

First Experiences Using TachyGIS in Excavation Practice

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The importance of GIS in archaeology has been constantly growing over the last years, not only for analysis and interpretation, but also for on-site documentation. In cooperation with the Archaeological Museum Hamburg, Tachy2GIS has been developed as a QGIS plugin to allow “live” measurements with Leica total stations in QGIS. A prototype of this plugin has been tested over several months on excavations at the opencast mines near Weißwasser (Saxony). During these tests, the team improved the excavation specific geodata structure and developed a specific user interface for an optimized support of excavation workflows.

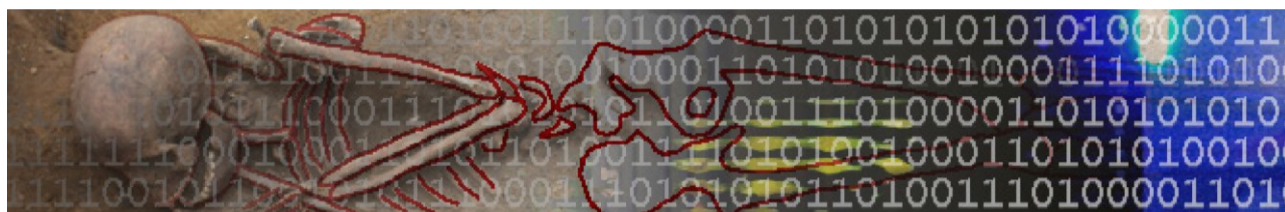


Fig. 1. Workshop Teaser “Digitale Grabungsdokumentation – objektiv und nachhaltig” (© R. Göldner).

In general, the Tachy2GIS software (Tachy2GIS, 2019, Trapp, 2019) is closely connected with the TachyGIS Idea (Göldner, 2018) that summarizes the aspects of excavation survey with total station and GIS on an abstract level. This Idea was discussed at the Workshop “Digitale Grabungsdokumentation – objektiv und nachhaltig” (VLA, 2018). The Hamburg Archaeological Museum maintains the development of all basic components of Tachy2GIS. The existing prototype now is consolidated and extended due to basic requirements.

First, Tachy2GIS was a prototype without a practice oriented user interface. So, after knowing that the prototype works fine, we were highly interested to build a user interface that meets the needs of an archaeological excavation (“T2G_Archaeology” plugin). The focus was on easy data acquisition in the field without extensive knowledge of QGIS-functions. Here are some very short operating instructions, just to get a small impression:

- perform local stationing of total station
- click T2G button and open Tachy2GIS interface
- select COM port (connection to total station) and GIS layer (to save measurements)
- n* perform total station measurement, measured geometry is visible as (editable!) preview

- click OK to transfer object measurements into GIS layer (possibly use point snapping)
- attribute table of the object opens automatically and can be filled (there are drop down lists available that can be controlled by user defined CSV files representing customized thesauri)
- finally, the new geometry is displayed (don't forget to save)

The geodata structure handles 3D-points, 3D lines and 3D polygons separately (shapefiles). As the plugin will be used on a great variety of excavations ranging from prehistoric to medieval and from small one day investigations to large projects over several months to years, the layer attributes are reduced to a minimum. Our focus is on documenting the geometry of archaeological features. The most important attributes are:

- object_id (unique identifier),
- activity_code (excavation code),
- object_type (rough category: feature, find, sample, profile, ...),
- object_species (detailed category: features: pit posthole, mural structure, ...; finds: sherd, coin)
- annotation (for map layout purposes),
- remark (for all purposes).

So far, we believe these to be sufficient for fieldwork and basic map/report. External databases like those of specific research projects can be joined with the data to allow further analysis.

The used thesauri can be managed and edited from the user interface (ensure that all values are UTF-8). To speed up the filling of the attribute table an auto-attribute-function was introduced. This function automatically inserts several attribute values (like automatic numbering, object categorization) based on default settings that can be customized by the user (before a measurement).

