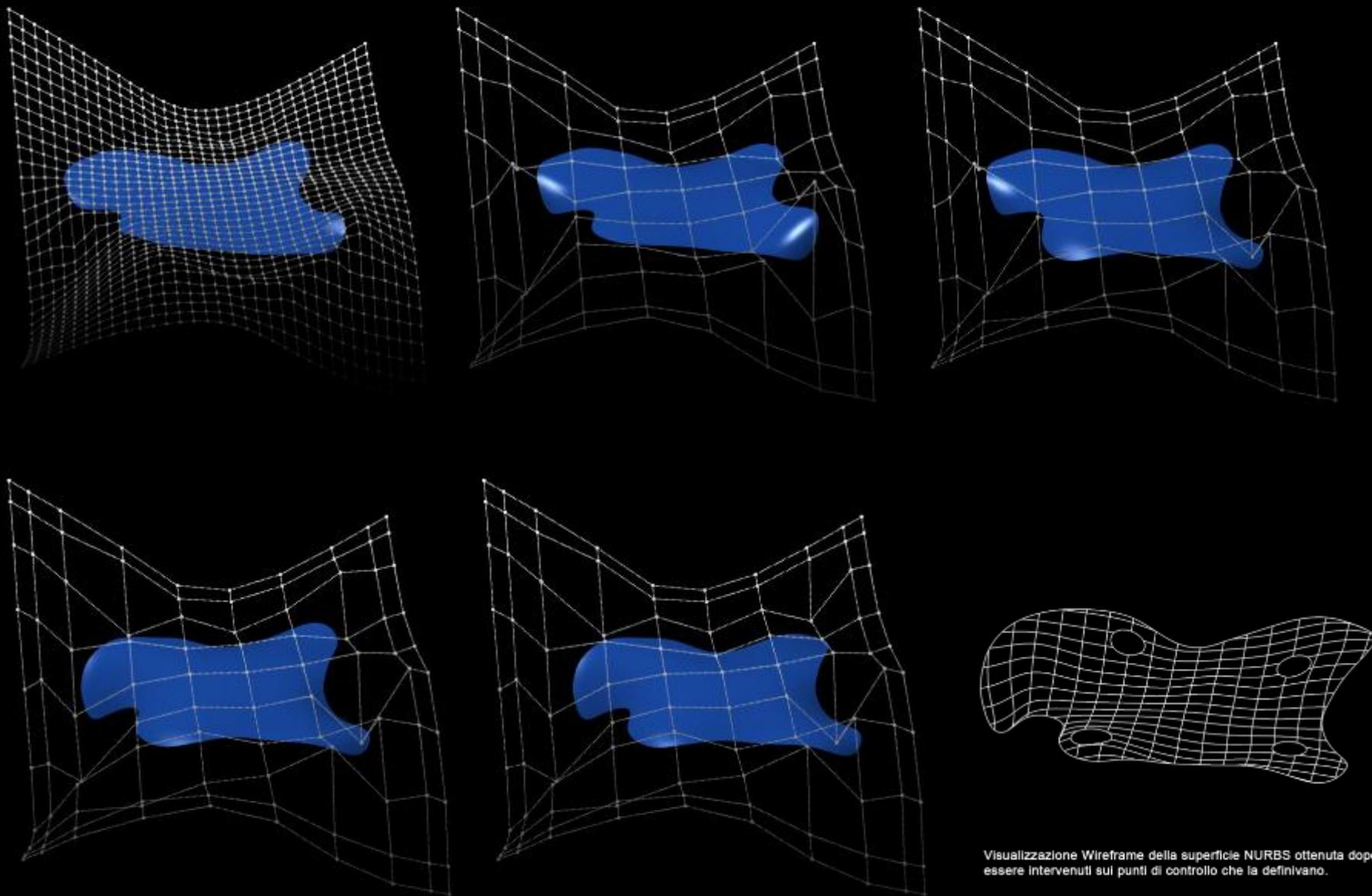


Costruzione superficie NURBS dalle sezioni estratte dalla superficie Mesh. E' stato utilizzato il software di modellazione Rhinoceros.

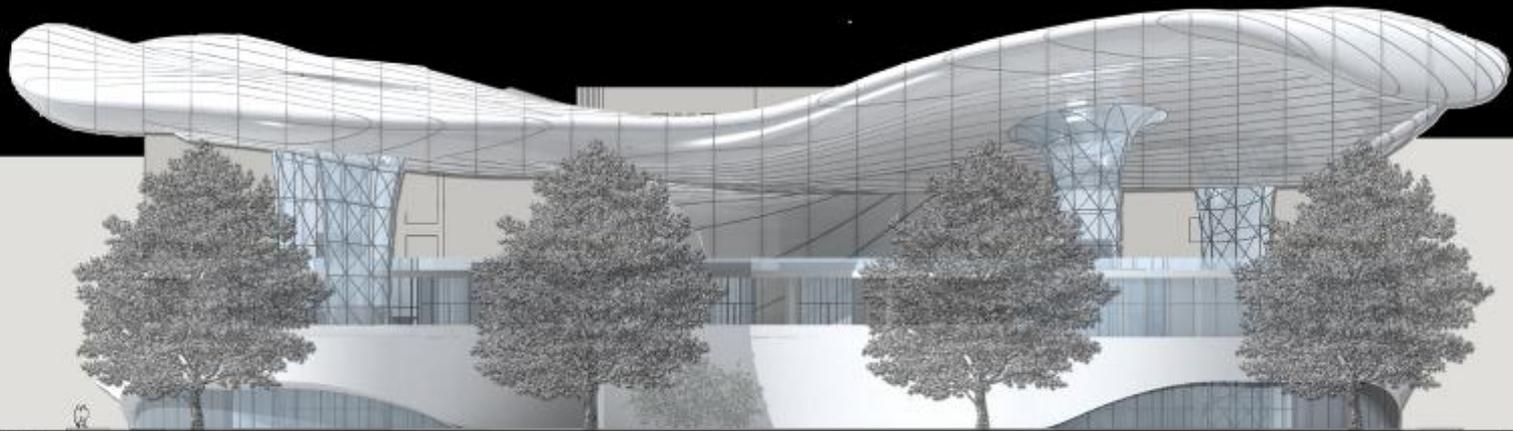


Superficie NURBS dopo aver eliminato i dati in eccesso che si erano ottenuti.

## FASI DI TRASFORMAZIONE DELLA SUPERFICIE NURBS



Visualizzazione Wireframe della superficie NURBS ottenuta dopo essere intervenuti sui punti di controllo che la definivano.

