



## VRVis

**VRVis Zentrum für Virtual Reality und Visualisierung Forschungs-GmbH**

**Programme: COMET – Competence Centers for Excellent Technologies**

**Programme line: K1-Centres**

**COMET subproject, duration and type of project:**

**Surfaces 01/2017 – 12/2020, multi-firm**

## A new tool for a holistic archaeological analysis

The HMC-Plus is a paradigm shifting tool enabling a holistic visual analysis in archaeology by combining data modalities. It combines stratigraphic relations of an excavation project with temporal information from the dating of finds. A sophisticated layout algorithm guarantees a comprehensive and consistent visual representation. This documentation of an excavation process is linked with geographic data of the site. A time-stamped layer model emerges, which is an invaluable asset for an extensive and accurate analysis. The tool was successfully evaluated on several ongoing excavation projects.



### Beyond the Harris Matrix towards a holistic archaeological analysis

The Harris Matrix, named after its inventor the famous archaeologists Edward C. Harris, has become the de-facto standard for the documentation of excavation projects. It is based on the insight that every archaeological site is stratified. Excavation is a destructive process successively removing layers of deposits to unravel the past. For the later analysis, it is important to accurately document this process and record stratigraphic relations of all deposits and surfaces between them.

This is done by building up a Harris Matrix, which is in fact a graph that clearly defines how the layers were vertically arranged, i.e. which deposits lay above which others before they were removed. While the Harris Matrix preserves the stratigraphy of an excavation site, it lacks explicit temporal information. Finds located within deposits are dated by various methods and for a comprehensive analysis this must be considered in conjunction with the stratigraphy.

Within the project Surfaces we addressed this open problem and even built a link to geographic information of archaeological sites.



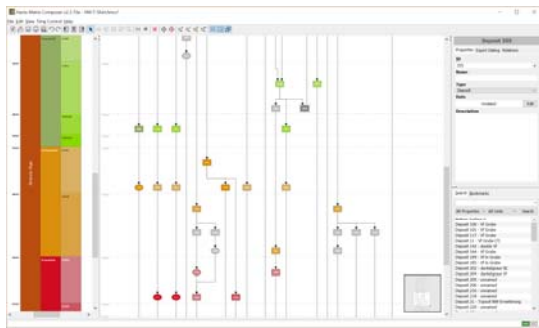
### The HMC-Plus editor Linking data modalities

Our research result, the HMC-Plus editor, combines stratigraphic with temporal information in a concise way. It allows to build up a Harris Matrix during an excavation and assign a time interval to each deposit after dating. The HMC-Plus features a time model consisting of three hierarchically organized time lanes. Intervals can overlap as dating in archaeology is mostly fuzzy. Fig. 1 shows a screenshot.

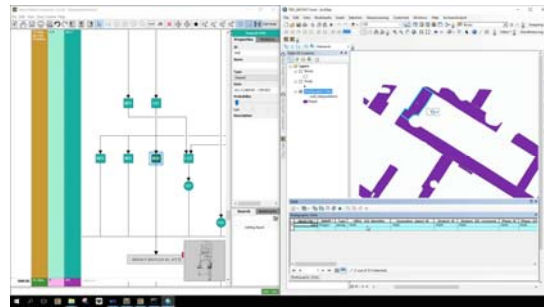
One challenge was to design a layout algorithm that achieves a comprehensive and consistent visual representation of both stratigraphic relations, which are always arranged top to bottom, and temporal relations, which means to align dated units with the corresponding intervals. The resulting layout algorithm also checks for inconsistencies between stratigraphic and temporal relations so that they can be indicated and

resolved by archeologists. In this way, an abstract time stamped layer model emerges, which is an invaluable asset for an extensive analysis and a reliable historic interpretation.

Another important data modality is geographic information, which is recorded in a Geographic Information System (GIS). To establish this link the HMC-Plus can connect with a GIS to build up a linked view. Selections of units in the HMC-Plus automatically highlights the corresponding map information in the GIS such as outlines of excavation pits (see Fig. 2). This works also the other way around.



**Fig. 1 : HMC-Plus with time lanes (left) and dated units of a Harris Matrix (middle) (© VRVis).**



**Fig. 2: Linked view between HMC-Plus (left) and a GIS (right) (© VRVis, LBI ArchPro).**

### Impact and effects

Due to the user-centered design approach the HMC-Plus was evaluated during the project on several excavation projects conducted by the LBI ArchPro. It helped VRVis and its company partner Humai (former Imagination) to develop a highly usable tool. These early experiences showed that adding dating information and a link to geographic data greatly improves the overall archaeological analysis.

Soon, the tool will become available to the international archaeological community. Humai sold several hundred licenses of a Harris Matrix editor without linked data modalities over the past 10 years and has built up a customer base, which is very interested in the new tool. The HMC-Plus has the potential to substantially change the way data from excavation projects is analyzed and to contribute to a paradigm shift in digital archaeology.

#### Contact and information

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