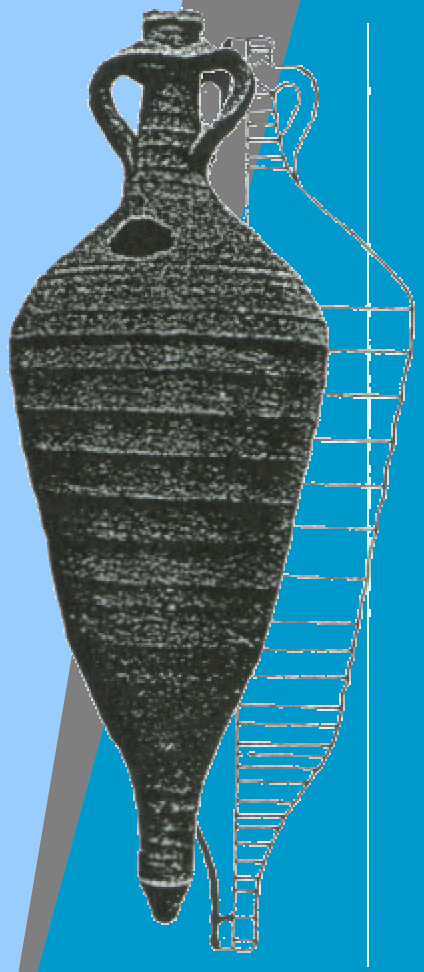

Towards an Electronic Database for Ancient Amphorae

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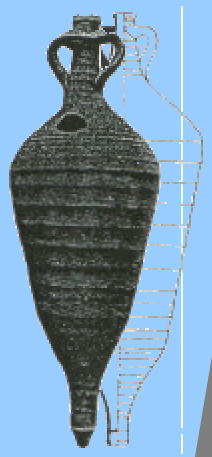
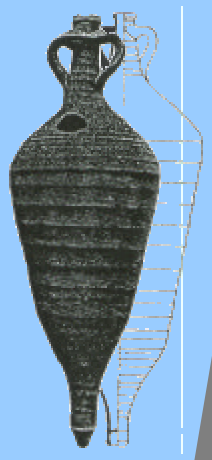


Objectives

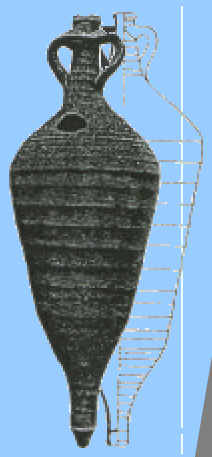
- Evaluation of the usefulness of creating an electronic database of ancient amphorae
  - Database : distributed, internet accessible repository
- Efficient access, storage, retrieval and management of amphora data in digital form
- Searching scheme through metadata



Objectives

- Interrogation of amphorae in 3D form
  - Geometric transformation : rotation, translation, scaling
  - Integral properties : volume, weight
  - Differential properties : curvatures
- Interoperability between heterogeneous systems on the Internet
- Ranking service for searching results
- Easy access through web browser

Overall Structure



Server

Resource registry w/ metadata

Graphical User Interface Application

Database 1

Database 2

Database 3

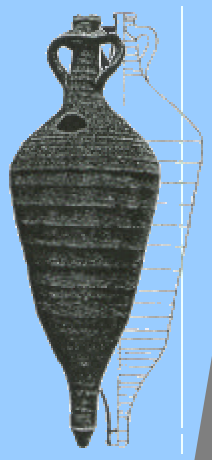
User

WWW Browser

GUI

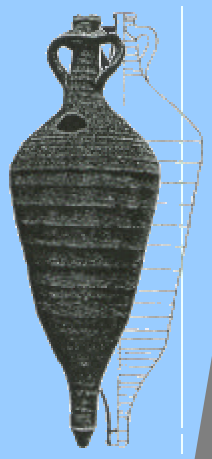
Library Service

Internet



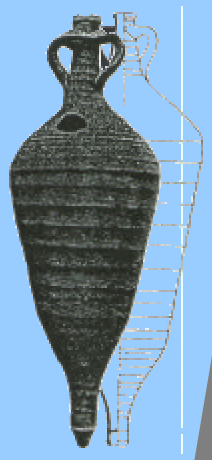
Web Browser

- Library service : Graphical User Interface
  - Searching : query input/output
  - Visualization
- JAVA applet for interrogation of 3D amphorae
  - Integral properties : volume, weights
  - Differential properties : curvature
- Hide complexity and heterogeneity from the users