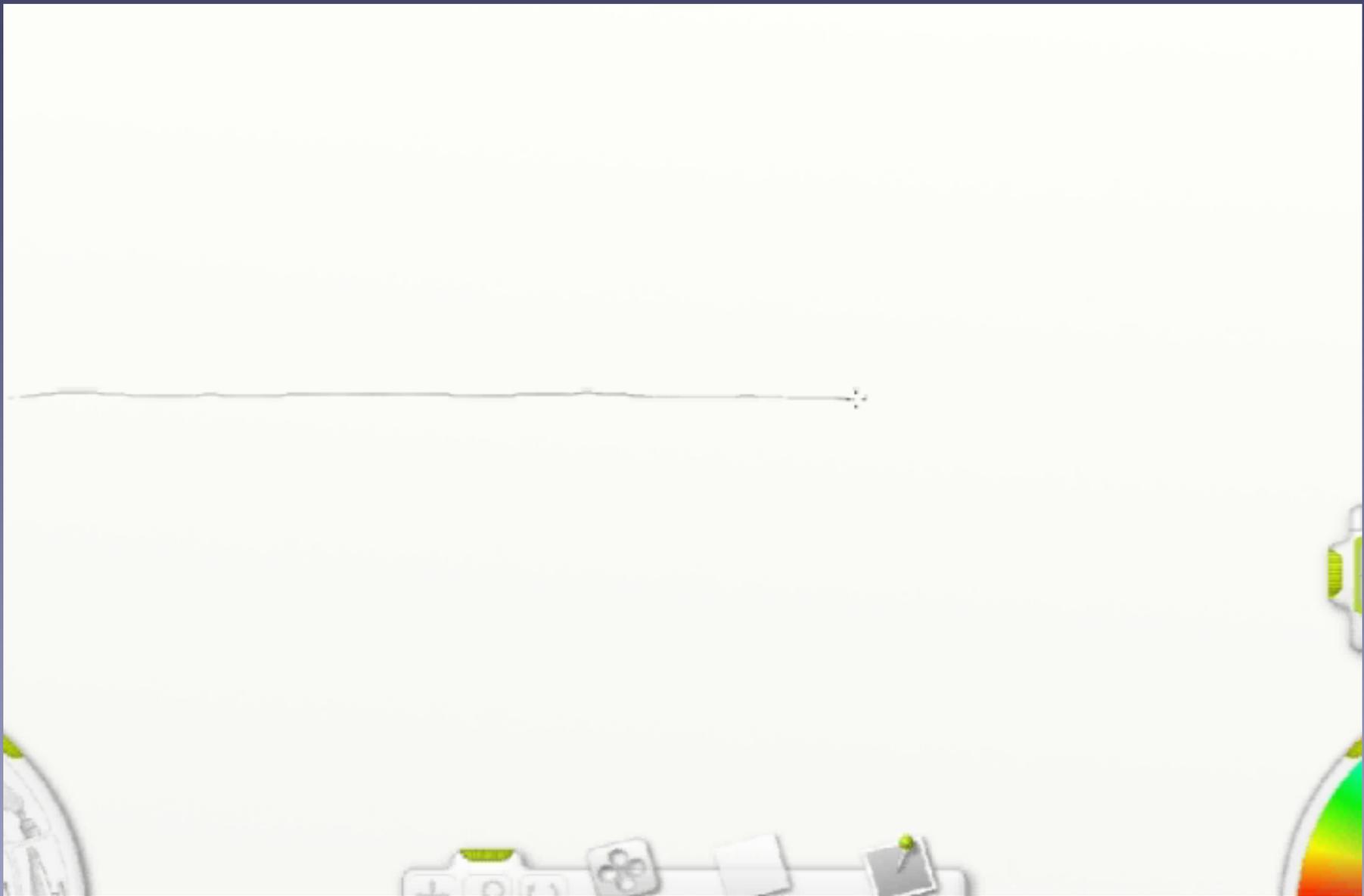


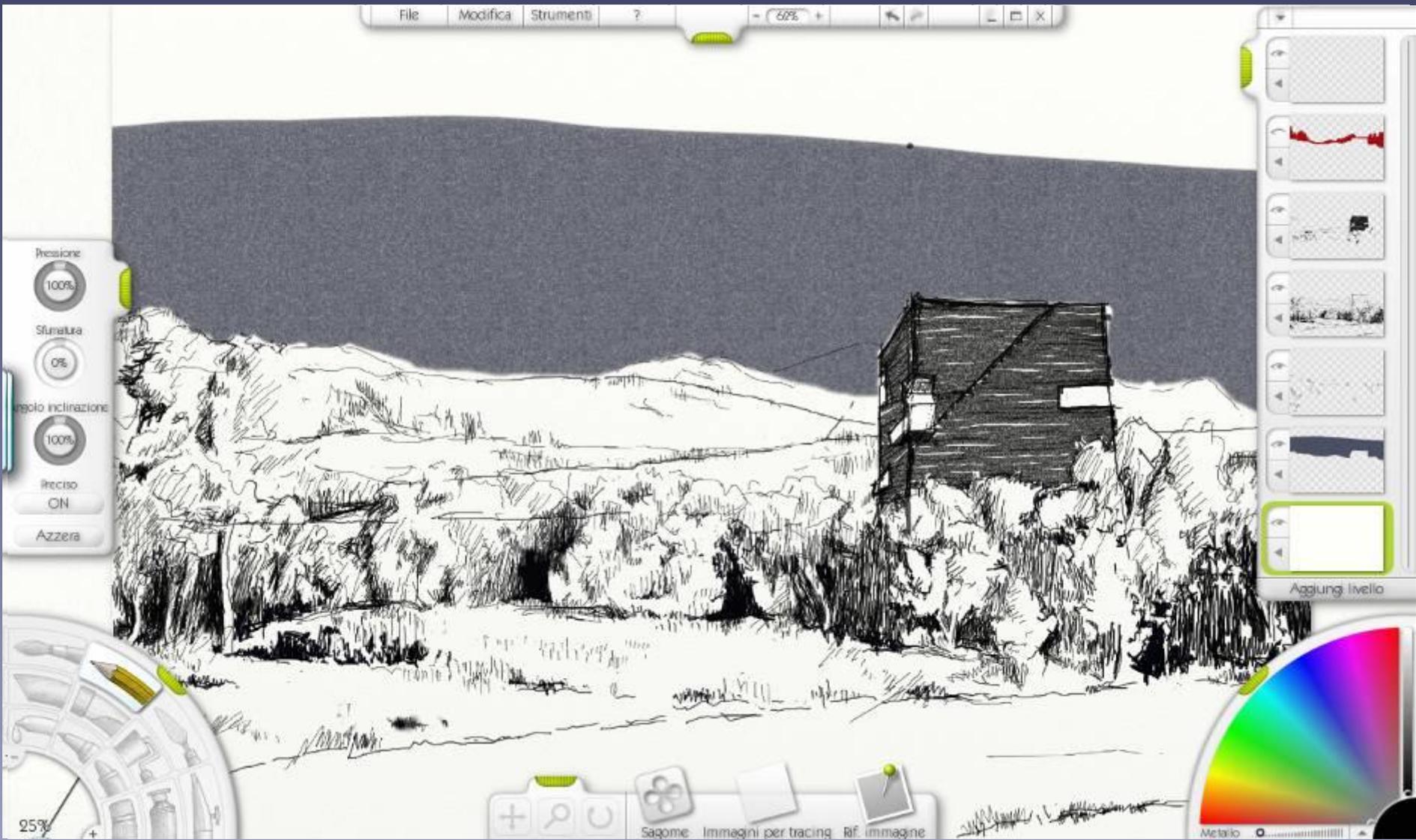
via Santamaura

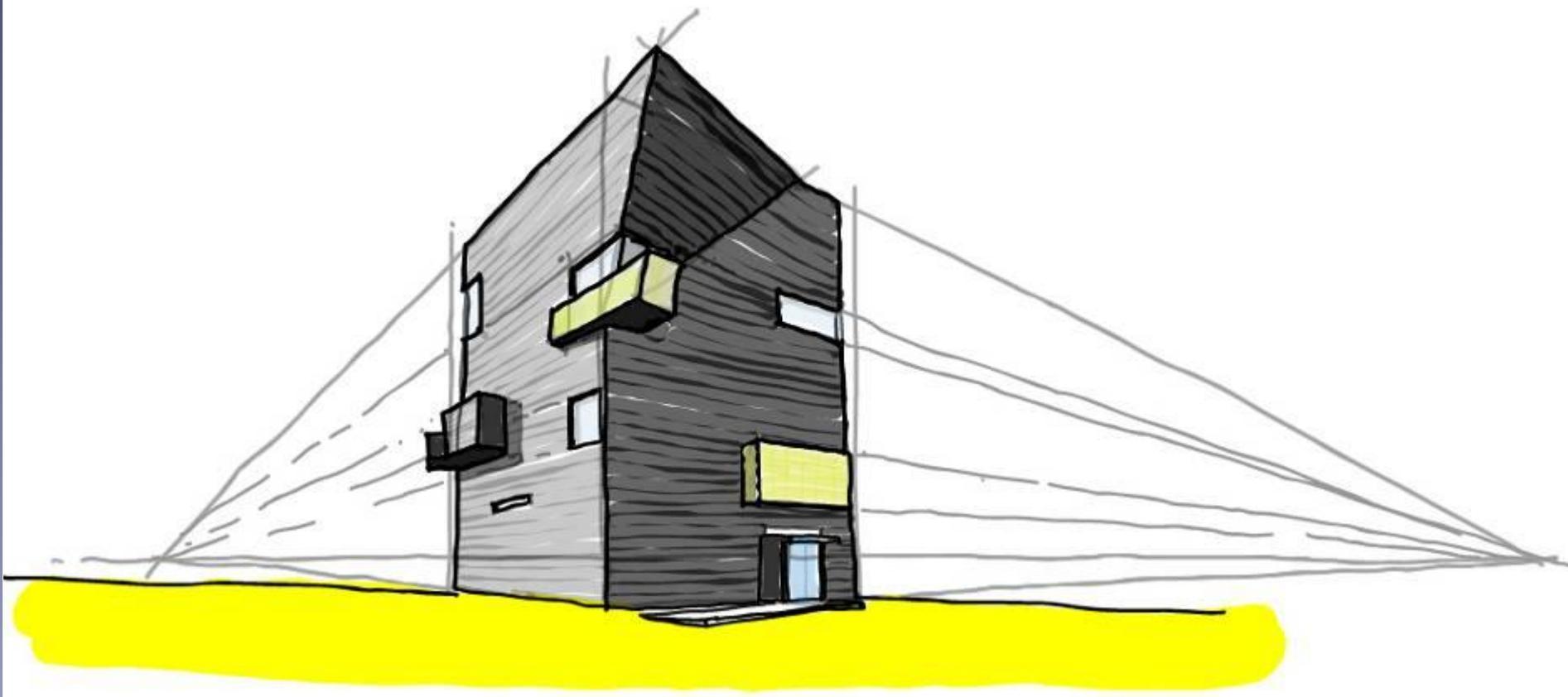
via Tunisi

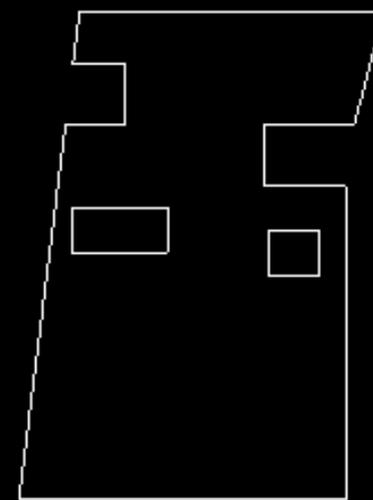
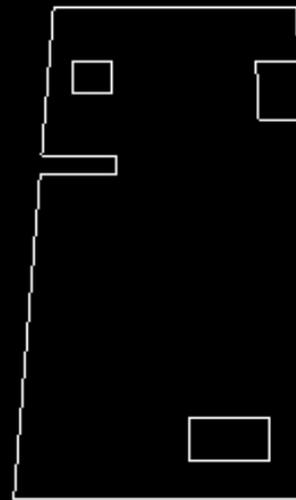
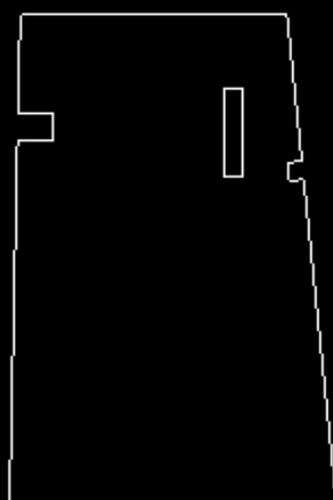
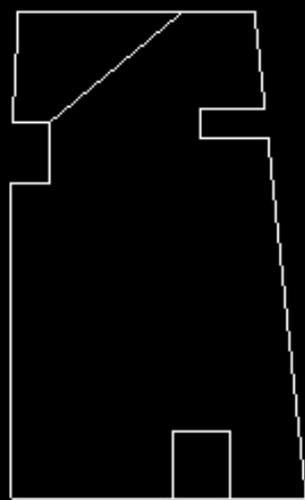
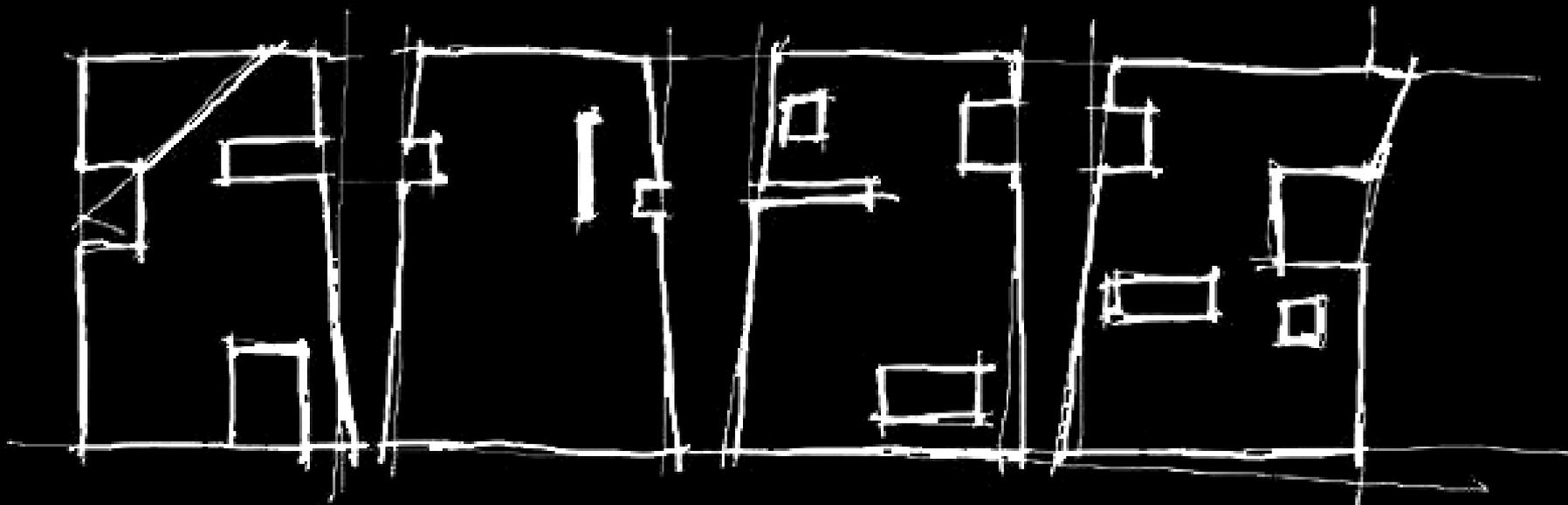


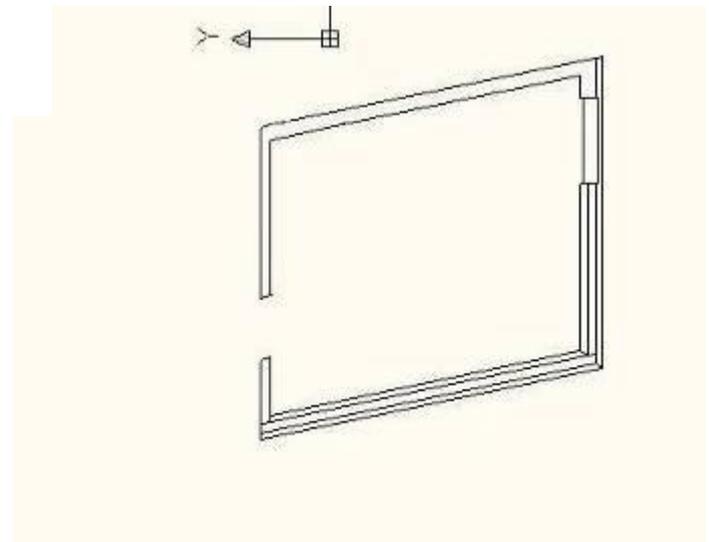
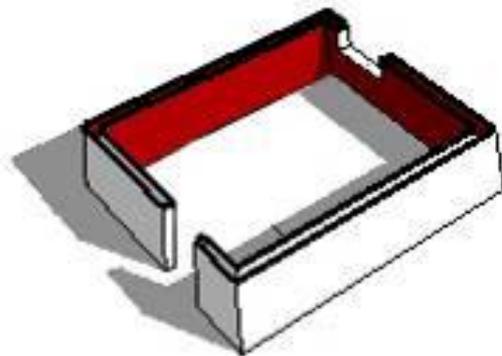
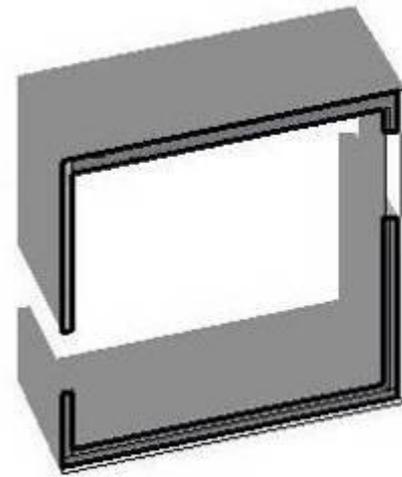
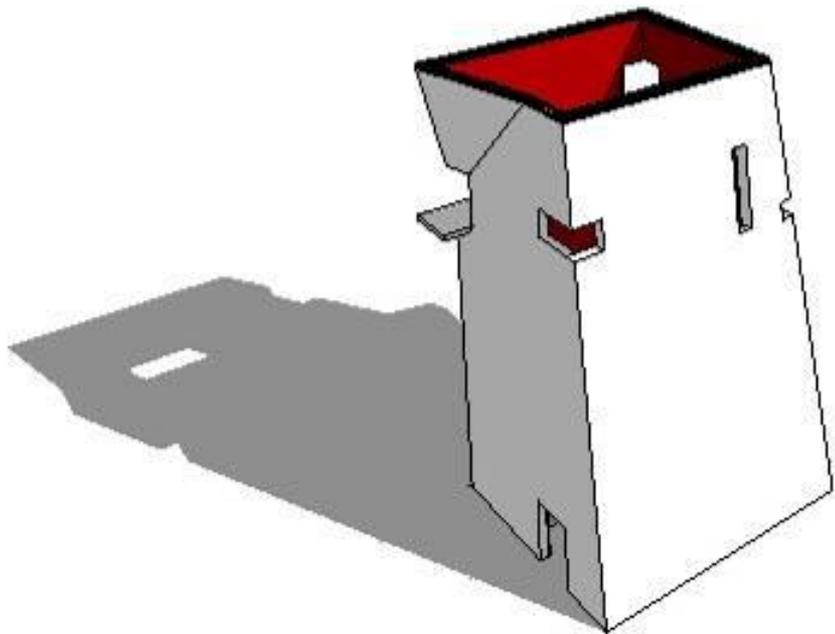














