# Stacks of Cartouches

G. RIVIERE

December 8, 2009

## 1. CONCEPTUAL

The concept is to easily build and manage compositions and sub-compositions of data items or functions, thanks to the representation of the items or functions by physical Cartouche [3] and organizing it with stacks.
Stacks of Cartouches can be rapidly prototyped using computer vision and specific tags [1].

Cartouches permit to physically represent:

- Represent items
- Represent functions

Cartouches permit to physically control:

- Sorting with hands (see Bricks CHI'95)
- Managing/Organizing items (Workspace)
- Sorting (like playing cards)
- Building (ordered or non-ordered) relations (Stacks)

Stacks of Cartouches permit to physically represent and control:

- Composition to represent data organization/arrangement
- Aggregate of digital items
- An ordered filter chain/workflow and to manage layers order/composition
- Management of sub-division/subsets of items aggregates

Advantages of stacks of Cartouches:

- Do not occupy lot of space on the desk
- Easy and quick learning
- Very simple metaphor for composition of data and ordered workflowss

## 2. APPLICATIONS

In the following two examples, for using stacks of cartouches to help supporting assembly process, and to build filters, are introduced.

### 2.1. Representing physically the Scene Graph Assemblies in ArcheoTUI

ArcheoTUI [2] is a user interface with tangible manipulation in space of props to move fragments to perform the virtual assembly of archeological objects (see Figure 1). However, a part of the interaction is

performed with a Graphical User Interface (see Figure 2). The space bar is used to merge virtual fragments, and the mouse is use to:

- Manage the composition scene graph (see Figure 3(3)),
- Manage the workspace of sub-assemblies (see Figure 3(2)),
- Browse the list of fragments and associate a new one to a physical prop (see Figure 3(1)).

