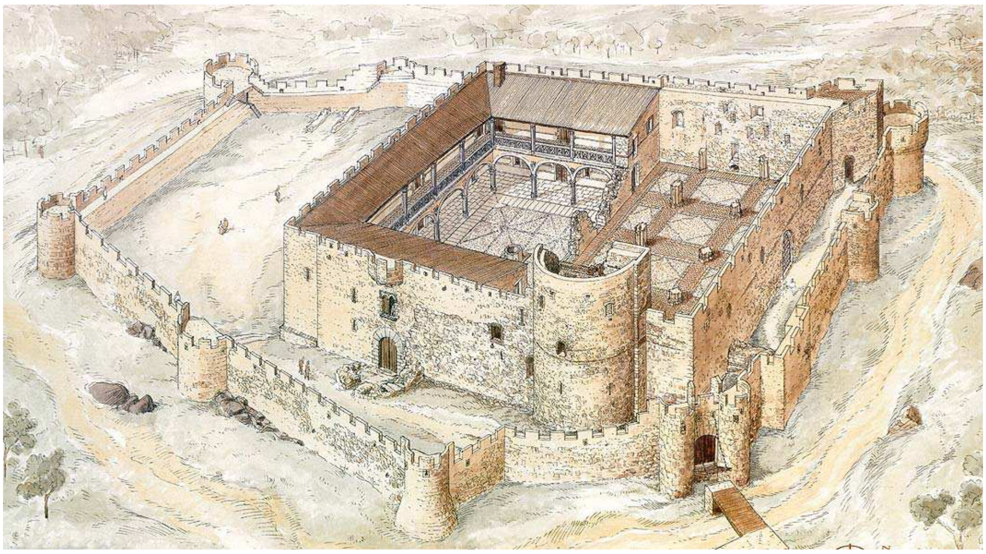
PFC

Gestión del Patrimonio Cultural

Nuevas Tecnologías

Year of realization:	September 2005
Method/Equipment	Archeological area/ Classical topography

Subjet: Topographic survey and creation of a three-dimensional model of "Castillo de la Adrada" and its environment. Elaboration of a multimedia document on the castle.



CONTENTS

1. INTRODUCTION

1.1. Objectives

Objectives of this project are the following ones :

- Raised topographic of the outside wall and the breast wall of the castle, as well as the surrounding zone.
- Elaboration of a general topographic plan(shot) of the zone in the scale(ladder) 1/500 with drawings of the equidistant curves of levels of 50 cms.
- Elaboration of a detailed topographic plan(shot) of the plant of the castle and the outside wall with equidistant curves of 20 cms.
- Development of a three-dimensional digital model of the castle and of the surrounding zone.
- Creation of a multimedia document of the castle following a historical perspective, architectural and topographic.

1.2. Location

The La Adrada's Villa is located in the province of Ávila, in the middle of the Valley of Tiétar, in approximately 11 Km of the source of the rio Tiétar, in the Sierra of Gredos' basin.

Figure 1: Situation's map

1.3. Historic summary

The origin of La Adrada's castle seems to go back to the XIII° century which first element was a Gothic church. According to the archives, La Adrada owned in 1250 a church located at the height of the hill of Torrejón. This church was composed of three naves, a central one, two on both sides and a semi-circular lane in addition. Many years later, in 1309, a tower was built close to the apse.

At the end of the XIV° century, at the beginning of the XV°, important changes occurred. Indeed, the king Enrique III raised La Adrada to the category of Villa which was, some years later, converted into the capital of the seigneury. The first lord of La Adrada, Ruy López Dávalos, decided to change the initial church into a castle. For that, the door of the temple was blocked, the cemetery disappeared, the church's tower has been pull down and on the apse, the tower of Homenaje has been built. In the same way, several minor dependences were realized around the patio which was already present.

Finally, the confine is surrounded by a wall strengthened by ditches and doors with drawbridges. Throughout XV ° century, walls were strengthened to protect themselves from the enemy fire. In addition, embrasures have been made into the walls to put in the artillery and an anti-door has been erected to avoid the outside invasions.

In the XVI° century, the castle has been transformed into a remarkable lordly residence. The south nave of the church has been transformed into a large room. The insides have been decorated to the taste of the period, walls and floors have been covered with azulejo tiles and paving. During next centuries (XVII° and XVIII°) while the castle belongs to the Montijos the transformations' rhythm goes by decreasing.

Figure 2: Aerial view of La Adrada's castle

In the XIX° century, when the castle become the property of Alba's family we can see a decline period. After the Independence war and the suppression of seigneuries the castle is completely disused, it is its ruin.

2. GPS NETWORK

Figure 3: GPS-200 of Leica

The devices used to carry out the survey were composed of:

- Three GPS-1200 Leica with radio-modem.
- One tripod.
- Two telescopic poles of 2 meters.
- Flexometre.

Characteristics of this equipment are :

- Detector GX1200 with RX1210.
- Memory card Compact Flash with 32 Mb.
- Antenna AX1202
- External batteries 12V and internal ones 7.4V.

Measurement precisions of the equipment are :

- Static: 5mm + 0.5 ppm
- Cinematic : 10mm + 1ppm.

2.1. Basic network

The first step to build the network has been to consult the topographic maps of the area in scales 1/50000 and 1/25000 to locate geodesic marks which could be a part of the network.

At first, 4 marks have been selected because their repartition covered the area. Then, being in the incapacity to place one of the chosen marks, 2 others were introduced on the place. In spite of the fact that it did not form the best geometrical configuration, the chosen marks divided up correctly on all the working zone and the calculation was assured. The selected marks used for the basic network are :

Encinosa and Pata Gallina which belong to REGENTE network and Pinosa, Pinosillas and Mancho of lower order (ROI).