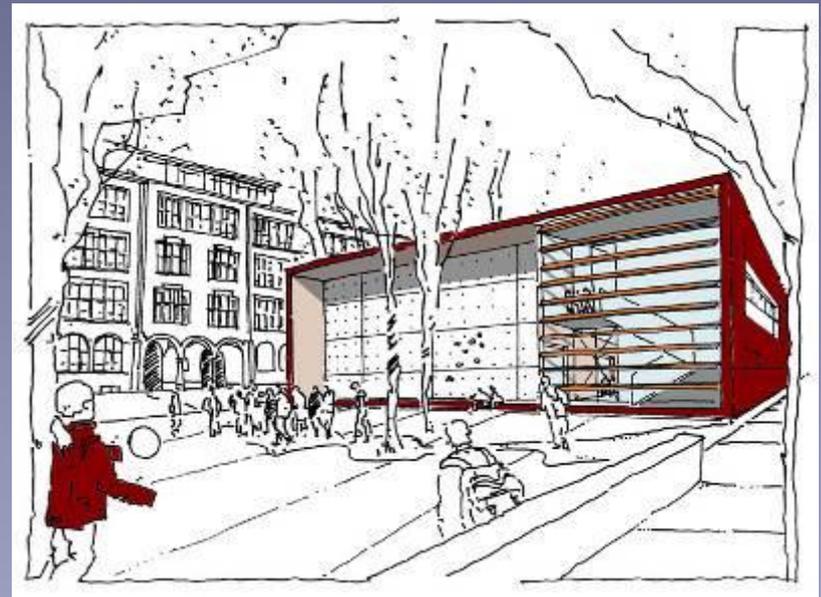
Halliday Clark arch.



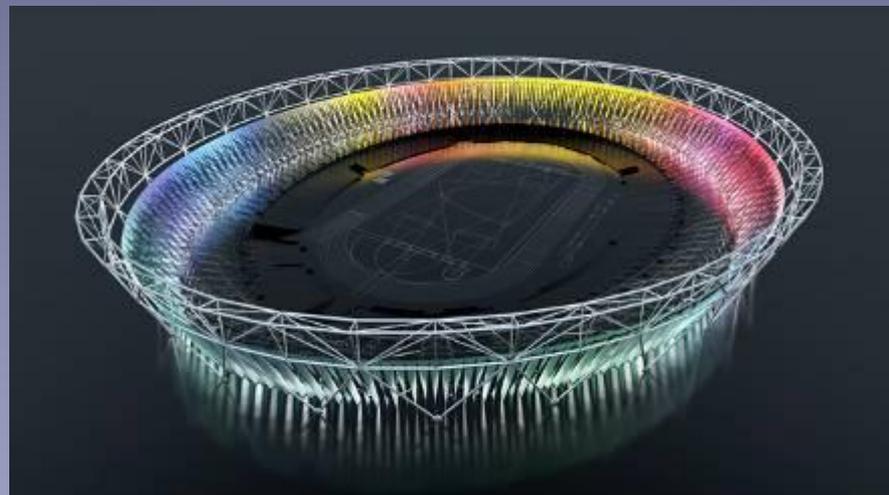
Wael Attili



Ikered arch

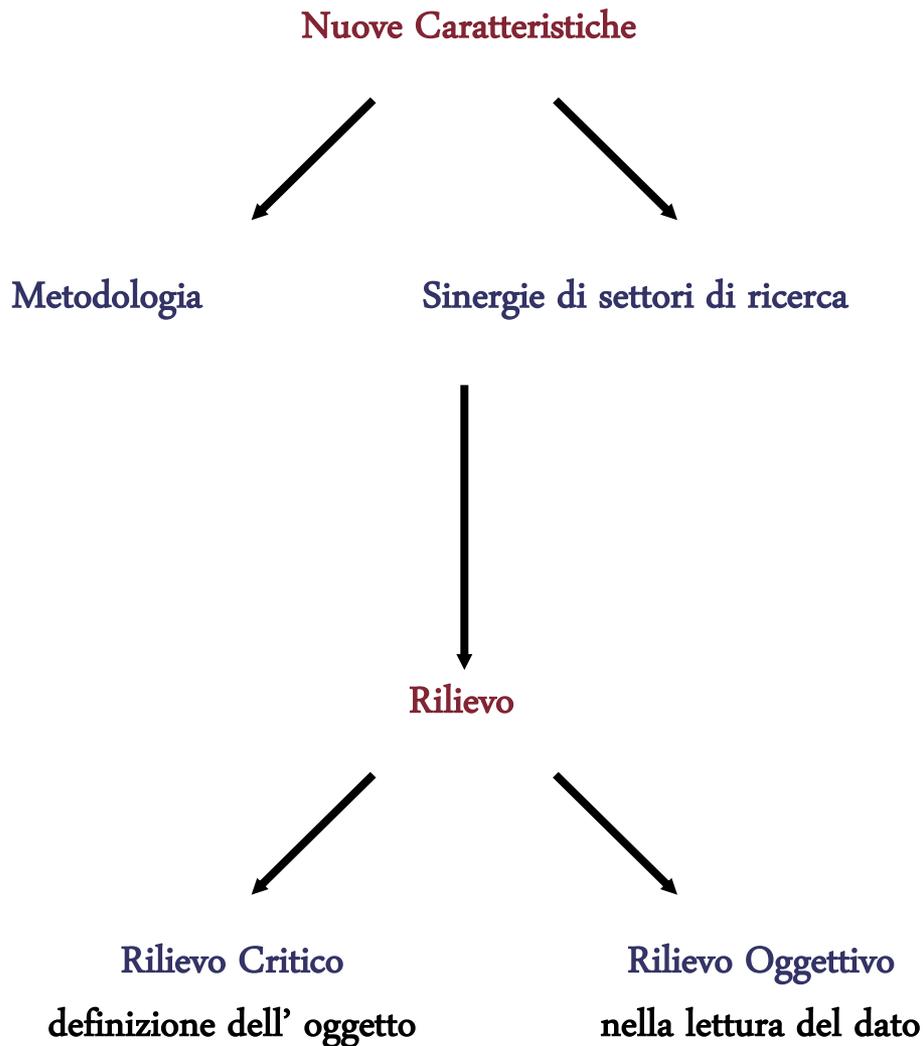


Boilles & Wilson



Squint Opera







Topografia



Fotografia



Long and Short Range Scanners



## Da un Rilevamento Integrato 3D

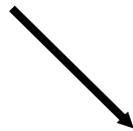
Integrazione di Metodologie



## A un Rilievo Integrato 3D

Integrazione di Modelli

Modelli



2D

3D

Dettagli



Scale Differenti



da 1:1 a 1:∞

# Modelli

Creazione di una documentazione analitica multilivello

## Modelli 2D (Disegni):

Geometrico Proporzionamento Architettonico

## Modelli 3D:

### Dettagli:

Creazione di un layout di dettagli

Modelli 2D

Disegni CAD

Modelli 3D

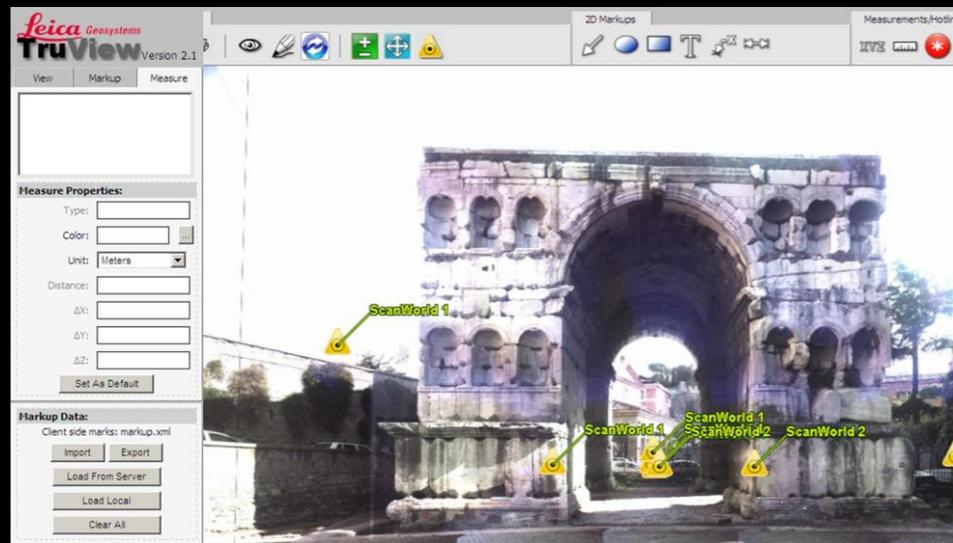
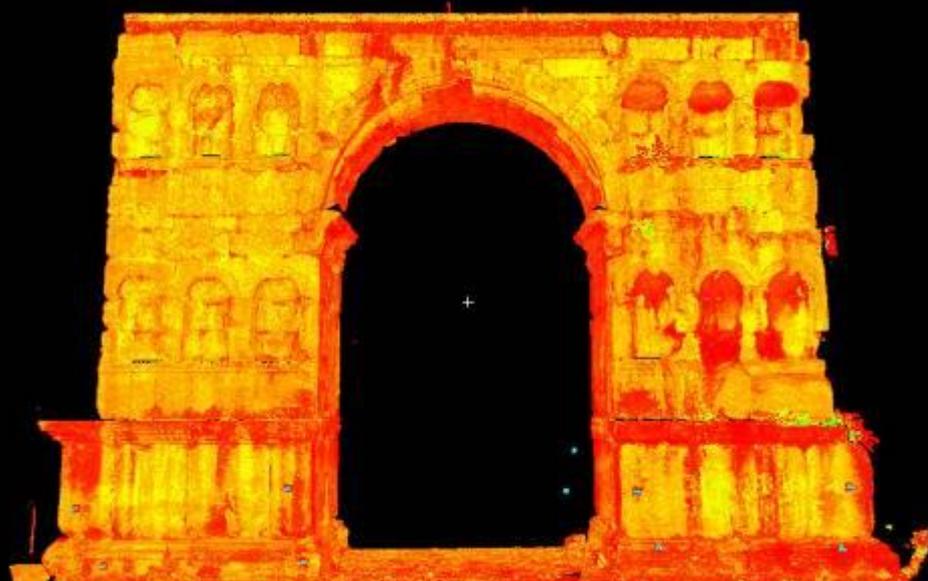
Modelli Virtuali CAD

Prototipo

Modelli Materiali

Publisher

Visualizzazione & Misura della nuvola di punti

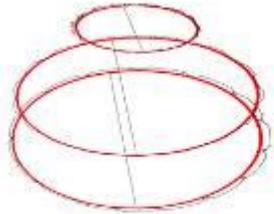
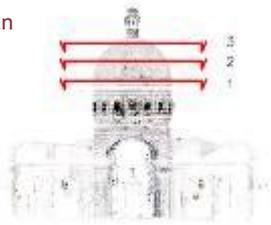




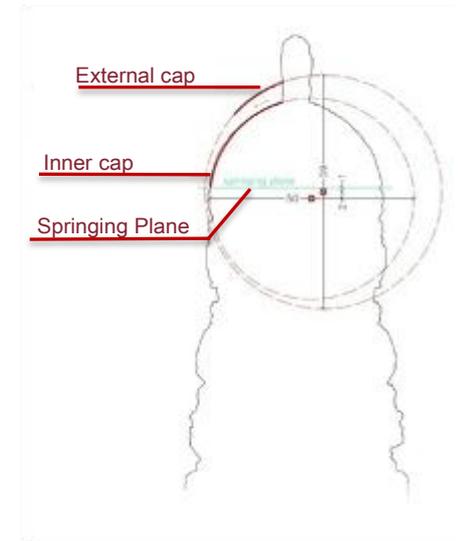
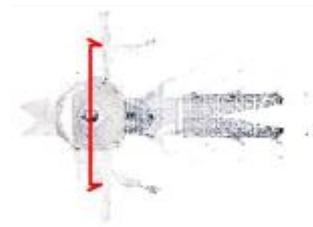


La nuvola di punti

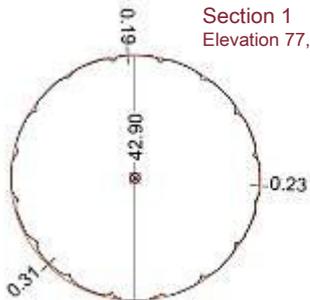
Key plan



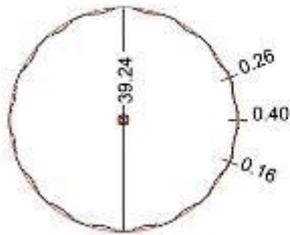
Keyplan



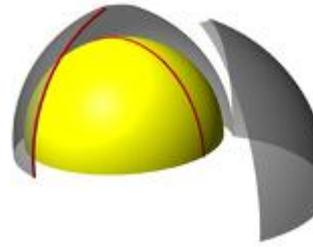
Section 1  
Elevation 77,5 m.