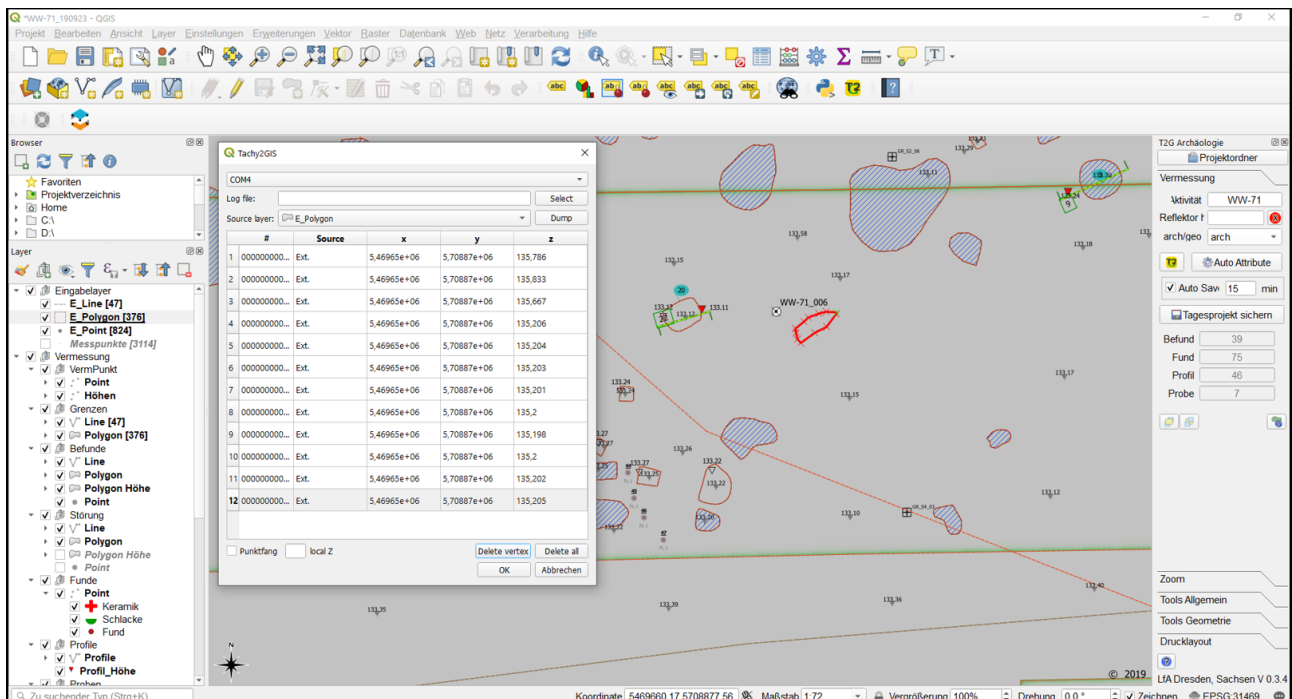


Fig. 2. QGIS desktop with both Tachy2GIS and T2G_Archaeology plugin. (© C. Schubert)

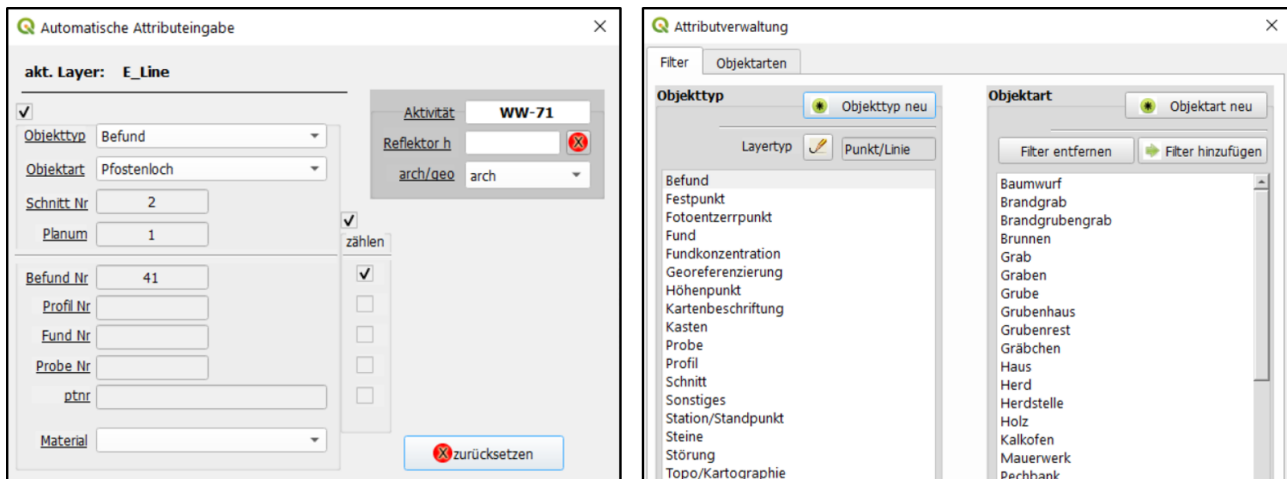


Fig. 3. T2G_Archaeology plugin windows: automatic attribution (left) and attribute values (right). (© C. Schubert)

It is also possible to easily import and export coordinate-lists, e.g., to transfer survey points for stationing to the total station or to import data measured with a GPS.

Some other functions would be fine, so further developing steps are planned. A clear and comfortable 3D visualization of the measured scene is needed for complex (inner city/medieval) excavations. An enhanced total station interface with bidirectional communications using Leicas GeoCOM is requested. This will allow e.g., to read and set prism height and to generate a more detailed measurement log file which then should contain stationing parameters as well as $r\theta\phi$ polar coordinates and prism height for every single measured point to enable effective debugging. Quite often, a local coordinate system has to be established before national coordinates are available for a site, so a user-friendly tool to transform measurements from a local into a national grid is also desired.

The résumé of using TachyGIS in excavation practice is: It works fine most of the time. It meets most needs of excavation projects that don't require very good 3D visualization. It allows the use of elaborated GIS tools to evaluate the excavations. And, because it's FOSS, it avoids the use of expensive CAD software. Further, expanded tests on our excavations will allow me to identify bugs and optimize our data structure while an ongoing software development will meet the above mentioned requirements.

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