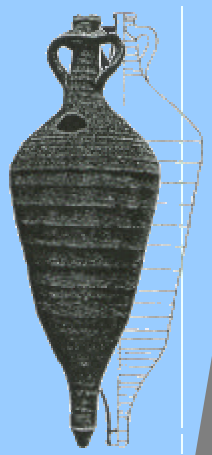
Server System

- Interpret queries / search results
- Rank the results
- Manage dataflow from/to homo/heterogeneous databases
  - Metadata repository
  - Communicate with users through JAVA applets



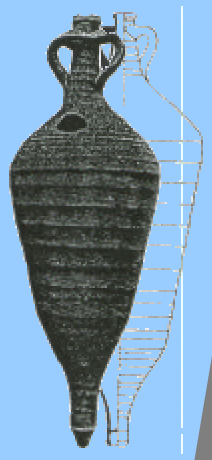
Contents of Database

- Metadata
- Articles related to the amphora
- 2D drawings and 3D surface representations
- Clay material properties (composition, density, etc.)
- Texture map of the surface of the amphora
- Photorealistic rendering of the 3D surface models
- Geometric/integral properties of the amphora



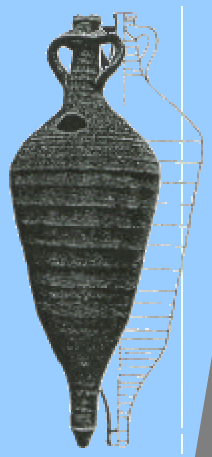
Metadata Description

- Dublin Core
  - Content
    - Title, abstract, keywords, etc.
  - Intellectual Property
    - Creator, publisher, rights
  - Instantiation
    - Date, Format, Identifier, Language
- Dealing with Multimedia formats
  - Image : GIF, JPEG, BMP, etc
  - Video clip : MPEG, AVI, etc
  - NURBS format : STEP, etc



Content-based Search

- Search through Metadata
- Search through 2D Image
  - Silhouette matching : outlines/skeletons of amphorae
  - Texture matching
- Search through 3D Representation
  - Integral property matching
  - Differential property matching



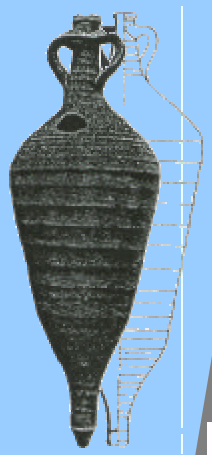
Surface Representation

- NURBS (Non-Uniform Rational B-Spline) Surface Patch:

$$\mathbf{r}(u,v) = \frac{\sum_{i=0}^{m}\sum_{j=0}^{n} w_{ij}\mathbf{p}_{ij}N_{i,k}(u)N_{j,l}(v)}{\sum_{i=0}^{m}\sum_{j=0}^{n} w_{ij}N_{i,k}(u)N_{j,l}(v)}$$