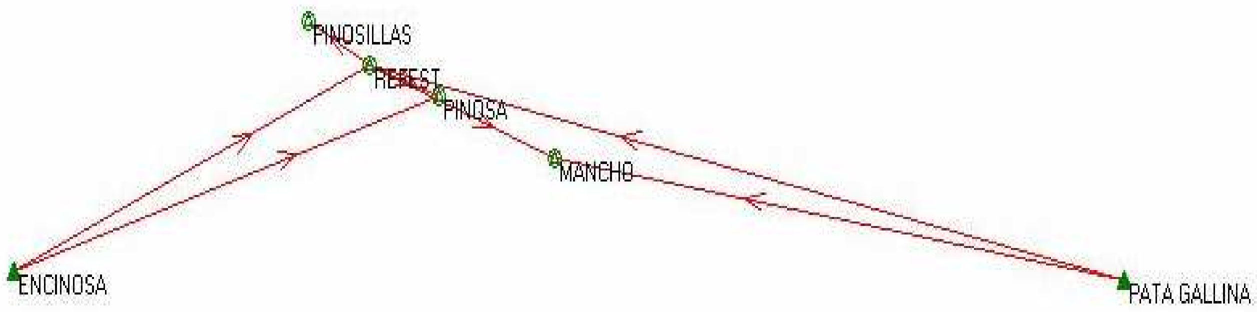


Figure 4: Croquis du réseau basique

Before to realize GPS observations, some conditions must be checked :

- All the geodetic marks must be existing and in good condition.
- The best way to reach them must be found before starting the work to save time during travelling.

2.1.1. Observations

This network's main goal was to determine reference point's coordinates called Refest, so an immovable receiver has been set up in this point. Two others receivers were moved on the others network's points.

Before to realize observations, a work folder is configurated (JOB) to record and convert observations by using following specifications :

- Positioning method: relative static
- Mask of rise: 10º (height minimum to use a satellite)
- Interval of recording : 10 seconds

The observation's process is the following one :While one receiver stayed on Refest, others were put on successively on the others geodetic points. The time of observation for each geodetic marks is about 20 minutes, it is the time required to calculate base-lines with suitable accuracy.

During observations, it is important to take into account a notion called GDOP, which refers to the geometric network of satellites. Its ideal value is one but it is acceptable until six. The difference between one and six is the time of observation, when the GDOP is close to six, observation time must be most important.

2.1.2. Calculation, Adjustment and Transformation

To calculate coordinates in ED50 system, with GPS observations, several programs are usable, but we have used SKI Pro V2.0, which is a Leica's software. Later, we will expose the calculation process.

The observations acquired on the ground, not without having previously to realize the purge of possible errors introduced on the ground, are used to resolve basic lines. After, the least-squares method is realized to the network, by calculating first a free adjustment to check that important mistakes are removed. After this control, a second adjustment is realized using one of the two points of REGEND network, that is to say either Encinosa or Pata Gallina. In the end, we have obtained every points' coordinates in ETRS-89 system, which correspond to the REGENTE network.

For this reason, we have had to convert these coordinates in 3D coordinates because in the end, it was coordinates in system ED50 which were interesting for us. To obtain transformation parameters, we have used both adjusted coordinates of the five points of reference in the both systems ED50 and ETRS-89.The used transformation is called "Stepwise" or step by step. It is an association of two methods ; 2D Helmert (for the planimetry) and interpolation in a regression plan (for the altimetry). With this method, errors are about one centimeter.

2.2. Secondary network

The first step consists in looking for and marking correctly points which compose the secondary network because they will be used to carry out the survey of the castle.

It was necessary to guarantee that the totality of walls is covered by points and that there would be no zone where the shone measures would be superior to the maximal distance of radiation.

Points have been marked either by nails, if they were in rock, or by iron pipes (30 cm long and 1 cm in diameter) if they were in the ground.

Points are called differently depending if they are located inside or outside the castle's surrounding walls. Inside, it is 20 000 to 29 000 and outside 40 000 to 48 000.

Once they are marked and drawn in a field book, we can start the observation's stage.