Section 2  
Elevation 88,5 m.

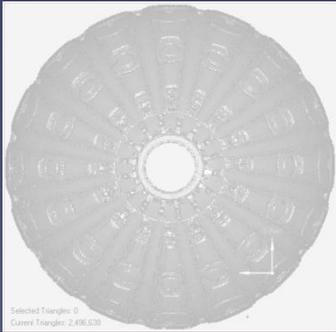


Section 3  
Elevation 98,2 m.



Analisi geometrica della cupola: sezioni orizzontali e verticali

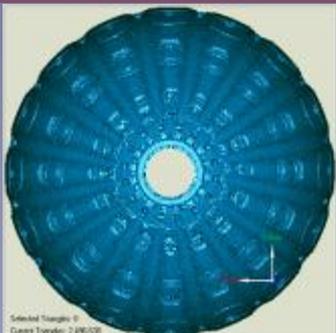




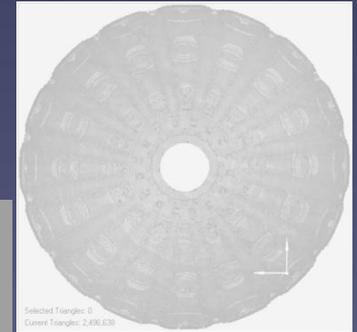
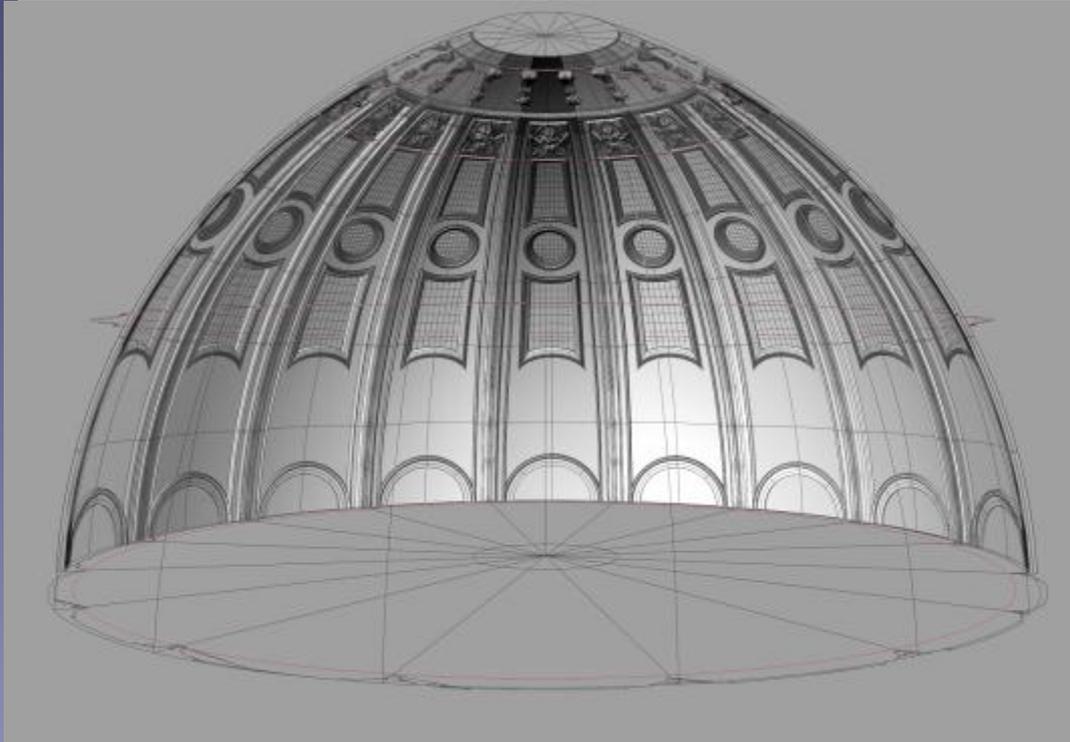
Boundaries and holes



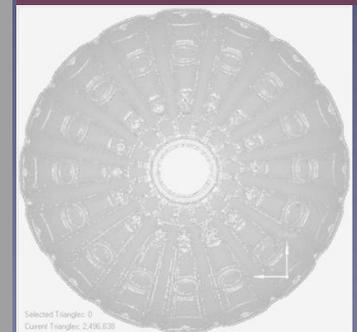
Point cloud



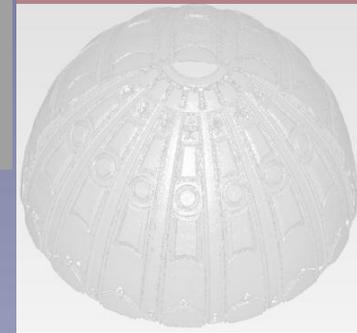
Mesh surface



Texturized mesh surface

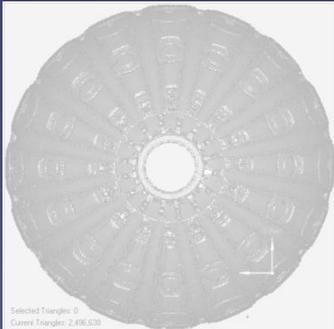


Filling the holes



Geometric Model

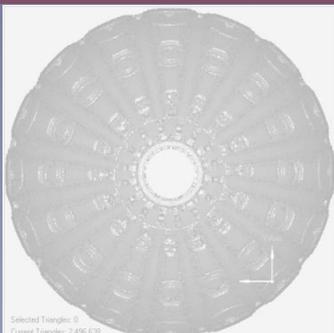
Studi per la costruzione del modello 3D della Cupola



Boundaries and holes



Point cloud



Mesh surface



Texturized mesh surface

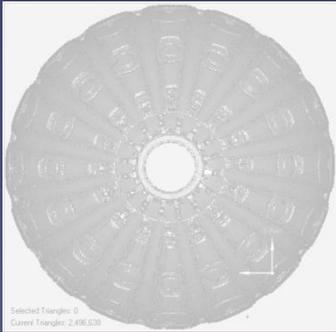


Filling the holes



Geometric Model

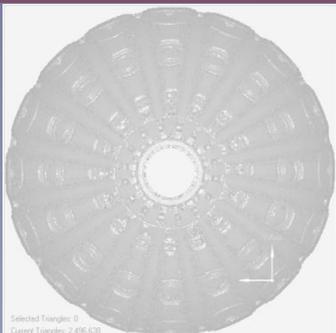
Studi per la costruzione del modello 3D della Cupola



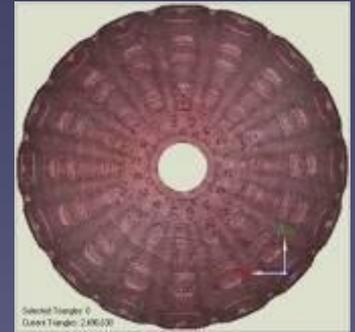
Boundaries and holes



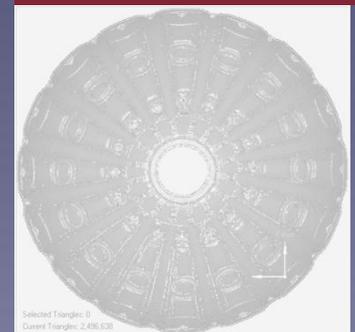
Point cloud



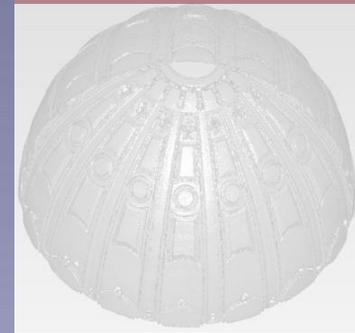
Mesh surface



Texturized mesh surface



Filling the holes



Geometric Model

Studi per la costruzione del modello 3D della Cupola

# PETROS ENI PIETRO È QUI

La Fabbrica di San Pietro in Vaticano celebra

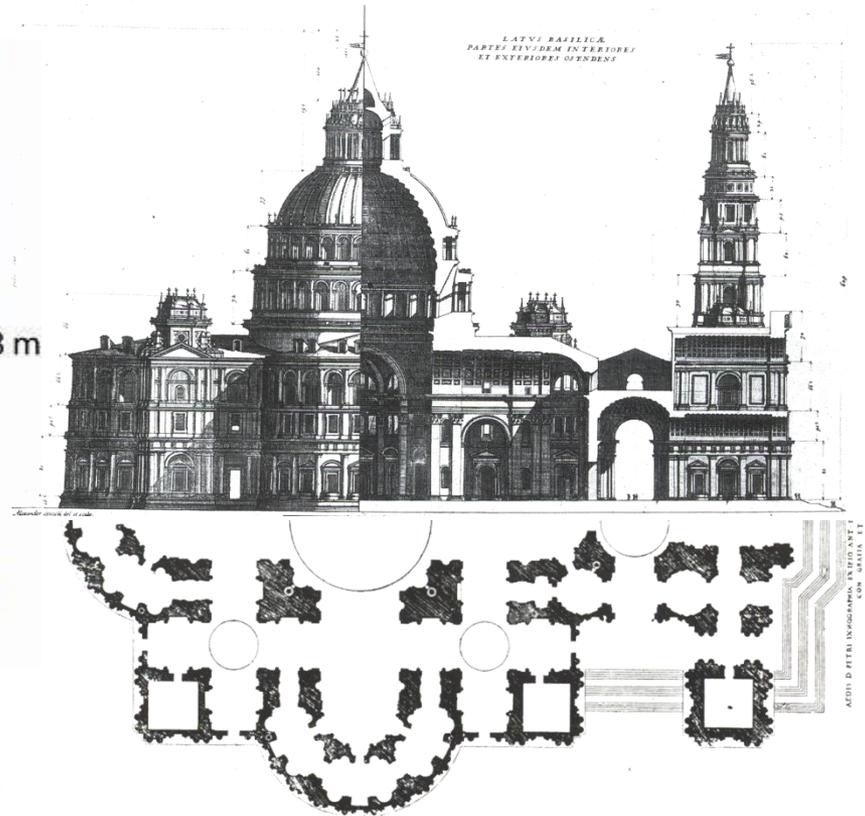
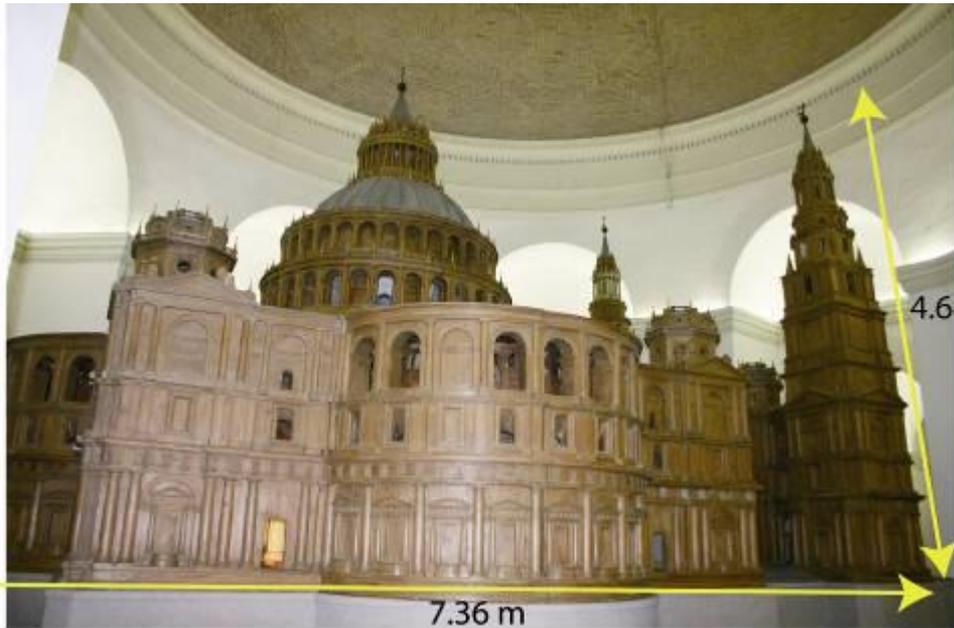
## 500 ANNI DELLA BASILICA DI SAN PIETRO

commentari da  
BRAMANTE  
ANTONIO DA SANGALLO  
RAFFAELLO  
MICHELANGELO  
TIZIANO  
EL GRECO  
CARAVAGGIO  
BERNINI  
REMBRANDT

