Virtual Archaeology – What Is It?

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In this paper I will introduce the Finnish Virtual Archaeology -project (Suomalainen virtuaaliarkeologia -projekti, SuVi) and discuss the possibilities of using 3D-documentation with total station in archaeological excavation and other possibilities to use new technology to visualize archaeological sites.

The Finnish Virtual Archaeology -project

The Finnish Virtual Archaeology -project started at the beginning of 2002 and ends this year. It involves four researchers, but also a few other researchers have taken part in the project.

Three of the main researchers have been carrying out their research for their doctoral dissertations on the themes of historical archaeology: Kirsi Majantie's theme is stove-tiles, Terhi Mikkola's theme is the premises of Häme (Sw. Tavastehus) Castle and Carita Tulkki's theme is red earthenware. The fourth researcher Kari Uotila has continued his research with themes about the archaeology of building which he took up after he finished his dissertation.

The first goal of the Finnish Virtual Archaeology project is to produce new research data mainly on the different aspects of daily life in the later middle ages and the significance of new innovations in that time. The second goal is to develop the methods of virtual archaeology in fieldwork, reporting and actual analysis, as well as a new kind of visualization of the research site.

The case: Archaeological excavations in Mannerheiminkatu, Naantali, Finland

Naantali (Sw. Nådendal) is a small town located near Turku (Sw. Åbo) on the south-western coast of Finland. The beginnings of Naantali go as far back as 1443, when King Christopher of Bavaria gave an order for the founding of a Brigittine convent on the Ailoistenniemi cape in the thirteenth

century. Many villages were founded in the area of Naantali. In the fifteenth century many of the farms were annexed to bigger farms or to the Church. The Ailoistennimi cape was owned by Lucia Olavintytär and her husband Henrik. They donated the land for the convent and town. When the convent was founded, the place got a new name: Vallis Gratiae or Nådens Dahl – in English 'Valley of the Grace'. The convent became a famous place of pilgrimage in medieval Finland as well as a popular meeting place (Suvanto 1976, 69–70, 113).

The town was built in the western part of the convent between the Lahdenperä bay and the Raumanvuori hill. The Lahdenperä bay separated the town and the convent and they were connected at first by a ferry and later by a bridge. In front of the bridge was a small market place and the town hall was located in the upper corner of the market and the main street named Isokatu (Suvanto 1976, 159).

The Reformation in the sixteenth century destroyed the Catholic convent and it was closed. Previously, it was thought that the town had become deserted too, but new archaeological studies in 2000 and 2002 show that the settlement on the main street actually grew in the late sixteenth and early seventeenth centuries (Uotila 2003, 40–41). In 1648 the town was given a new plan. The street was straightened and the plots alongside it were moved accordingly (Jäntere 1959, 50).

The oldest archaeological studies in Naantali were carried out in the area of the convent. But the first excavation in the old town, in Mannerheiminkatu – the old main street Isokatu – was conducted in the 1980s, but the results were not particularly noteworthy, because the oldest cultural layers were from the eighteenth century. Thus, the sewerage works carried out on Mannerheiminkatu in 2000 and 2002 offered a new opportunity to study the history of Naantali.

The excavation area was about 80 meters long and only about 2–3 meters wide. And what was found? There were two yards with their structures and marks of the oldest street. These structures and also the artefacts of these yards were all from the late sixteenth century or the early seventeenth century (Lehtonen 2003, 35–43; see also Uotila 2000 and Uotila & Lehtonen 2002). This area of the town was populated during this time because the area was under the sea during the medieval period. Evidence for that is also found in archeobotanical research. There are a lot of plant remains typical of wetlands, shores and waters (Lempiäinen 2003, 29).

Picture 1. Urban archaeology on Mannerheiminkatu street in the summer of 2002. Archaeologists with total stations and other equipment, a digger, as well as men from municipal engineering.

Complete Digital Documentation of Excavations

From the beginning of the excavations at Naantali, the chosen method for fieldwork and documentation was single-context excavation and digital surveying, carried out with total station. On the other hand, other surveying equipment, such as GPS devices, also works with the same software and with the same principles of measuring, data collection and three-dimensional observation and thinking.

In single-context excavations, each soil layer, feature and structure is examined and documented as an individual unit. The layers and structures are removed individually layer by layer, following their real extent and shape, and they are documented using written records, photography and digital surveying. This technique produces far more detailed and accurate data than spit excavations, making it possible to consider a broader range of questions in further studies but on the other hand, requiring more time and skill during fieldwork.

Total station gives x, y, and z coordinates for the measured target directly. In Finland, total station has been used before in archaeological documentation, but not as comprehensively as was done for the project in Naantali. We documented everything – structures, soil layers and sections, as well as finds and various samples – directly in three-dimensional format with total station. What is noteworthy about the Naantali excavations is that we also measured the provenance of all finds digitally. Historical archaeology and urban excavations in particular yield numerous finds, and most of the material consists of so-called mass finds, such as iron nails and shards of window glass. For this reason, the context of finds is usually recorded in the relevant layer and site grid. Due to the speediness of total station surveying, recording the exact position of even a very large number of finds is not a problem. The decision to measure the provenance of finds digitally also affected the thoroughness of the excavation – we had to be able to recover finds from their context and not from the sieve. Excavating more carefully means that the digging is slower but, on the other hand, documenting with total station is considerably faster than with traditional methods, so the time that we gained by using the total station we used for excavating more meticulously (Uotila & Tulkki 2002, 427–430).

So in this way, a completely three dimensional digitized research material was created in the field, ready to be perceived or visualised entirely in three dimensions.