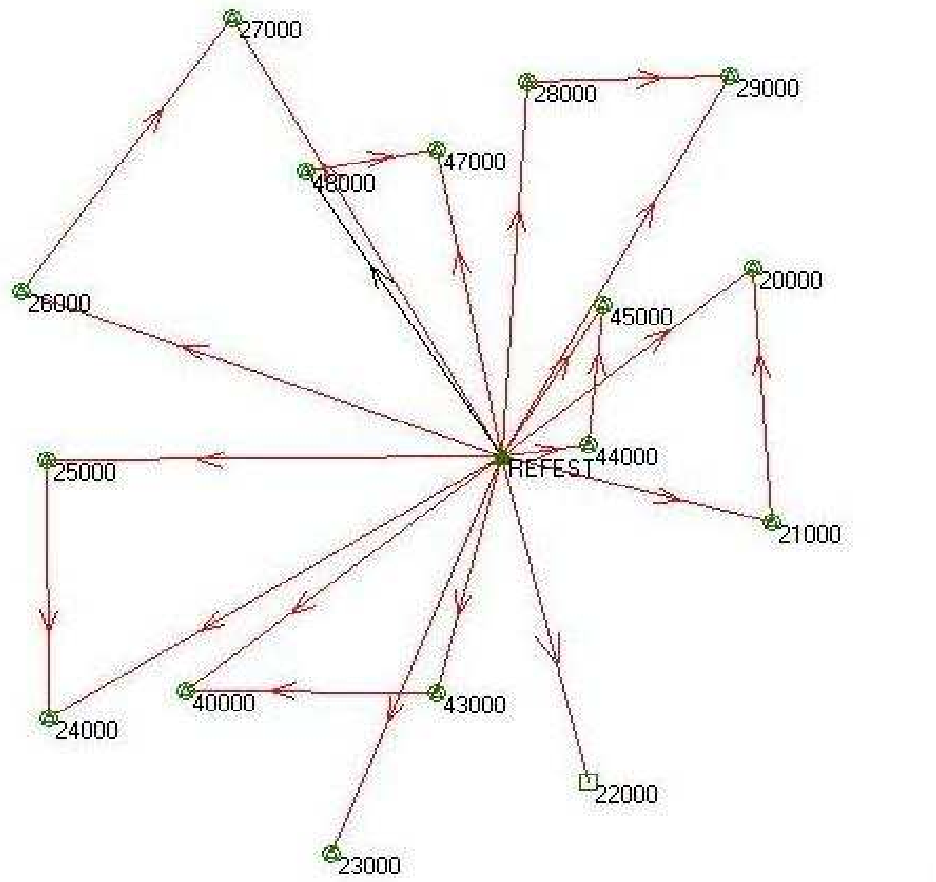


Figure 5: Sketch of the secondary network

The method of observation has been similar to that of the main network, a receiver were located on Refest (whose coordinates were known thanks to first step) and others have been moved on the points which composed the secondary network.

Observation's process was to leave a permanent receiver on Refest and to observe other points at the same time until every points of the network were completed. There were obligations which were to record data between Refest and other points at least during 20 minutes, moreover, GDOP had to be lower than 6.

Then, data has been dumped into the software to solve basic lines and adjust network by least squares' method. After, coordinates have been transformed as we did for the main network.

2.2.1. Observations

Every points of the intern network have not been calculated with GPS techniques. Indeed, to cover all the area of the castle some marks have been set in places where GPS techniques have not been possible for example places where GPS observations can not be received, because of masks too important or because of observations without required quality to resolve ambiguities.

These coordinates have been calculated using classical topography as we will explain it after in this report.

2.3. Networks precisions' study

To obtain coordinates' precisions of the basic and secondary networks, it was necessary to realize a transmission of variances in the model used for the transformation. In this model, precision of adjusted points in ETRS-89 and precision with which they were calculate by IGN have been recorded.

Basic network's precisions are calculated taking into account several precisions:
- These we have got during observation and then calculated by Ski-Pro
- These we have got by transformation ETRS-89/ED-50

If we calculate a quadratic composition using both precisions:

For the secondary network, calculations are made using Refest as base with precisions which are the mean of basic network's precisions.

	σ_x	σ_y	σ_H
Refest	0.067	0.022	0.039

Absolute mistakes which are estimated for the secondary network are quadratic composition of standard deviations adjustment and estimated mistakes from Refest.

Number	X	Y	H	σ (x)	σ (y)	σ (H)
Encinosa	347170,415	4456982,794	485,609	0.096	0.004	0.01
Pata Gallina	389193,801	4455999,341	491,489	0.035	0.031	0.035
Pinosa	363325,419	4461497,890	797,252	0.044	0.031	0.045
Pinosillas	358439,981	4463636,550	662,137	0.093	0.024	0.064
Refest	360743,018	4462432,970	676,307	0.067	0.022	0.039
20000	360771,354	4462455,322	663,423	0.067	0.022	0.039
21000	360772,918	4462424,425	662,166	0.067	0.022	0.039
23000	360723,030	4462385,163	660,311	0.067	0.022	0.039
24000	360691,912	4462402,146	659,580	0.067	0.022	0.039
25000	360692,196	4462433,427	662,185	0.067	0.022	0.039
26000	360689,822	4462454,041	664,236	0.067	0.022	0.039
27000	360713,875	4462486,768	666,563	0.067	0.022	0.039
28000	360746,752	4462478,314	664,747	0.067	0.022	0.039
29000	360769,322	4462478,757	663,845	0.067	0.022	0.039
40000	360707,245	4462405,234	666,962	0.067	0.022	0.039
43000	360735,086	4462404,426	663,236	0.067	0.022	0.039
44000	360752,674	4462434,157	665,357	0.067	0.023	0.039
45000	360754,634	4462451,159	667,638	0.067	0.022	0.039
47000	360736,422	4462470,394	669,228	0.067	0.022	0.039
48000	360721,709	4462468,071	667,013	0.067	0.022	0.039

3. NETWORK OF SUPPORT : OBSERVATION USING CLASSICAL TOPOGRAPHY

The goal of this network has been to make denser the basic network and to calculate coordinates of points which have not been calculated by GPS.

We have used the Leica station TCR 705. This device could realize distance measurements without prism thanks to laser beam. To measure with the reflector, we use infrared option of the device.

Technical characteristics :

- Typical deviation in angle measurements: $\pm 0.5 mgon$
- Zoom: 30 X
- Typical deviation in distance measurements:
    - Without prism: 3 mm + 2 ppm
    - With prism: 2 mm + 2 ppm
- Dual axis compensator

Complementary instruments used:

- Tripod Leica.
- Prism reflector Leica.
- Flagpoles.
- Flexometre.
- Bars of steel corrugado and steely nails.

Figure 6: Totale Station TCR 705 from Leica

3.1. Method of observation

As every point could not have been determined by GPS observations, we have been obliged to realize classic measurements using polygonal with redundancy between observations.

Angle measurements and distance measurements have been made by direct and reciprocal observations, taking azimuthal lectures to reduce as much as possible mistakes of direction. Zenithal lectures and distance means' have been made on the central part of the prism. Then, we have realized a least-squares fitting.

3.2. Coordinates' calculations.

To this process we have used the software Topcal21.

To obtain approached coordinates of points 41000 42000 and 46000 which could not have been calculated by GPS we have used 2 polygonals :

- For points 40000 and 41000 a polygonal was made between points 26000 and 42000.
- For coordinates of mark 46000 an other polygonal starting from 45000 to 47000 was realized.

These polygonals were all in the tolerance range both for angular closures and planimetric and altimetric closures.

As approached coordinates of adjusted points we have taken, in case of station number 22000 coordinates we have obtained with GPS observations and in case of stations 41000, 42000 and 46000 these we have got with the polygonal.