Braccio di Carlo Magno  
Città del Vaticano  
12 ottobre 2006 - 8 marzo 2007



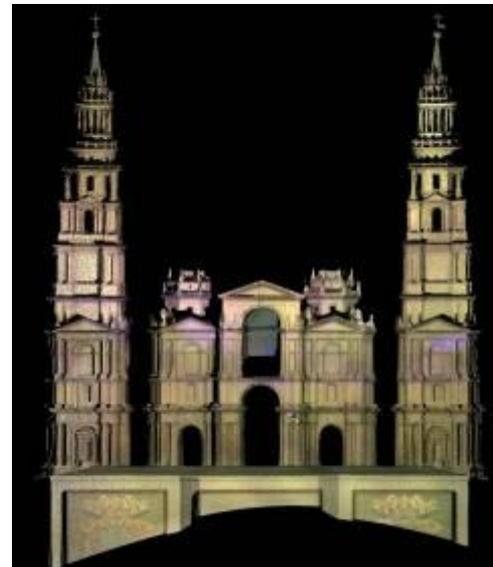
Il San Pietro *non costruito*



Realizzato durante gli anni '30 e '40 del XV secolo con lo scopo di illustrare il progetto che Antonio da Sangallo aveva concepito per il nuovo San Pietro, il Modello è costato quasi 5.000 scudi (il costo di una chiesa vera). Ha dimensioni davvero ragguardevoli: costruito in scala 1:30, è infatti lungo 7.36 m., largo 6.02 e alto 4.68 fino alla cima della cupola. Era inoltre dipinto e dotato di una parte mobile in modo da consentire l'esplorazione anche dell'interno.

Il Progetto di Antonio da Sangallo

		Prospetto	Pianta	Sezione
Ordine dorico (misure in mm)	Trabeazione			
	Capitello			
	Fusto			
	Base			

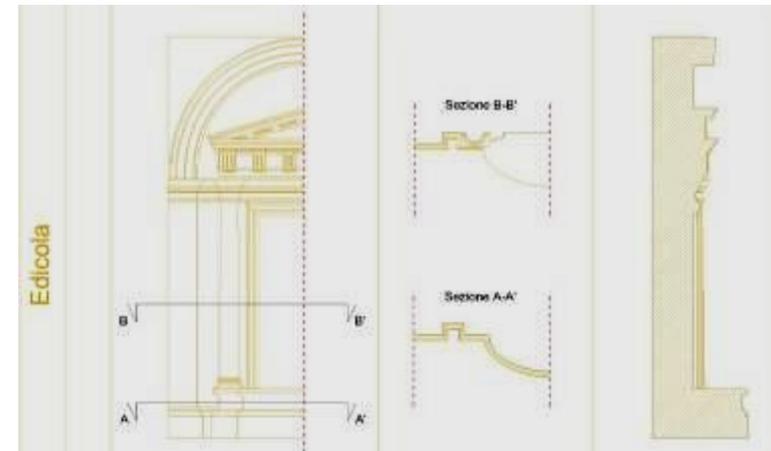


Nuvola 3D ▲



▲ Dettaglio del primo ordine del campanile  
Analisi morfologica e dimensionale dell'edicola ▼

◀ Analisi morfologica e dimensionale dell'ordine dorico



Acquisizione e analisi dei dati

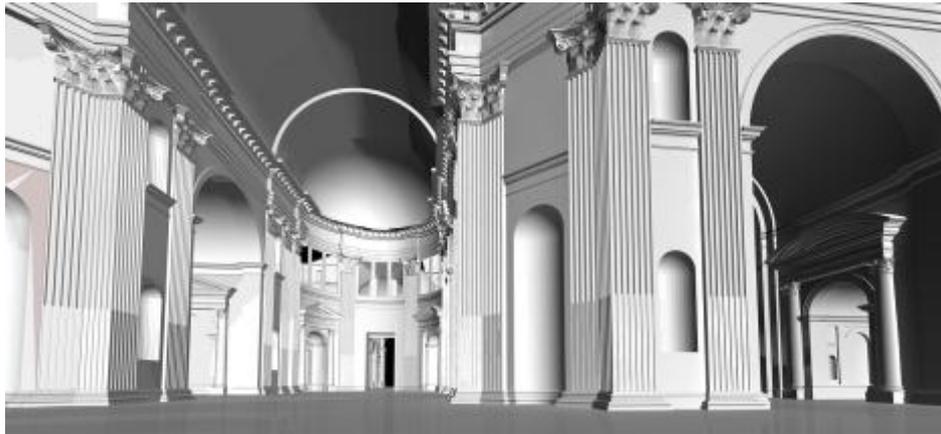
Il montaggio  
degli elementi



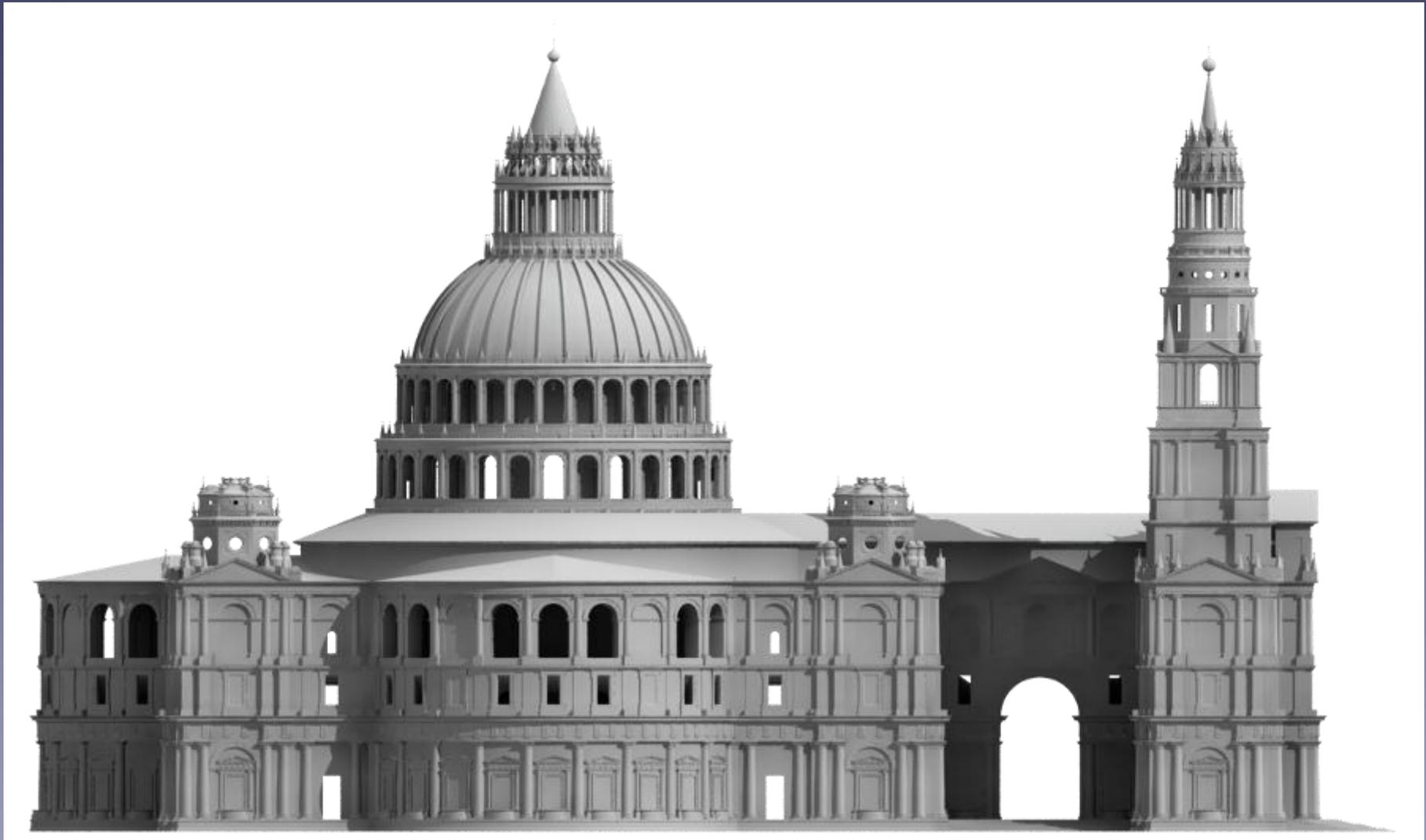
“... cieca di lumi ...”