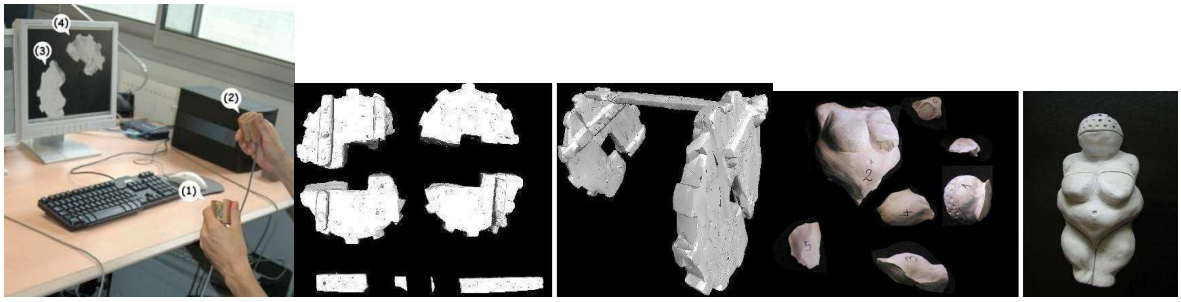


**Figure 1.** *ArcheoTUI and examples of assemblies. (Fragments of the Barzan Fountain and a statue).*

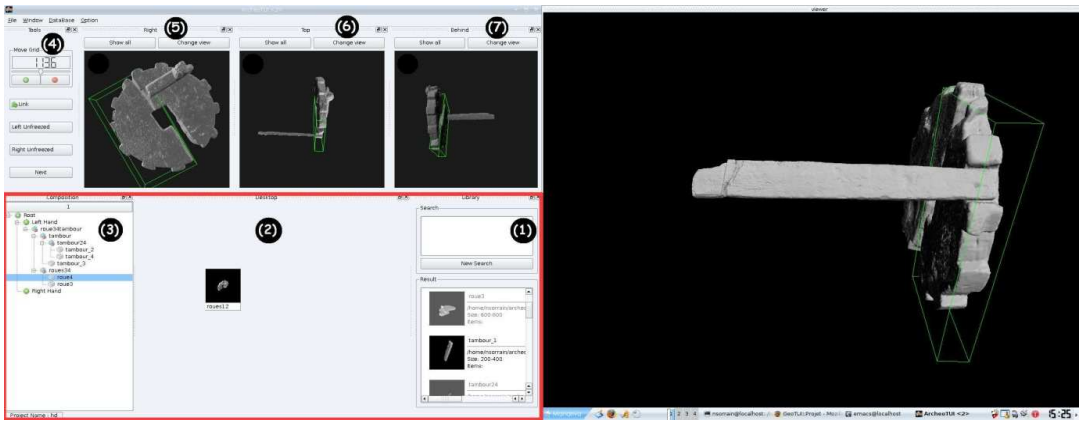


**Figure 2.** *The GUI of ArcheoTUI on a dual-screen view: Assembly steps management and Assembly view.*

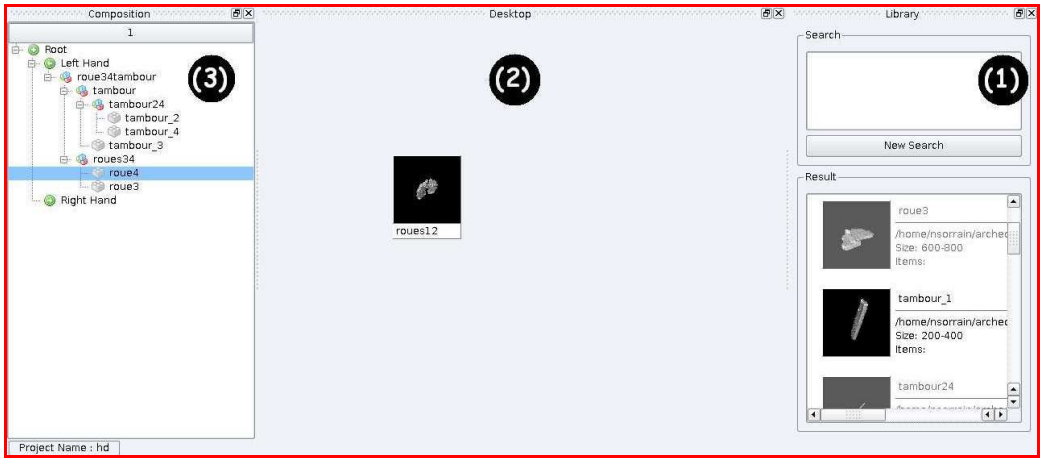


**Figure 3.** *Management of the assembly process: "Scene graph composition" of the current assembly, "Workspace" to temporary store the sub-divisions of the steps of the assembly process and "Library" of the available fragments.*

Representing virtual fragments with physical Cartouches permits:

- To provide to ArcheoTUI a full tangible metaphor and make it easier to learn
  - Tangible manipulation of props and foot pedals are easy to learn
  - But, the graphical user interface make the management of fragments difficult and slow
- To easily associate a fragment to a prop
- To simplify the management of several sub-assemblies
- To quickly switch to the observation of one fragment (thanks to a dedicated slot)