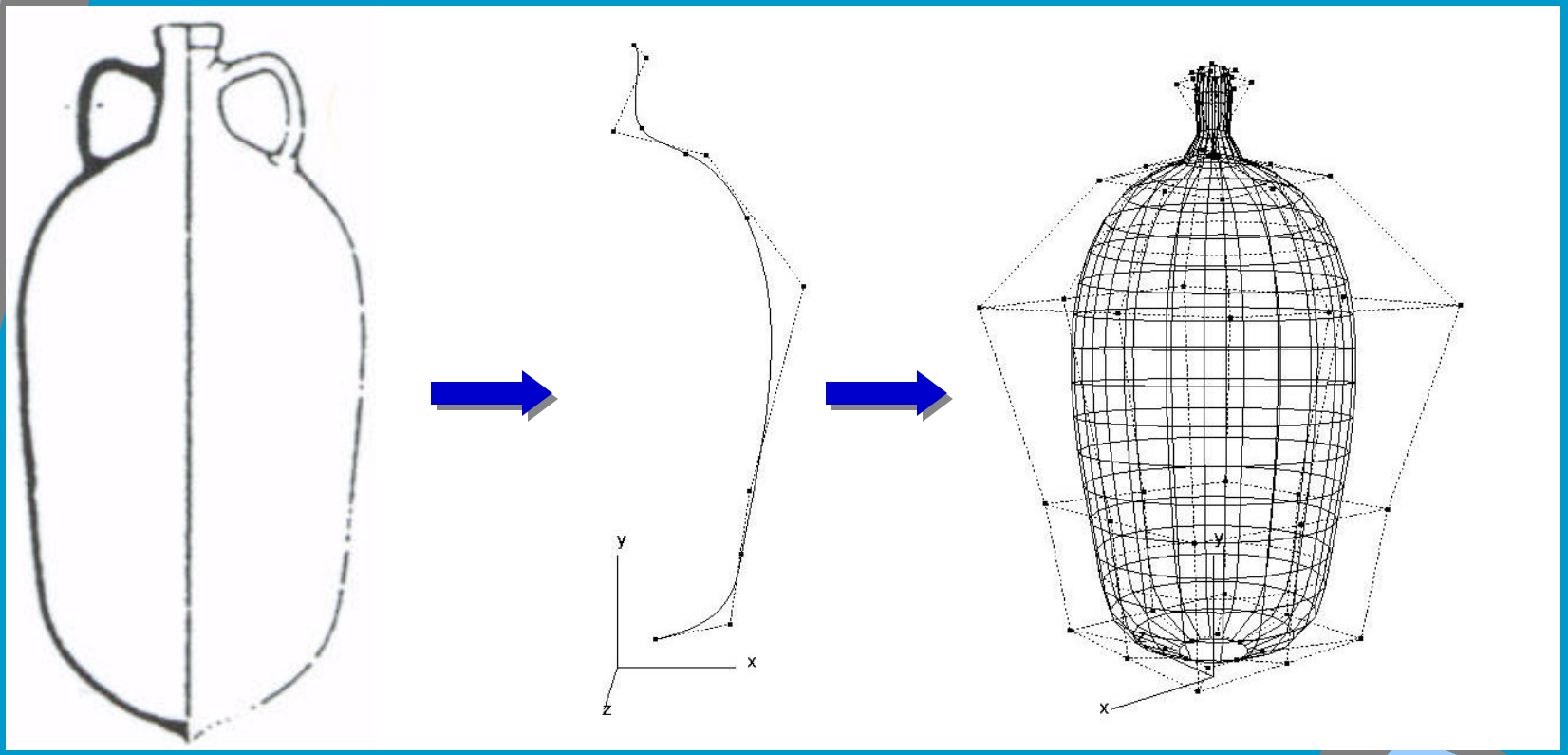
  - Weights : $w_{ij} > 0$
  - Control points : $\mathbf{p}_{ij}$
  - Knot vectors : $\mathbf{U} = (u_0, u_1, \ldots, u_{m+k}),\ \mathbf{V} = (v_0, v_1, \ldots, v_{n+l})$