Summary of adjusted coordinates with their accuracy:

N º Point	X	Y	Z	σ (X,Y)	σ (Z)
22000	360751,208	4462392,764	661,000	0,004	0,006
41000	360705,713	4462442,167	666,038	0,004	0,008
42000	360705,530	4462423,613	663,730	0,004	0,008
46000	360744,543	4462462,763	666,851	0,003	0,006

4. GPS SURVEY

We have carried out a topographic survey using GPS techniques for the surroundings of the castle to create a model and to get the plans.

Device used was :

- Three GPS-1200 from Leica with radio-modem.
- A tripod
- 2 rods of 2-meters length
- Flexometre.

4.1. Observation's methodology

To carry out the survey of the area around the castle we have used RTK method (*Real Time Kinematic*) or cinematic in real time. We

Pour la réalisation du levé de la zone autour du château on a utilisé la méthode RTK (*Real Time Kinematic*) ou cinématique en temps réel. We have considered this method as the most effective in view of the speed of the acquisition of data and the obtained precision.

To finalize the observation we leave a fixed receiver as reference on one of the marks of the secondary network, (Refest, situated on the height of the castle in the center of the zone of study), and two other receivers are configured as being mobile. It is with those that we take the necessary points on the ground.

The obtained data were divided into three groups:

- Points of details: points which define the ground. The quantity of captured points depends on the lie of the land (more or less bumped); we shall take more points in the zones where the change of slope is fast.
- Lines of break: they define the abrupt changes of slope.
- Structural lines and singular points: they define the superficial and punctual elements which representation is important for the plan.

For the division of these data we used codes, in the mobile devices, which allow to differentiate the types of raised points.

4.2. Calculations

The recording of data was realized without having the coordinates of the reference station Refest. We have opted for the calculation of approached coordinates using *"single point positioning"* which allowed us to obtain coordinates in WGS84 with a precision of about 10 meters.

Then, to the office, when we had ended to calculate the network, we changed these coordinates *"single point"* by adjusted coordinates in WGS84 of this point. The program of calculation during the realization of the coordinates takes care to make the three-dimensional translation to obtain the definitive coordinates.

4.2.1 Absolute precision of radial points

The biggest errors committed with radial points have to be lower or equal to 0,2 * denominator of the scale (10 cm) in planimetry and lower or equal to ¼ of the contour interval (25 cm) in altimetry.

To calculate maximal errors we have taken the absolute precision of the base, Refest.

- Planimetric precision = under 0.0708 m
- Altimetric precision = under 0.0380 m

In the working configuration for receivers the recording of the points was made with a precision lower or equal to 0,02 m. A point with a precision bigger than 0,02 m will not be recorded.

Realizing quadratic composition, we get absolute precision of radial points:

Planimétry $\sqrt{0.0708^2 + 0.02^2} = 0.0735m$ 7.4 cm < 10 cm

Altimétry $\sqrt{0.038^2 + 0.02^2} = 0.0429m$ 4.3 cm < 25 cm

5. RADIAL METHOD

With this method we determine the coordinates of the necessary points for the three-dimensional definition of the castle. For it, we used the total station TCR 705 of Leica, because it has the property not to need a prism reflector what facilitate the acquisition of data.

To record data, we have set up the device on points of the network marked previously. We directed the device in order to observe as many points of the network as possible and we have looking for remote and good references to ensure and to control that the device is stable during observations. To ensure our work we have taken horizontal and vertical lectures.

The biggest distance we took is : D_{MAX} = 511.9 m

In planimetry, the maximal error is determined by calculation of the transversal error and the longitudinal error. Finally, we took the main error. It was the transversal error.

$$E_{R_{XY}} = 5.7mm$$

5.1. Final precision of the survey

The planimetric tolerance is given by the relation : T = 0.2 * $D_{Echelle}$

The altimetric tolerance by: $T_Z = 0.25 * Contour\,interval = 0.05m$ (contour interval= 0.2 m)

Taking the unfavorable case (mark number 27000 whose maximal relative error is $E_{R_P} = 0.00488m$), and realizing variance transmissions with used methods, the final planimetric precision is $E_{R_{XY}} = 7.5mm$. This value is inferior to the tolerance.

As well as for the previous case, to calculate the final altimetric precision we use the mark whose relative error is the biggest (mark 25000 $E_{R_A} = 0.00954m$) and with variance transmission, we get a value $E_{R_Z} = 0.0108m$ lower to the altimetric tolerance. Then the work is validated to realize the cartography.

6. CARTOGRAPHIC DRAWING AND PUBLISHING OF THE CARTOGRAPHIC PLAN

Previous phases of data processing are necessary to define geometrically the castle and its surroundings. As result, we get a cloud of points from which we draw the topographic plan to different scales 1:500 (for the castle and its surroundings) and 1:200 (to detail the bottom of the castle and the ground next to it).

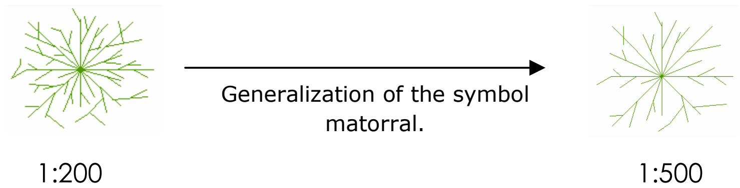
To realize this phase we use the software Microstation.

6.1. Plans' realization

During this phase, we proceed to the meeting of points using sketches realized on the ground with the code introduced into the device at the time of the recording of the data.

During the phase of symbolization, we took into account the cartographic standards, the scales which were of use to the realized plans and the logical rules which allow a good legibility of the cartographic document.

A very important factor at the time of drawing the symbols is the scale. In this project, we realized two topographic plans in scales 1:200 1:500. The stage of the symbolization, to pass of the plan in the 1:200 to the plan in the 1:500, implies not only a change of scale but also a generalization of the symbol so that the legibility is correct.



