

DIGITAL RECORDING IN ARCHAEOLOGICAL EXCAVATION USING TABLET PC

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KEY WORDS: archaeology, tablet pc, methodology, topography, photogrammetry, digital photoplan.

ABSTRACT:

The paper presents the use of tablet pc in archaeology, it explains what is a tablet PC and the steps to draw archaeological remains using a digital photomosaic. It's described the test made during the experience in the roman town Grumentum in South Italy (2006). The use of a tablet pc in archaeological excavation is a powerful tool for digital documentation. This work explains a method to take advantage of this new hardware using directly during the excavation. The advantages offered by this hardware are that one obtains precision, quick recording times and the possibility to manipulate big data during an excavation. During Grumentum experience the working area (12m x 13m) was divided in small rectangles (2m x 1,5m) and every single rectangle was photographed using a digital camera and rectified on site. The topography and location of finds are recorded using total station. All data are imported into tablet PC, where the digital photoplan was available to draw directly on the screen.

In this last step in the tablet PC it was possible to draw the shapes and layers of single objects and stratigraphic layer. In general the digitalization is made in a second step in laboratory, using tablet pc it's possible reduce time and it's possible to draw directly on the excavation.

This recording operation is the data entry of a excavation GIS that constitutes one portion of the general GIS of the archaeological site. The obvious advantage is the immediate data realization without necessity of inspections succeeded.

1. INTRODUCTION

1.1 What is a Tablet PC

Tablet PC is a portable computer of small dimensions with wich it's possible to interact using an optical pen, and whose digital ink them can be recognized and be converted in text in a software like Microsoft Word. Tablet PC was born to be used always and in every place. Entire professional categories need anytime of documents, files, email and electronic agendas; They need to exchange information and data using portable systems with the same facility with which they use a personal computer. Before the birth of the Tablet PC, the only way in order to satisfy such requirements was to choose between a PDA or a simple notebook. PDAs of last generation are small but they haven't the same functions of a PC. Notebooks instead are powerful as desktop, but they cannot be defined portable in the true sense of the word. To resolve this problem it's possible use a Tablet PC. They are divided in two categories: Slate and Convertible. Slates are without keyboard and they have the advantage of being particularly light and contained dimensions. Convertibles are transformed in tablet moving and closing the screen over the keyboard. Tablet PC is used with a electromagnetic pen ("digital Ink"), similar in the shape to the optical pen of PDA. The technology used from the greater part of the producers of tablet is call "Active Digitizer" and has characteristic following: The layer sensor for the input is found instead behind screen LCD. Every Tablet PC uses Windows XP Tablet PC Edition that differs from the classic version of Windows XP for the acknowledgment of the writing and the possibility to use the digital ink also in the office applications.

1.2 The model used

The Tablet PC employed in this work (figure 1) is a Tablet PC Fujitsu Siemens Stylistic ST4121 Outdoor 933 with screen TFT 10,4 inches (figure 1). The processor is a Intel Pentium III 933 Mhz and the hard disk have 60 GB. To make able Tablet PC to work with numerous software in contemporary, the memory RAM has been expanded until 768 MB. It was able to work with many programs to make a digital photoplan and to digitalize with software CAD.

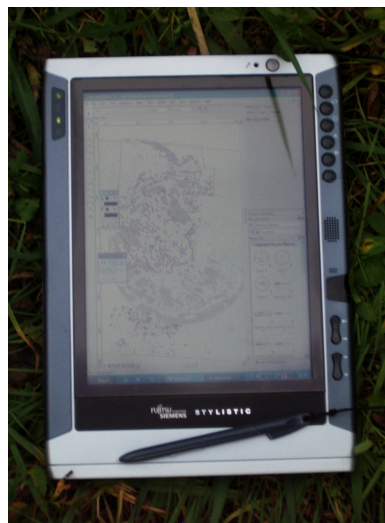


Figure 1 The Tablet PC

2. THE CREATION OF PHOTOPLAN AND THE DIGITAL DRAW ON TABLET PC

The work described in this paper has been developed in many phases. The final result is the product of many operations, topographical and photogrammetrical methods. They have been characterized through appropriate strategies of work the methods and the instruments to use in order to realize a usable and obtainable final product using a Tablet PC. The idea to draw the archaeological remains directly on Tablet PC is an innovative example but improvable in the future. The numerous difficulties during the realization of plants and sections in an archaeological excavation, have encouraged to find a solution better and faster respect to the handmade draw realized in every excavation. The excavation area selected to experiment this instrument was a zone of particular interest and it was assimilable to a plan (figure 2). The area selected was 12 meters x 13 meters in which during the excavation are emerged circular structures building and numerous stones fragments.