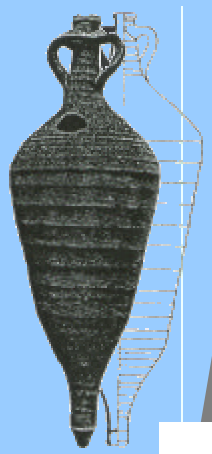
$$0 \le u \le 1, \quad 0 \le v \le 1$$



Construction of 3D Amphorae

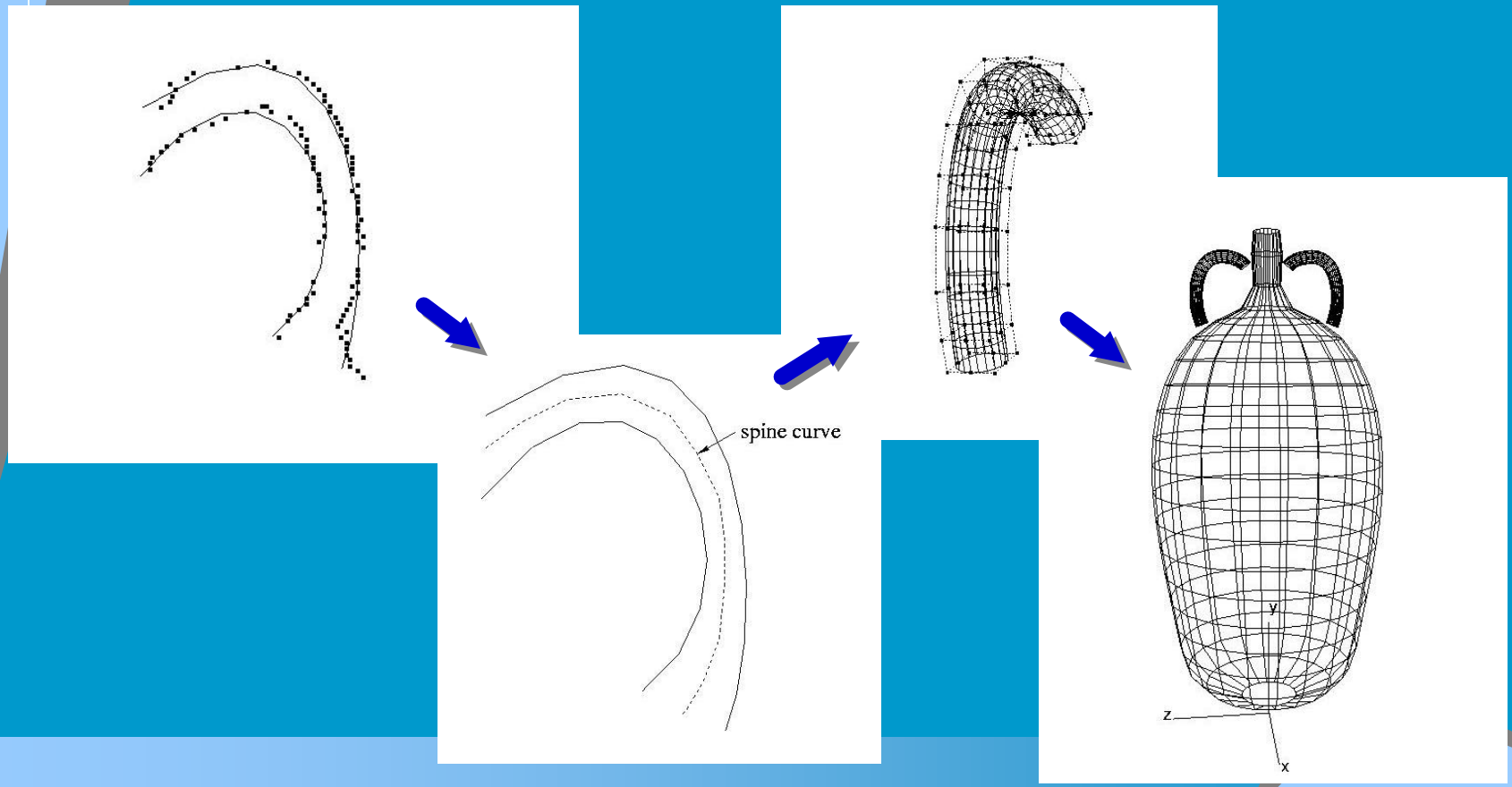
- 2D Image : Image processing technique and surface of revolution