The color used for every symbol was chosen to seem the closest to the entity which it represents. The final color of the symbols and the other entities results from multiple tries until find finally the most adequate. These colors were registered in tables of colors.

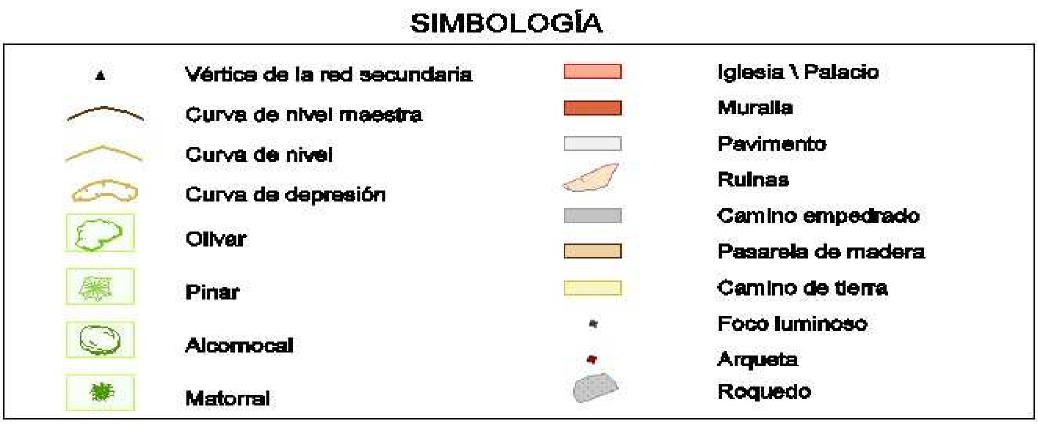


Figure 7: Symbology created for the plan at the scale 1:500

The representation of the relief was made by means of contour lines of 0.5 m of equidistance in the case of the plan in 1:500 and 0.2 m of equidistance in the case of the 1:200, and they were completed by a series of highly-rated points.

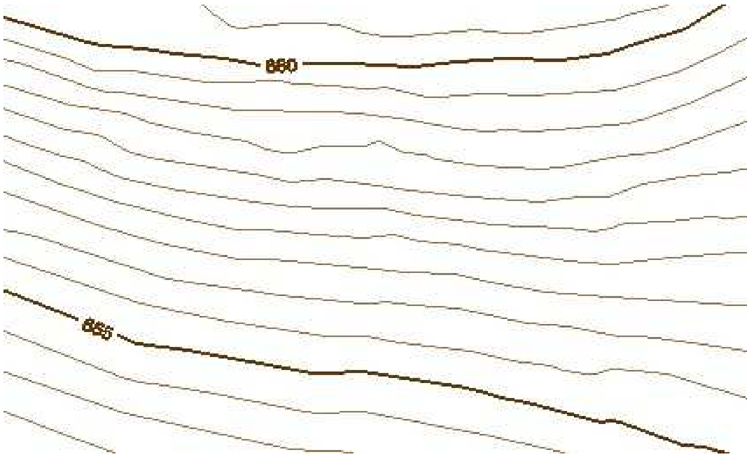


Figure 8: Contour lines corresponding to the topographic plan in the scale 1:500

For a correct digital modeling, we have to introduce not only points acquired on the ground in a unpredictable way, but also add lines of break (lines which indicate a change of slope) and dark zones (bum around for which we did not wish contour lines, as for example inside the palace).

7. THREE-DIMENSIONAL MODELING OF THE CASTLE AND DIGITAL MODEL OF GROUND

7.1. Three-dimensional modeling of the castle

At first we realized the drawing of the walls of the castle until obtain its three-dimensional reconstruction in the space. Then we proceed to the realization of the digital model of ground. When we obtained both products, we proceed to the meeting what allows a general visualization. In this process we use the Microstation program.

Using the sketches of ground (made during the acquisition of data) and diverse tools which we have thanks to Microstation, we proceed to the creation of the surfaces which form the walls of the castle.

The difficulty of this phase was the work in 3D because of the enormous quantity of taken points (approximately 20.000), what provokes a mixture and an overload of the information. Localization of the points on the walls and details of the castle complicate the modeling.

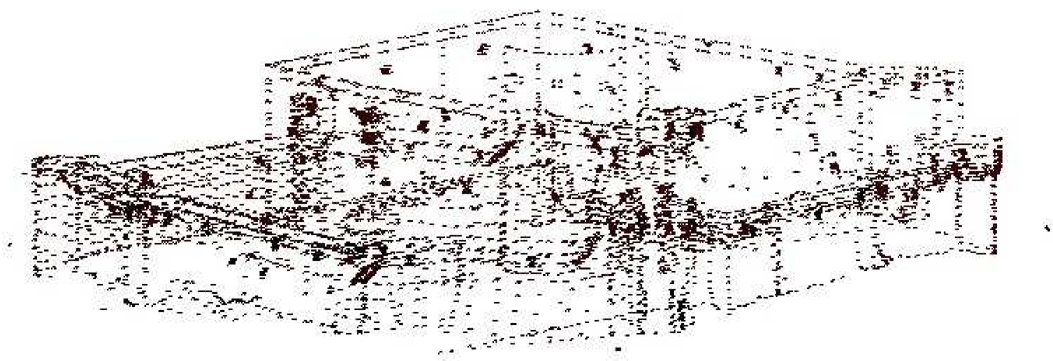


Figure 9: Global sight of the cloud of points of the castle

To facilitate this task, we did not work with the complete cloud of points on the screen, but we divided it so many parts as there is of stations (from those with whom we made the radiation) and we obtain 19 clouds of points. The following stage consists in the correct meeting of all the averaged points, we so profile all the structural lines and the skeleton of the castle.

Finally we are crossed in the creation of modélisables surfaces that all the elements of the castle (crenellations, towers, walls, murderesses) form.