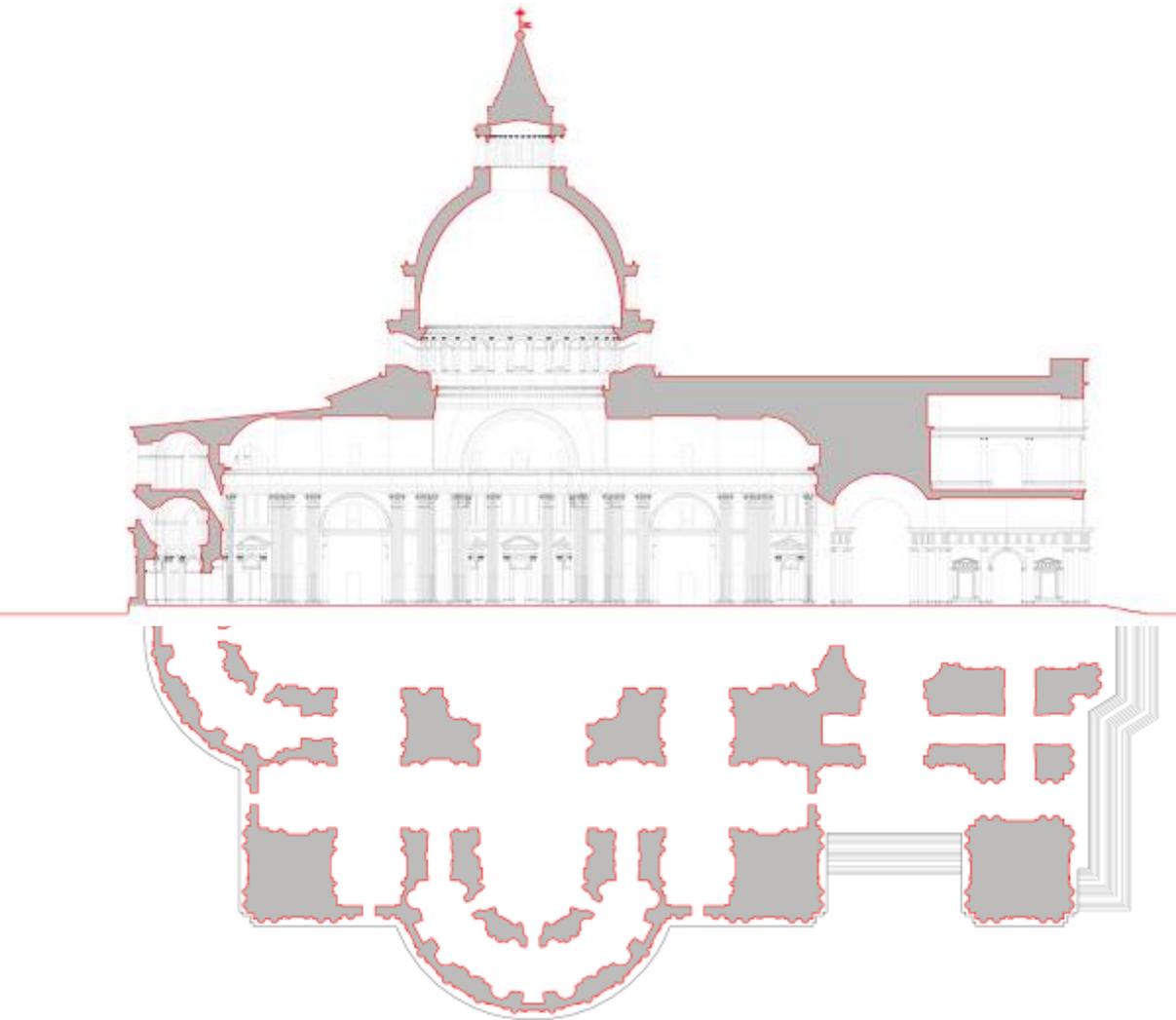
studio dell'illuminazione interna



La costruzione della replica virtuale: allestire la scena



La costruzione della replica virtuale: il modello finale



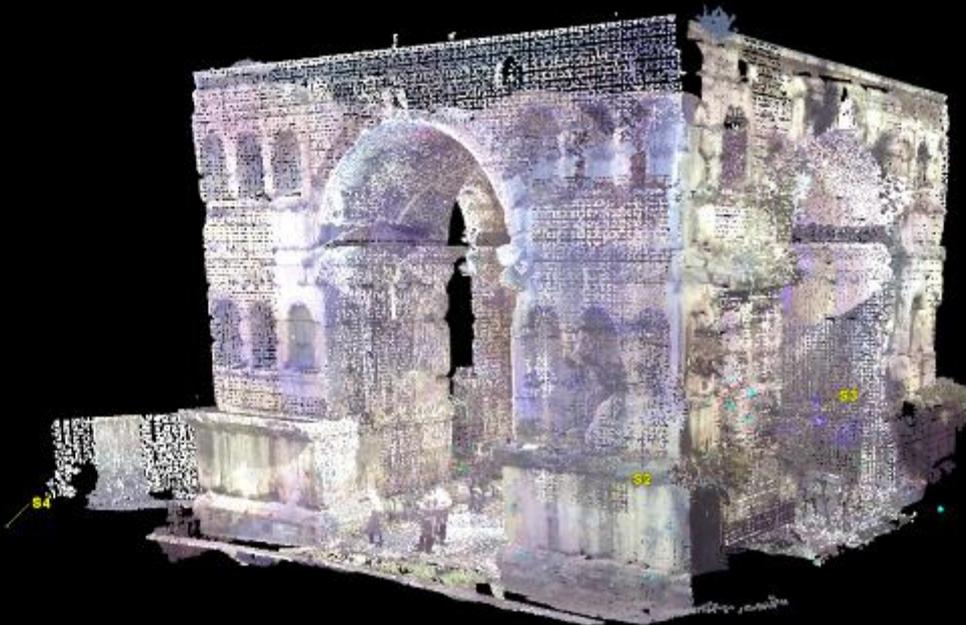
La costruzione della replica virtuale: il modello finale

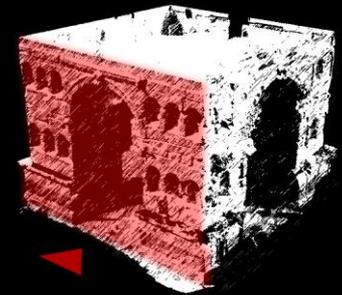


La replica materiale

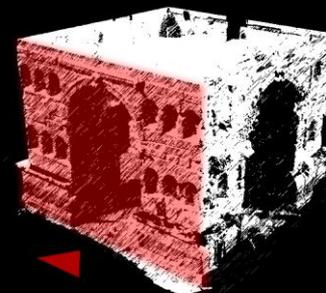
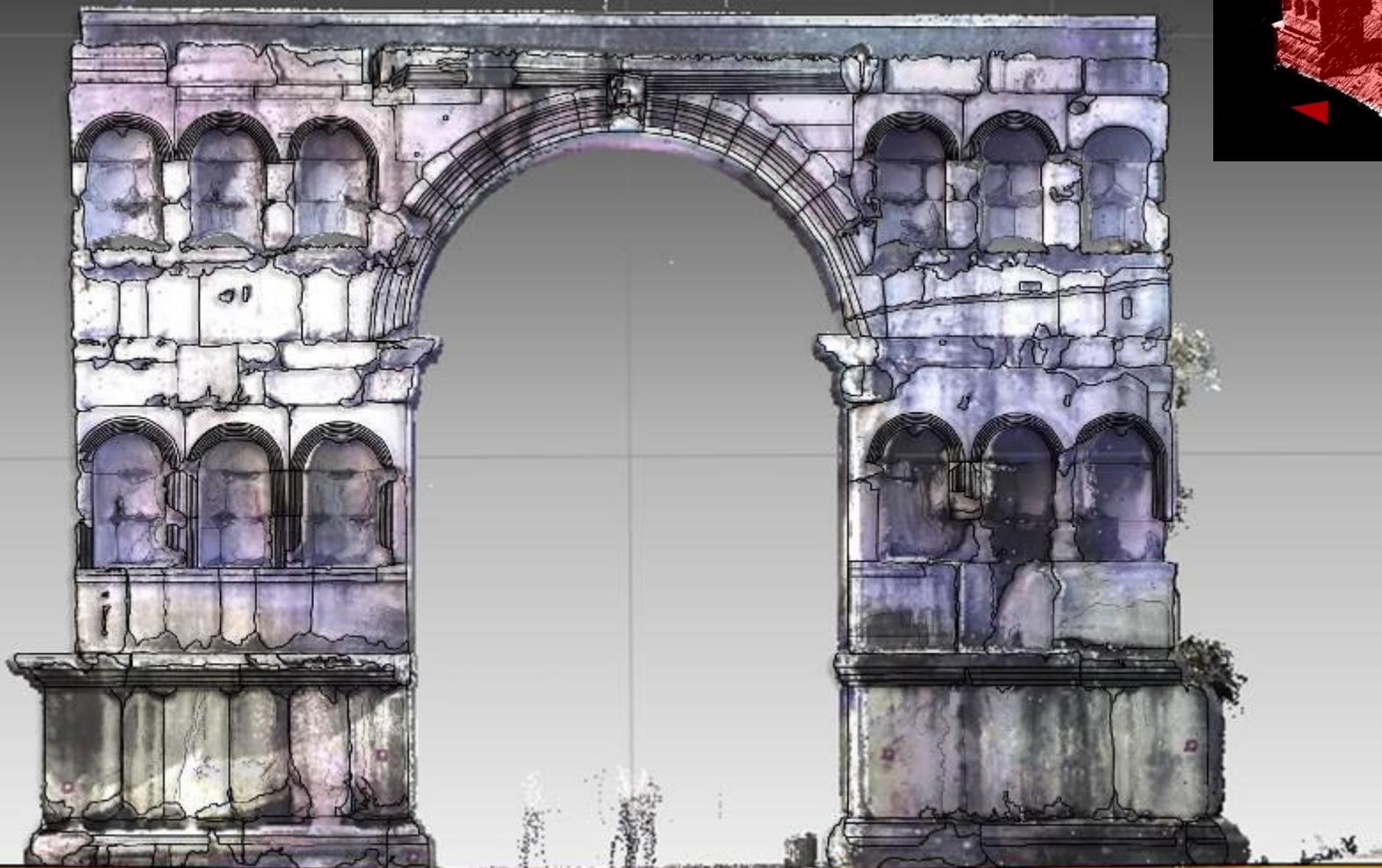