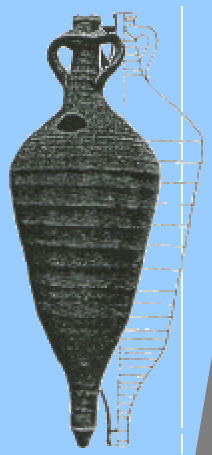




Construction of 3D Amphorae

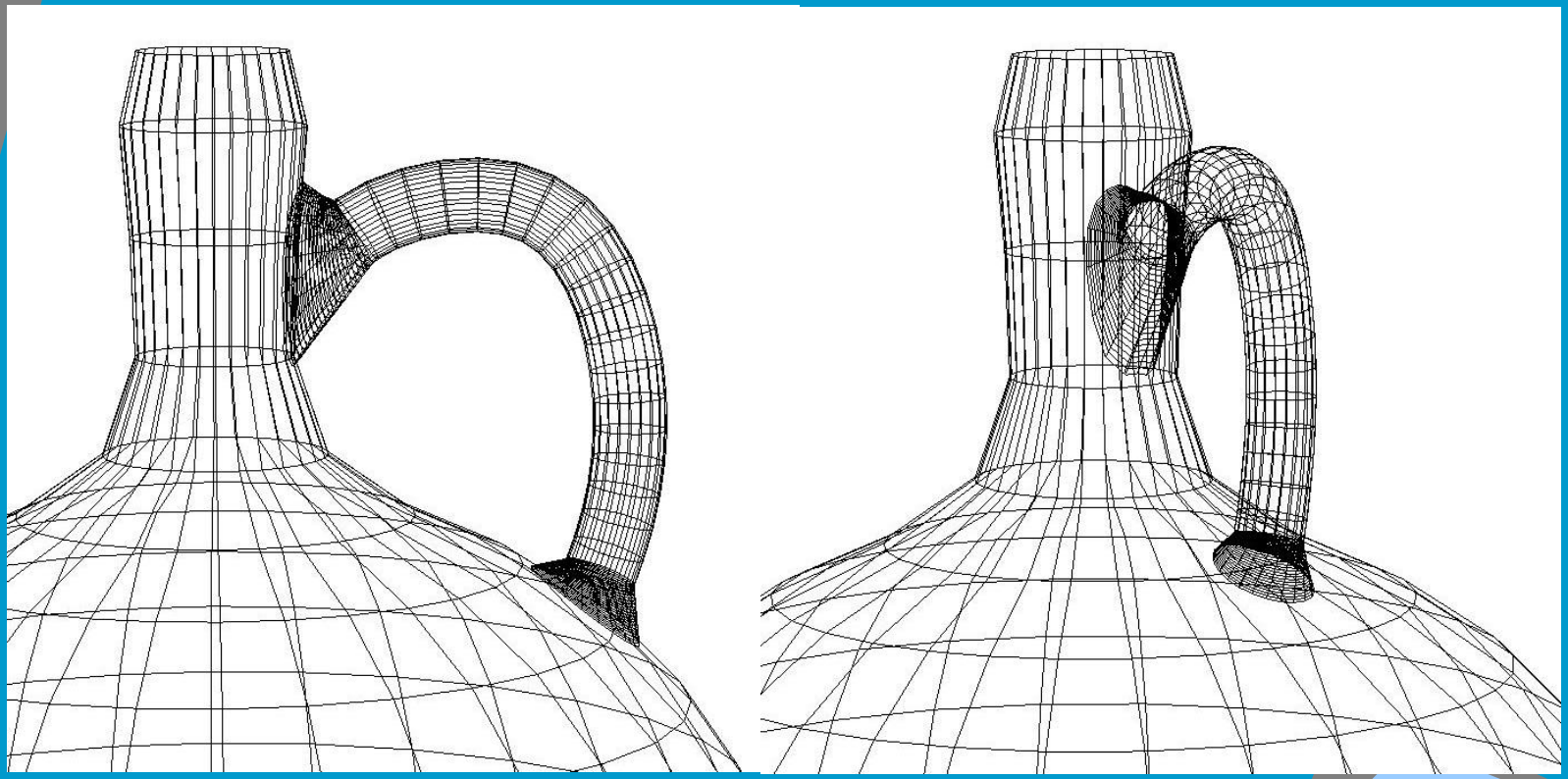
- Constructing Handles : Pipe surfaces



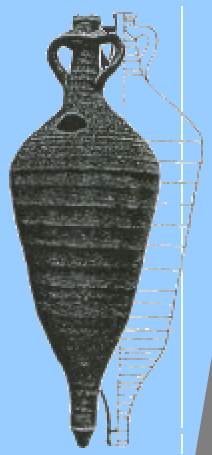


Construction of 3D Amphorae