Then we realized an assignment of the materials of surfaces by trying to endow the three-dimensional representation of the most realistic possible appearance.

The major part of the used tools was extracted from palettes of tools which Microstation has inclu by default as well as of palettes of tools formed from the images in the format .jpg obtained thanks to the real objects.

For the elaboration of the digital model of ground we used the MGE program the Ground Analyst application of which is specific for the creation, the manipulation, the edition, the display analyses of digital models.

Then we obtain a series of images of the most representative zones of the castle.

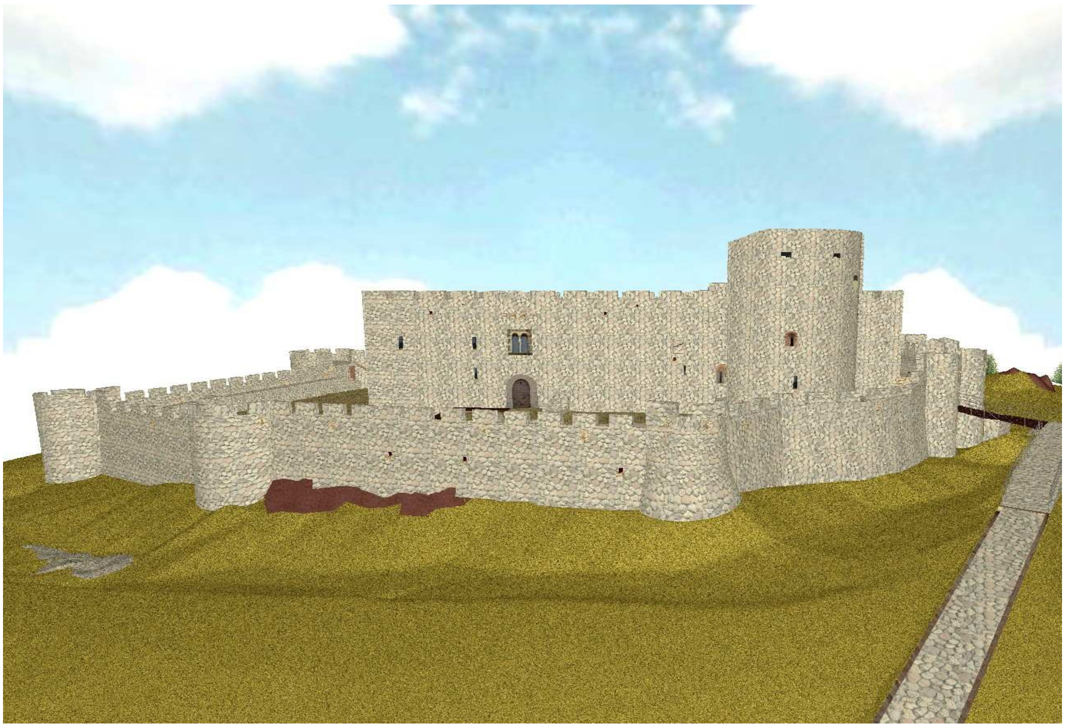


Figure 10: Castle panoramic

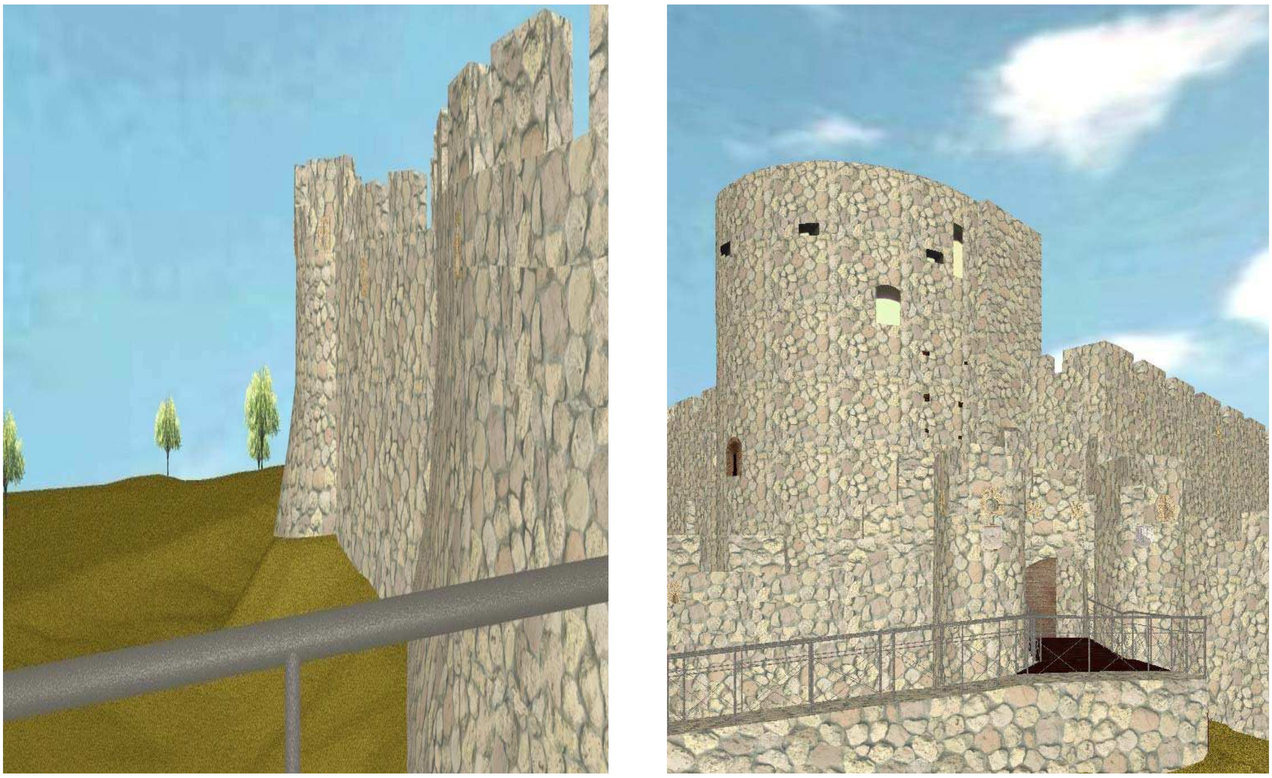


Figure 11. Sight of bulwarks

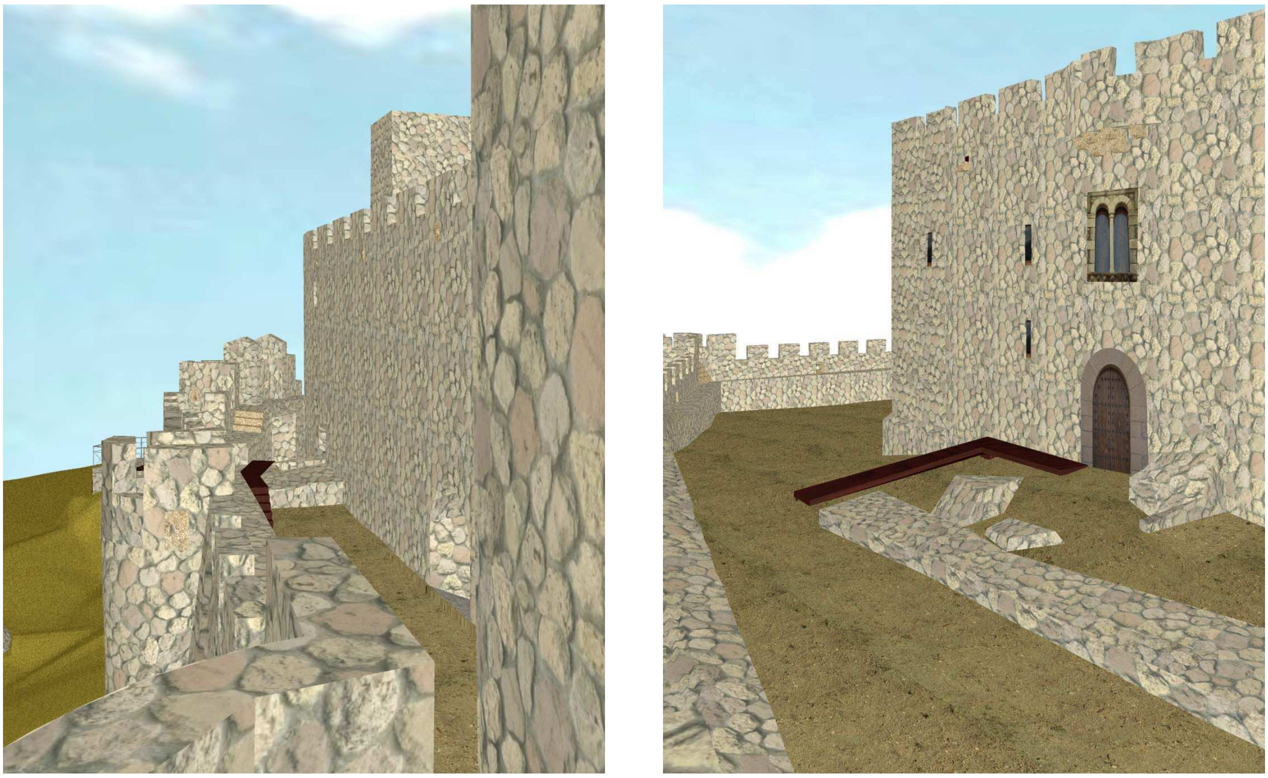


Figure 12. North wall and entrance of the palace

8. DEVELOPMENT OF THE MULTIMEDIA APPLICATION

To realize this application, we look for very varied information: mapping(cartography), texts, images, sounds and videos. The obtaining of the information was facilitated by the various bodies which participated in the reconstruction of the castle. The biggest quantity of documentation was acquired according to the study of the architect Doña María Jesús Fernández, which generously facilitated us the access to this study of all the project of castle's reconstruction. We also arranged several information reports thanks to the Institution Gran Duque de Alba.
In this multimedia document we told the story of the valley of Tiétar and Adrada, we described monuments and landscape, we told the story of the construction of the castle and its architectural details, we described the state of the castle before, lasting and after the reconstruction and we reserved a party to define the technical terms.

As regards photos, once selected, we realized an important work of treatment of the images by means of the program Adobe Photoshop. We treated certain aspects such as the levels of lights, the rate of shine, the contrast, tones, the saturation, the luminosity, thanks to tools numeric as filters, according to calculations of distortions, shaded off images, brightness of edges … These treatments were realized to modify the size, improve the tone, the shine and the saturation, to eliminate the not wished elements or to make an assembly or more simply to mask elements.

Figure 13. Originals photographies

Figure 14. retouched photos

The realization of the multimedia application was made in compliance with the rules of clarity and simplicity so that the information which it contains can be used by every public. The application was made according to a hierarchical structure in windows and under windows, what facilitates the access to the various levels of information and details. In this way we allow the user to navigate according to his searches(researches) and to use the information at a more general or more concrete level. To realize the application we used the Lingo program. We then obtained panels as this document:

Figure 15. Panel: " the castle: reconstruction "