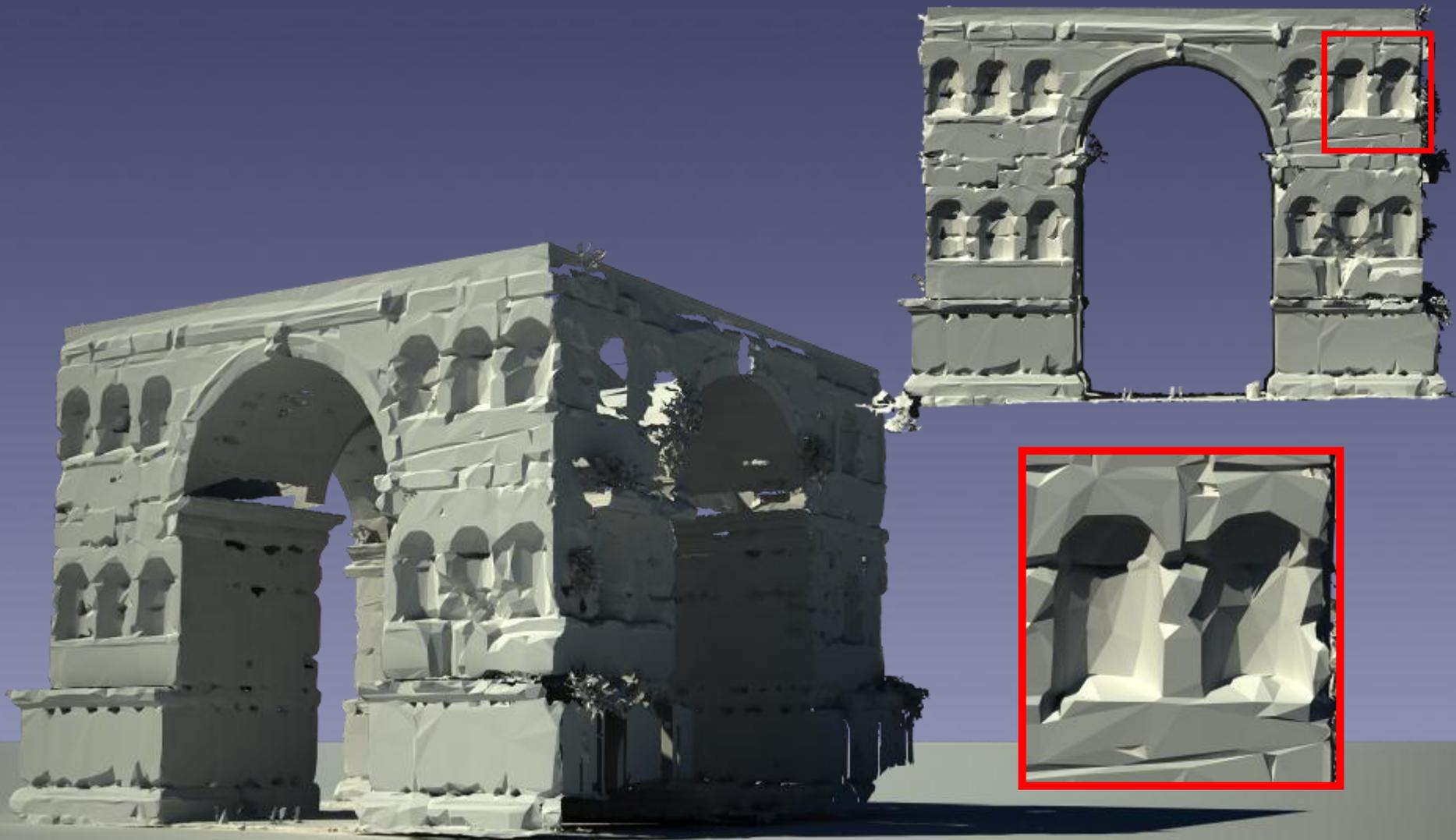




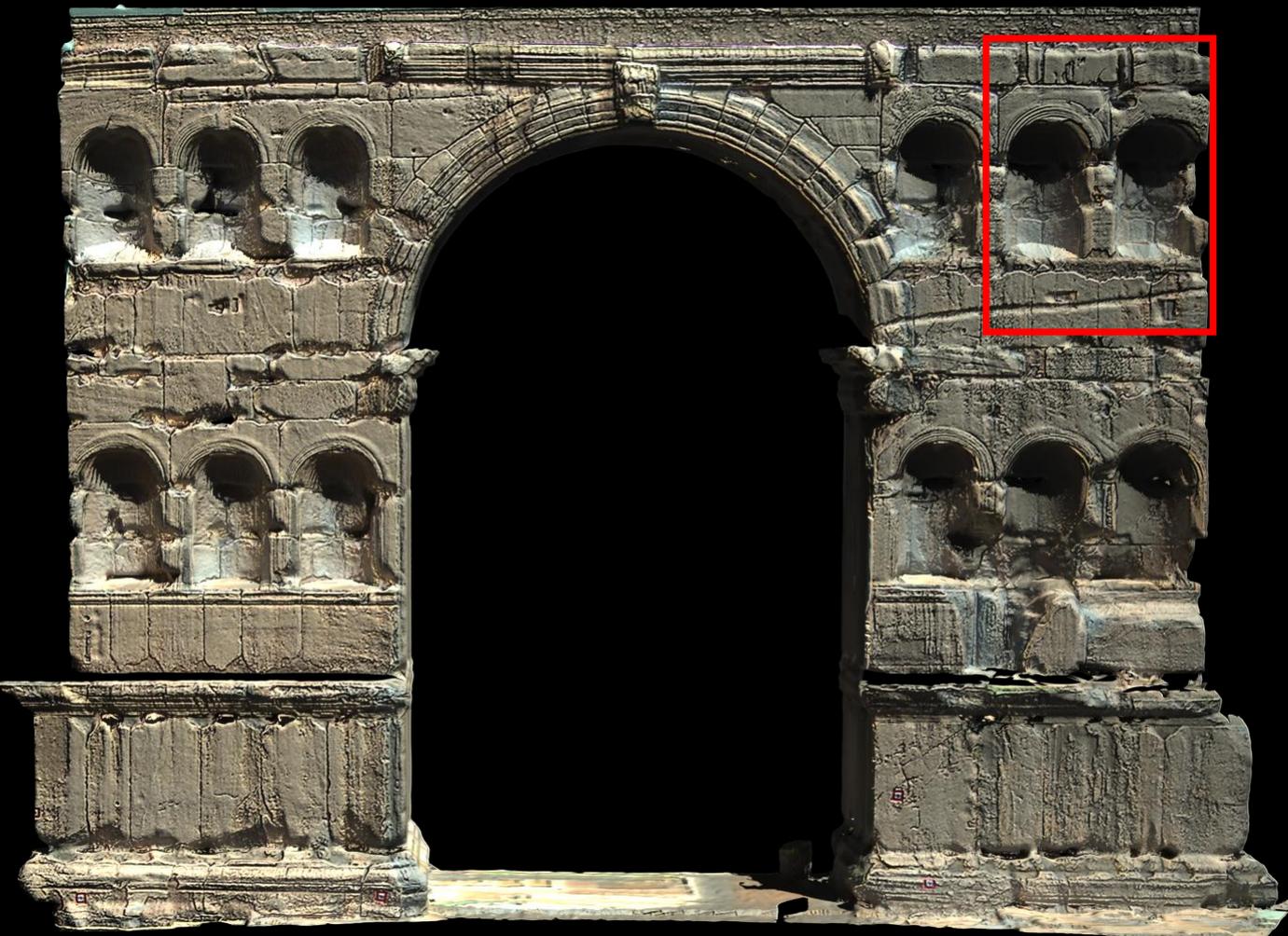
Alzato: geometrico ed architettonico



Alzato: geometrico ed architettonico

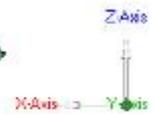
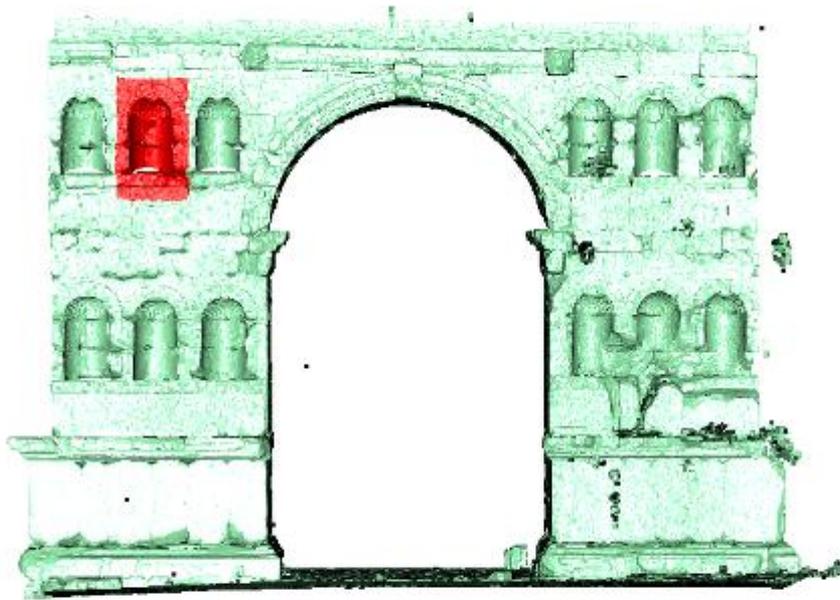


Modello3D Geometrico



Modello3D Architettonico

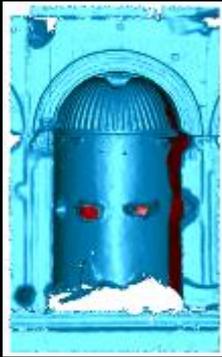
(Bottom)

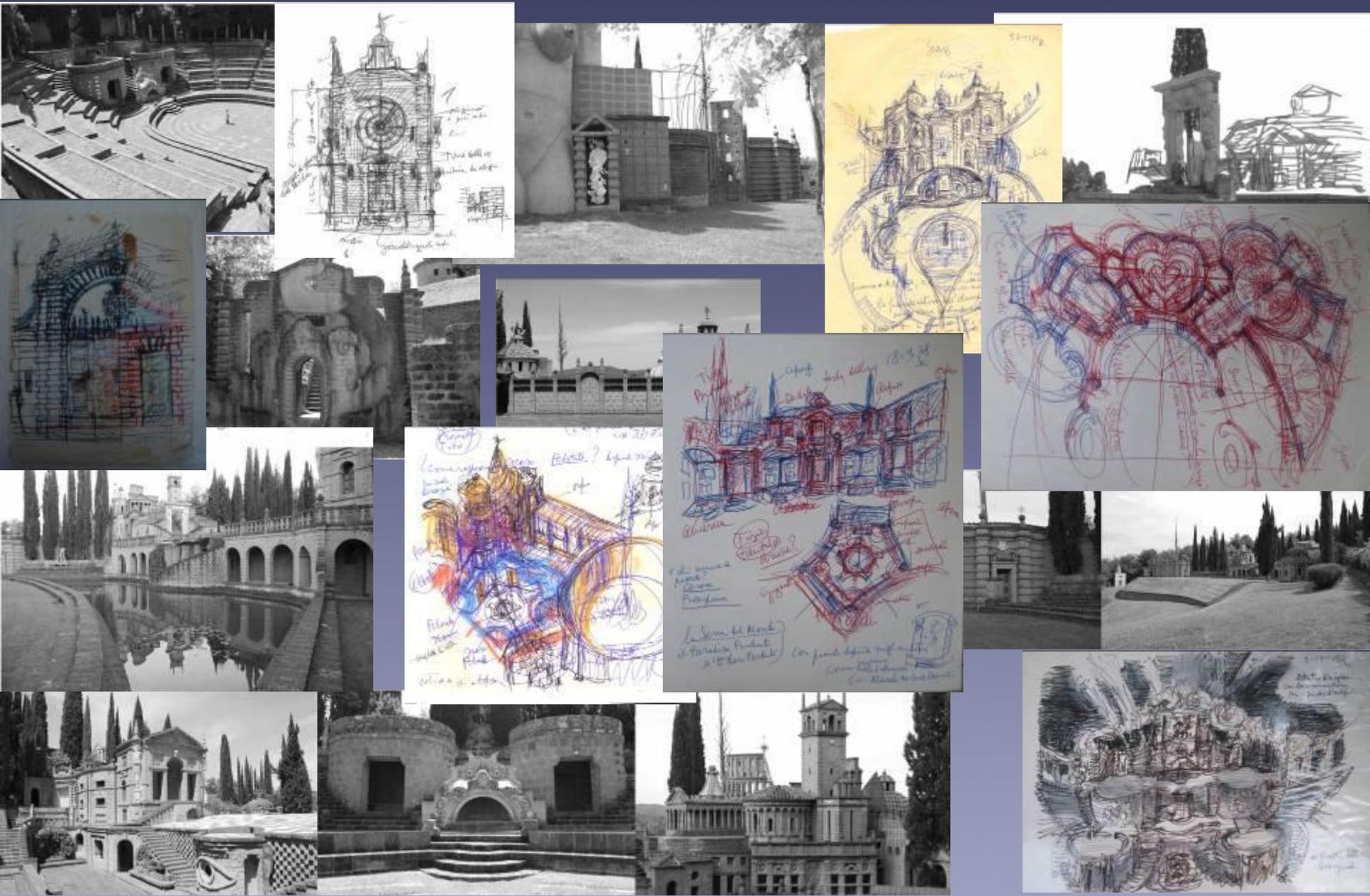


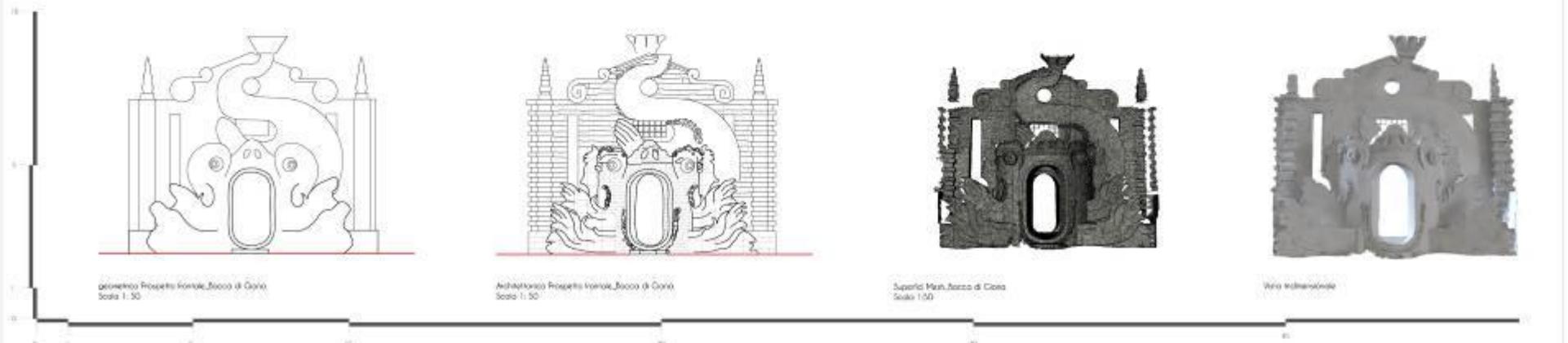
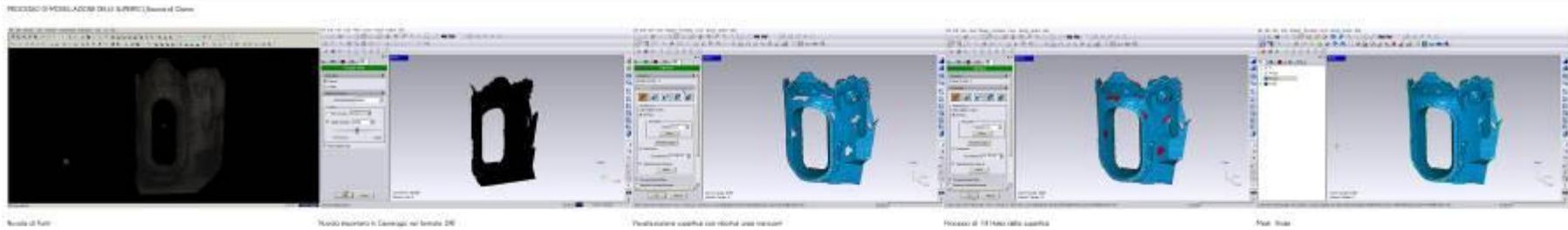
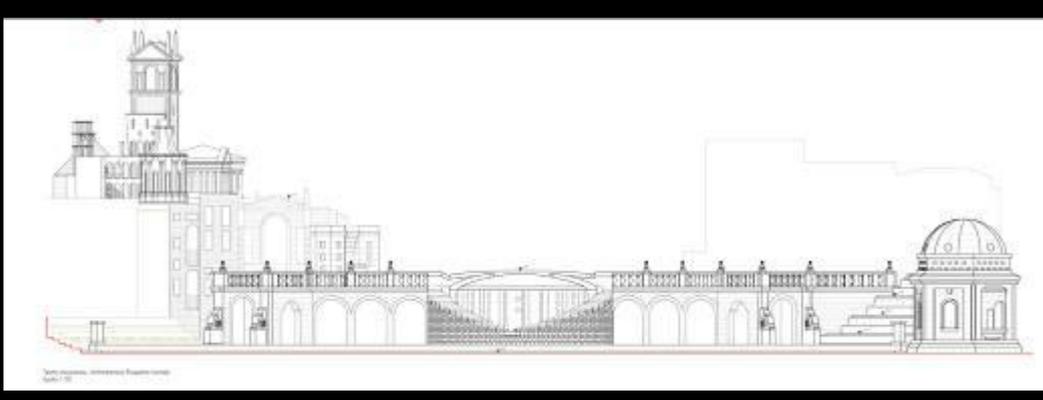
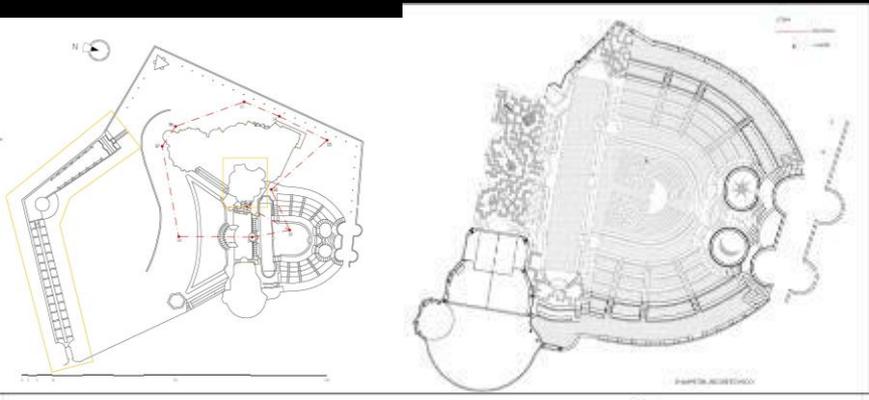
Current Points: 8,524,305  
 Selected Points: 82,099