## 2.2. Representing physically filters applied to 3D models in Schlumberger Petrel Software

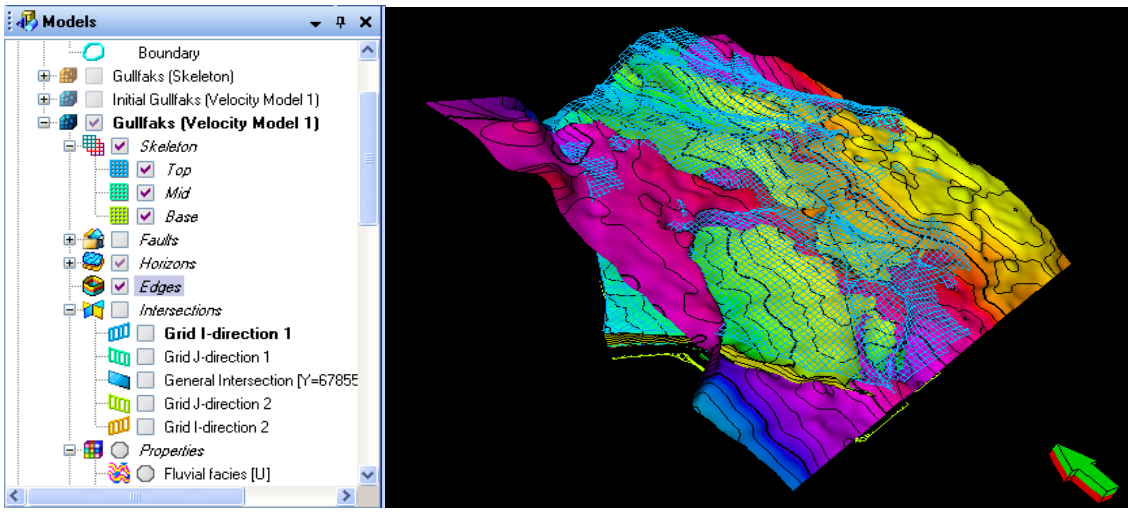


**Figure 4.** *View of a 3D model in Petrel (GF FinalAlan). Selection, in the tree, of filters and data to display.*

When viewing a 3D model of the subsurface with Petrel the user activate/inactivate different options and filters. Each of these options and filters can be physically represented by a Cartouche. Combining Cartouches as a stack permit to built the viewing of the model.

# 3. TIMELIME

**Friday 4:**

- Software: Development of prototype for detection of stacks
  - Linux, C++, QT4, V4L2
  - Design of the tags patterns

**Monday 7:**

- Hardware: Cardboard prototype of a Trail and test of the detection (GR)
- Software: Improvement of target detection (GR)
- Hardware: Design of the Cartouches (Discussion GR + CW)
  - Removable picture
  - 3 layers of acrylic
  - How to facilitate the vertical stacking/alignment of Cartouches
  - “Ergot” (maybe problems for sorting/sliding)
- Work on forms for post-doc in Grenoble

**Tuesday 8:**
- Work on this report
- Work on proposal for qualification Assistant Professor position (Rules changed)
- Work on forms for post-doc in Grenoble

**Wednesday 9:**
- 1 trail with 2 spots: 1 or 2 webcams? (GR)
  - Problems of alignment of targets and webcam
  - Tests with cardboard prototype
- Hardware: order 3 webcams (GR + BU)

**Thursday 10:**
- Hardware: Design of the trails (Discussion GR + CW + ZD)
  - Trail with 1 spot and 2 spots
  - Technical design
  - How to integrate the webcam
  - 1 Trail with 2 spots: 1 or 2 webcams

**Friday 11:**
- Physical prototyping of Cartouches + Trails (GR + CW)
- Integration of webcam sensors in Trails

**Monday 14:**
- Send proposal for qualifications for Assitant Professor posisition

**Tuesday 15:**
- Software: Manage several spots
  - Management of several webcams
  - Management of several spots with one webcam

**Wednesday 16:**
- Software: build a short demonstration with several spots to show the concept

**Thursday 17:**
- Software: Manage order in stack
- Implement algorithm
- Design of the tags
- Hardware: Put in place the new tags

**Friday 18:**
- Software: Test stacks ordering
- Make a short demonstration movie/film of the concept and the prototype

**Saturday 19:**
- departure

## 4. REFERENCES

[1] Bartindale, T. and Harrison, C. (2009). Stacks on the Surface: Resolving Physical Order Using Fiducial Markers With Structured Transparency. In ITS/Tabletop'09: Proceedings of the ACM International Conference on Interactive Tabletops and Surfaces (November 23-25, 2009, Banff, Alberta, Canada). ACM, New York, NY.

[2] Reuter P., Rivière G., Couture N., Sorraing N., Espinasse L. and Vergnieux R. (2007). ArcheoTUI - A Tangible User Interface for the Virtual Reassembly of Fractured Archeological Objects. In VAST'07: Proceedings of the 8th EuroGraphics International Symposium on Virtual Reality, Archaeology and Cultural Heritage, (November 27-29, 2007, Brighton, UK), pp. 15-22. Eurographics Association.

[3] Ullmer, B., Dever, Z., Sankaran, R., Toole, C., Freeman, C., Cassady, B., Wiley, C., Diabi, M. and Wallace, A. (2010). Cartouche: conventions for tangibles bridging diverse interactive systems. In TEI'10: Proceedings of the fourth International Conference on Tangible, Embedded and Embodied Interaction (January 25-27, 2010, Cambridge, MA, USA). ACM, New York, NY.