Modelling is part of research

When the measured data are in digital form, it is easy to transfer them in three dimensional form to a visualization program. We use the 3D Studio MAX program. For example the colour and material of each stratigraphic unit can be specified in this program and it is quite easy to visualize the relationship between deposits and structures (Uotila et al. 2003, 191–194).

These 3-dimensional models are not only pretty pictures, but rather a part of the research results. Modelling as a process is research and therefore I think it is important that archaeologists themselves make models of their own research sites. When you do modelling, you have to organize and process all the information, as well as interpret it. It is important to understand the relationship between different units and to see the larger context, such as the environment or landscape where the site to be modelled is located.
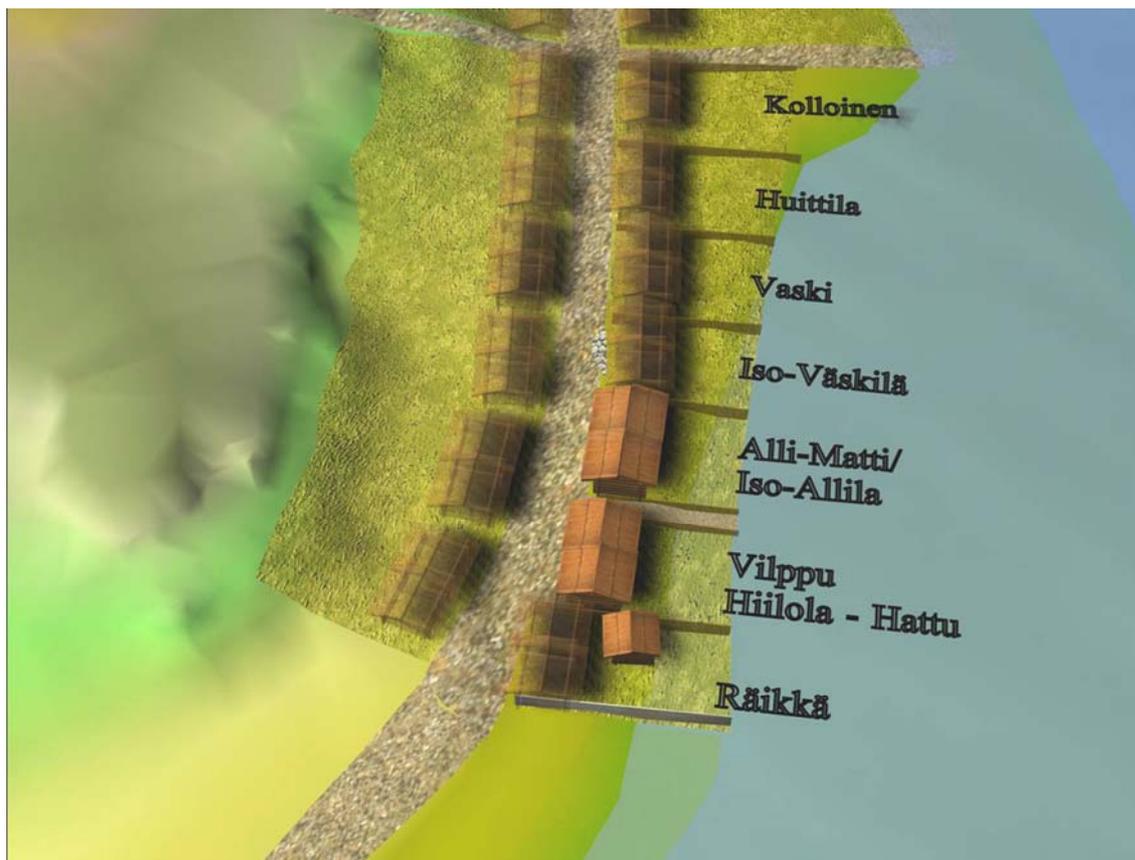
Picture 2. Model of Isokatu street in Naantali at the beginning of the seventeenth century, created on the basis of research data.

What is virtual excavation?

Our excavations in Naantali got lot of attention from the locals. Many people passing by stopped to ask what we had found. Sometimes it is hard to convince people about what is being studied, because the traces of the past can be very weak. With the help of modelling, this kind of all but destroyed evidence of life in the past can be brought back to life. Models give a more comprehensible form than plans and sections of excavation can provide. And if needed a well-documented excavation can afterwards be modelled entirely, stage by stage. For researchers models can also be used to test various theories and interpretations. Models are also useful in visualizing the artefacts. A small fragment of an artefact can be used to recreate the whole object.

As in Naantali and many other sites there are no visible signs left of excavations, even the sites that were interesting and provided a great deal of new information about the past. However, a tablet PC and its multimedia

software, together with a GPS unit, offer a new kind of opportunity to get know the sites in Naantali. A pupil or tourist can walk around Naantali with a tablet PC and when she or he is at an excavation site for example on Mannerheiminkatu, the GPS unit gives a signal to the software and a presentation of the site appears on the display. The multimedia software presents the site with the help of still images, moving images, videos, for example the excavation work, text, sound and of course 3Dmodels. The user can choose how much information she or he wants to see (Vatanen et al. 2004, in print; Lehtonen & Uotila 2004, 61–63).

Picture 3. From archaeological to virtual excavations – There are rarely any visible signs left of excavations and discovered features. However, we can model the excavation or discovered structures and the landscape, and use it in a tablet PC with a GPS locator.

Digital surveying technology and documentation methods, as well as 3D models, provide a new way to study, interpret and popularize archaeology. It is important, because it gives more visibility to excavations and research. Digitization and modelling are also useful to the archaeologists: digitized excavation records speed up post-excavation work and thus leave more time for actual research or perhaps for the making of 3-dimensional models and

having these in the field leaves more time for making interpretations during fieldwork.

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