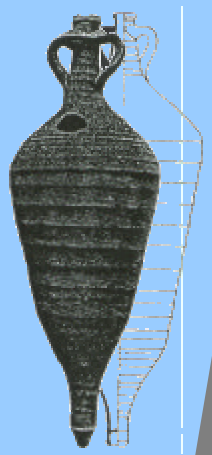
- Blending surfaces

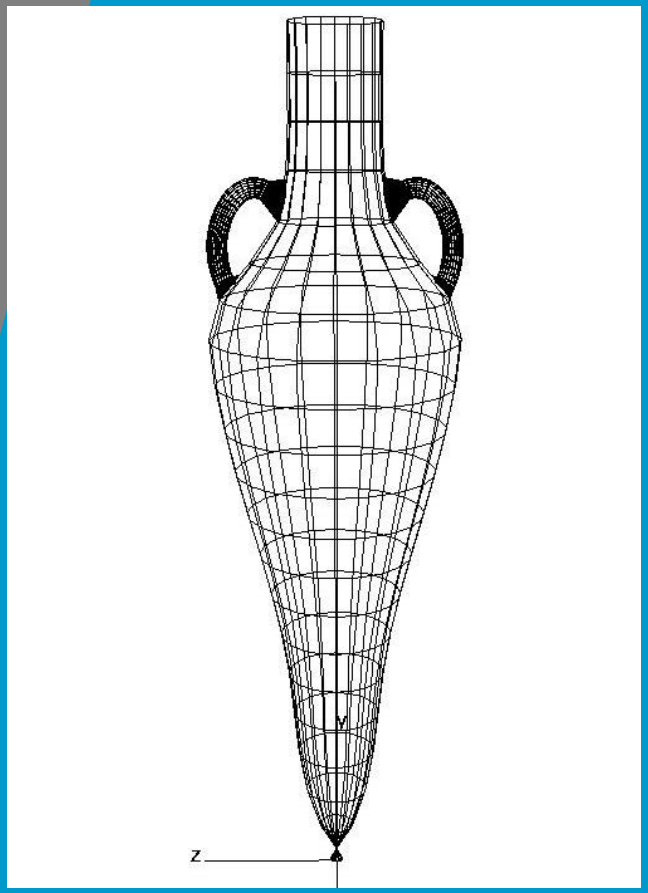


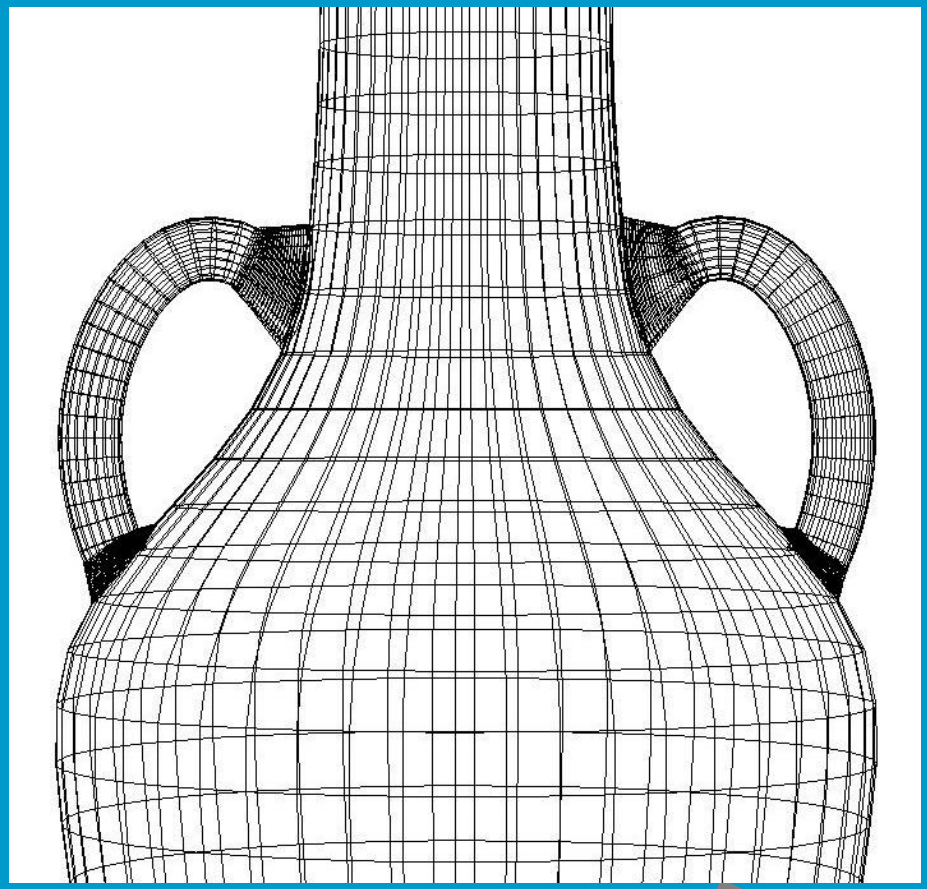
Examples (Cretoise)



Examples (Tomi)







Examples (Tomi)