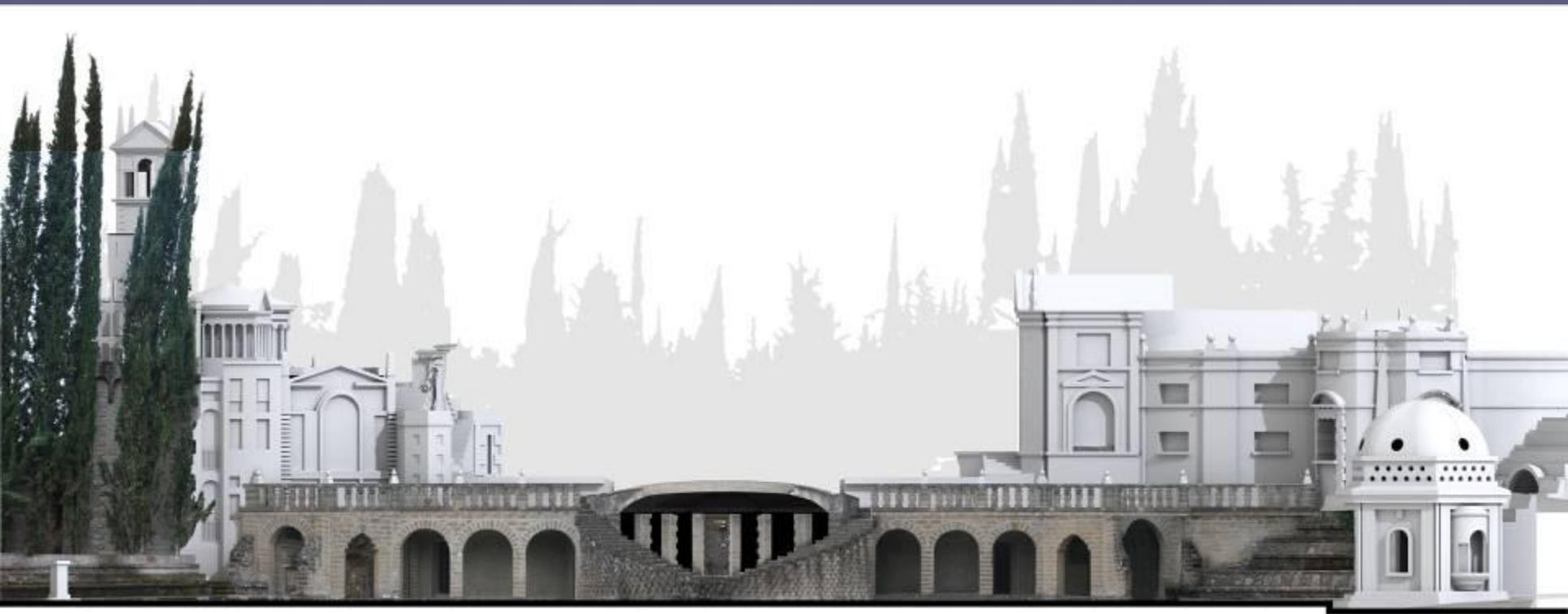
Dettaglio



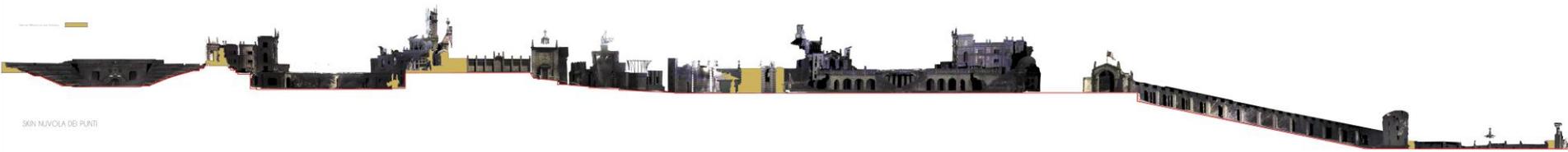




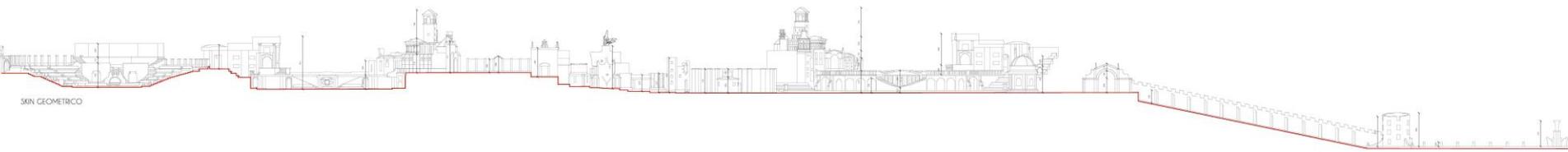
Modelli 2D: geometrica ed architettonica



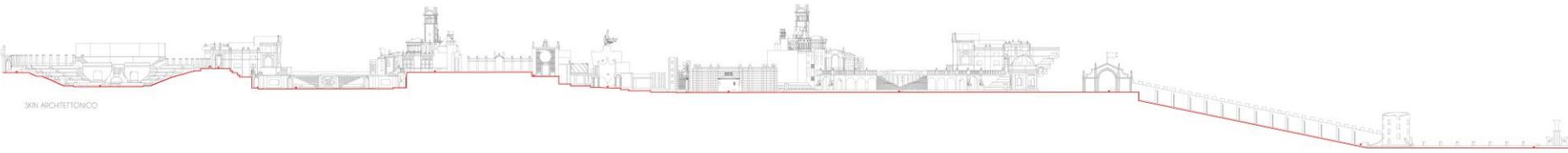
2D – 3D models



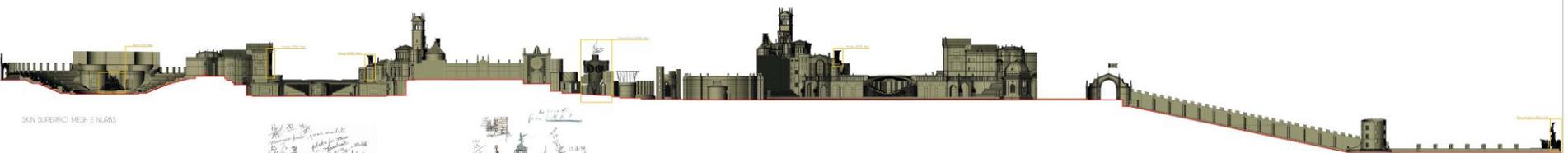
SKIN NAVOLA DEI PUNTI



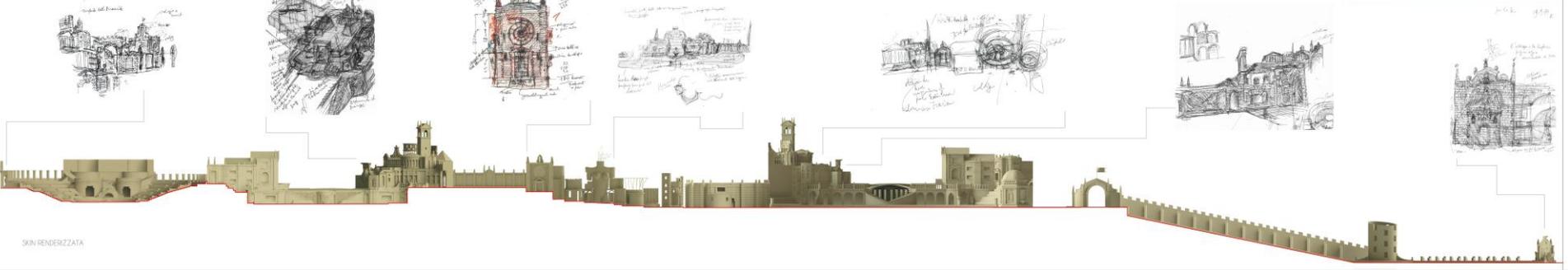
SKIN GEOMETRICO



SKIN ARCHITETTONICO



SKIN SUPERFICI MESH E NURBS



SKIN RENDEREZZATA

Modelli 2D e 3D





## La fotomodellazione – sperimentazioni

### Temi affrontati:

- Rapporto tra geometria e colore
- Aberrazione lente macchina fotografica
- Problemi di misura
- Sintesi finale





Testa di Eracle  
(Palazzo Massimo, Roma)

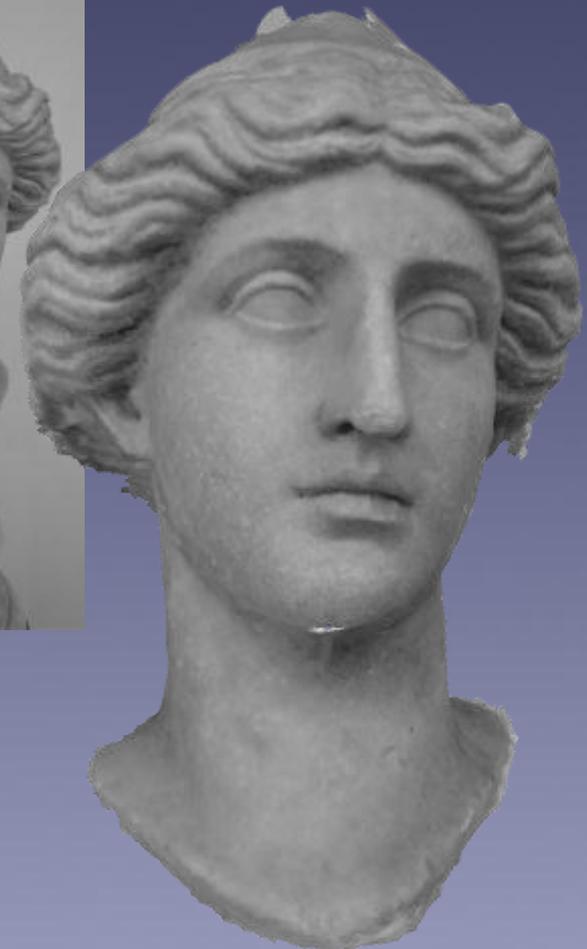


Bassorilievo  
(Museo Archeologico Nazionale, Napoli)

# La fotomodellazione – rapporto tra geometria e colore



Modello mesh composto da: 355.526 facce



Modello mesh composto da: 354.053 facce

La fotomodellazione – aberrazione lente macchina fotografica



originale



sovrapposizione bordi



corretta



Modello mesh composto da: 516.340 facce



Modello mesh composto da: 633.152 facce



# Informatica in Architettura

*alfonso ippolito*

**INFOR**av

*Istituto per lo sviluppo e la gestione avanzata dell'informazione*

roma 16 maggio 2012 P.zza Barberini