Figure 2 Excavation sequence

2.1 Topographical surveying

The excavation area of 12m x 13m corresponds approximately to a square. The phase of staking out has been enough fast because the area's stakes correspond to the limits of the square. The peaks of the area delimiting a square, are only four to reduce the possibility of ulterior errors in the phase of the survey. A greater number of peaks can accumulate linear and angular errors. The general area assimilable to a square, has been further on subdivided in rectangular smaller areas (2m x 1,5 m). Every apex of these rectangles has been delimited from photogrammetrical targets for the next phase tied to the photogrammetry. The survey

was made by plan coordinates method. Using a graduated bar with a prism they have been finds the photogrammetrical targets, the points that delimit the various stratigraphical units and the limits of circular structure evidenced during the excavation.

2.2 Photogrammetrical surveying

In this phase they have been taken photos to the rectangular delimited to the photogrammetrical targets. All the excavation area has been therefore covered by photos that subsequently has been elaborated with photogrammetrical softwares. Thanks to topographical coordinates, it has been possible to rectify photos of the excavation area. Through photogrammetrical software RDF in analytical modality based on control points, the photographed object has been transformed from central perspective into orthogonal projection. The prospective effects have been corrected and it was attributed for every photos a measurable constant scale. The final scale of the finished product has been of 1:20. Through a common graphic software, it has been made the relative photomosaic of the excavated area visible in the figure 3.



Figure 3 Digital photoplan – Scale 1:20

2.3 The digital drawing process on Tablet PC

In last and the more important phase it has been tested the use of a Tablet PC to create the plant of the excavation. Respect to the graphical tablets in commerce, Tablet PC has allowed to use in the same instrument all the potentialities of a portable PC. Using the optical pen of Tablet PC directly on the screen, it was possible to digitalize the numerous architectural and archaeological evidences presents on the excavation area. In some cases, it has been possible to go directly on the area thanks to the portability of the instrument. During this experiment, after the phase of survey, it was possible to continue the excavation that it was not interrupted by the presence of the operators on the excavation area. All the necessary data to digitalize were present on the

photoplan and it has been possible to continue the excavation.

This phase has introduced some difficulty, corrected and resolved with numerous tests. A problem has been found using directly on the screen the optical pen. One of the problems was relative the sensibility of the pen on the screen, easy solvable from the options of configuration of the optical pen. But the big problem was using the software CAD. In particular it was difficult to close polygons in the digitalization phase. Using an automatic function present in every software CAD, it has been difficult to use the keys on the optical pen. Clicking the key place on the pen, often it was risked to modify the shape of the designed polygon. This problem has been resolved using simultaneously a traditional mouse. The optical pen is used to draw directly on the screen, and simultaneously clicking on the mouse it was possible to close the polygons (making a double click) reducing the risk to modify the polygons created using the optical pen. The final result is that visible from figure 4, where are evidences the perimeter of the circular structure with the first steps excavated. Inside it is possible to see a smaller circular structure and the direction of the collapse towards the left angle of the draw. Moreover they have been documented the areas in which various lime layers were present, connected to the circular structure. In the low part of the draw it's documented an area in which various mixed fragments of tiles and stones are emerged during the excavation. The final result is a plan of the excavation area in scale 1:20 with evidenced the structures and the distribution of the stones with annexed lime concentrations and tiles in various points of the excavation.



Figure 4 The final draw made on Tablet PC – Scale 1:20

3. CONCLUSIONS

In order to obtain the visible final result from figure 4, they have been necessary approximately 3 days, including topographical and photogrammetrical survey. Thanks to a good photoplan it has been possible to obtain an excellent

final result. The use of instruments as Tablet PC on the archaeological excavation could speed up the draw generally produced hand made. It's useful to have this instrument considering that now they have characteristics much similar to the notebook. Such instruments enjoy good portability, are light and enough resistant. They are more useful directly on the excavation area, they can be used like a graphical tablet in next phase of computerize in laboratory.

4. ACKNOWLEDGEMENTS

The author would like to thank Prof. Attilio Mastrocinque, University of Verona – Italy, director of Grumentum Project 2005-2007 and its staff, particularly Dott.ssa Federica Candelato and Dott. Massimo Saracino.

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