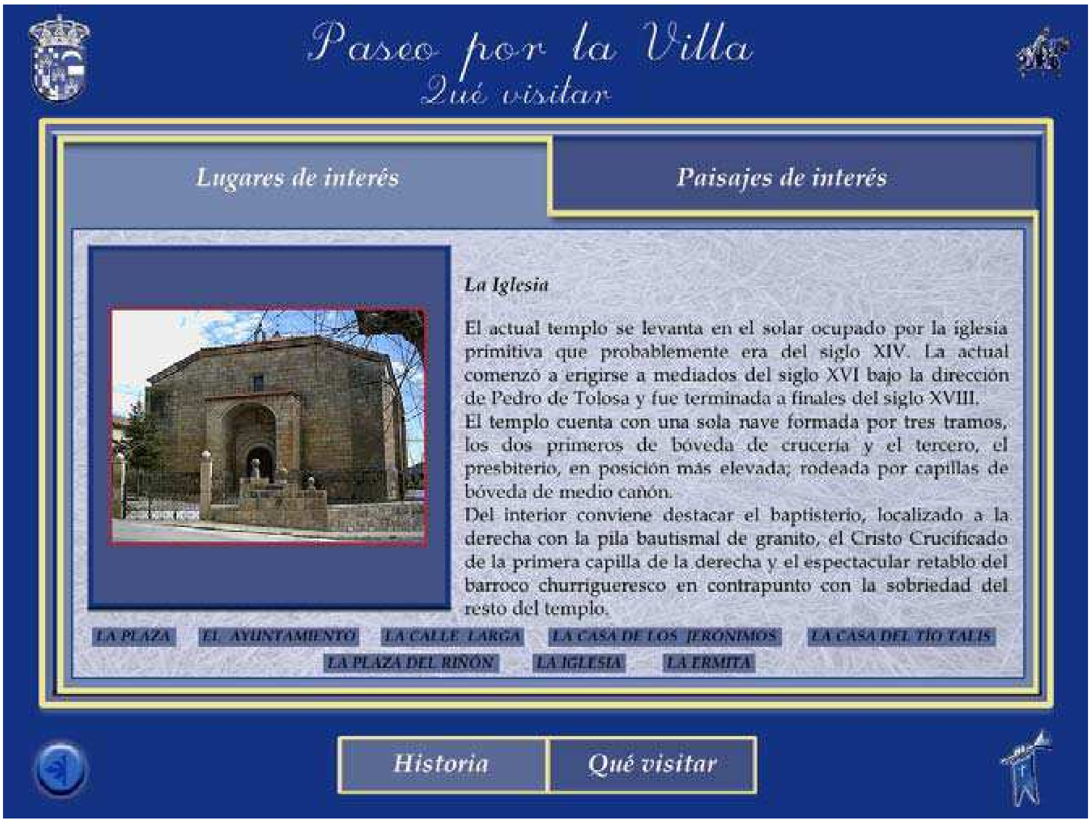


Figure 16. Panel: " Walk in the city: to visit "

9. COST

Although the cost of the realization of this project was calculated without taking into account the phase of apprenticeship of the multiple techniques involved in the execution of the project, it being due to the difficulty being able to differentiate the period of apprenticeship and the period dedicated to the work for the project, these calculations remain all the same a valid estimation.

ACTIVITY	COST
Preparatory phase	
Planification	1080
Equipment preparation	540
	1620
Basic network	
Localisation	620
Observation	4615,2
	5235,2
Secondary network GPS	
Implantation	420
Observation	3076,8
	3496,8
Secondary classical network	
Observation	**1012**
survey GPS	
Acquisition of points	**3805,2**
Rayonnement	
Acquisition of points	**10120**
Calculation GPS	
Volcado and edition	367,5
Calculation and adjustment	918,75
	1286,25
Calculation classical	
Volcado and edition	551,25
Calculation and adjustment	1102,5
	1653,75
Cartography drawing and plan 's edition	
Plan's drawing	1286,25
Edition	918,75
publishing	397,5
	2602,5
Reconstruction 3D	
Castle 's drawing	3675
Material	3675
	7350
Formation of MDT	
Creation of MDT	551,25
Material	918,75
	1470

Union and generation of films	**791,25**
multimédia	
Re compilation information	3037,5
acquisition of photographies	1104
	4141,5
Edition of information	
Edition of text	4556,25
Edition pictures	2756,25
Edition sons	367,5
Edition videos	367,5
	8047,5
Application 's drawing	
Planification	558,75
Drawing of fixed elements	2756,25
Drawing of interactif elements	3675
Programmation	9187,5
Integration of information	5512,5
Revision	918,75
	22608,75
Redaction of memory	**1822,5**
Binding	**300**
Handing-in of the report	**240**
Sub-total	77603,2
Benefice 14%	11640,48
Total	14279
Total + IVA(16%)	**103.522,38**

The cost are in euros.

10. CONCLUSIONS

Thanks to the realization of this project, we wanted to generate a series of documents which not only describe the castle geometrically, but which also show the custom(usage) of which we make of these documents there. Then, we obtained a series of conclusions thanks to the analysis of the various methodologies used(employed) for the realization of the project.

The application of techniques GPS, the observation of networks and sunrise present many advantages, in particular the most remarkable are the productivity gain, thanks to the decrease of the time of observation, the weak average human beings and thanks to the fact that we do not require any more a visibility between observers during the observations. As inconveniences it is necessary to raise the problem of the observations in zones close to walls of the castle, it was impossible to complete totally the document because of the limits which the GPS presents during the presence of screens.

As regards the classic topography, we used it for the observations of the networks which we could not realize with the GPS. The problem which presents the classic topography is the necessity of inter-visibility, what increases considerably the time of observation and decreases at the same moment the return. In spite of these inconveniences the usage of the classic topography remains indispensable for the creation of the network and for the execution of the radiation of points on the walls of the castle.

During the realization of the three-dimensional model of ground and the cartography it is very important not to trust the results given by certain applications, it is indispensable to realize a continuous control and the edition to obtain an optimal result.

As regards the application in the multimedia it is necessary to know that this one has to have a hierarchical structure to facilitate the access to various levels of information and details, and to allow the user to know at any time about which place he can find this information. Furthermore, to improve the final drawing of the application we had appeal to the follow-up of reactions on behalf of a group of volunteers what allows to estimate the legibility of the realized system of consultation and to optimize the clarity of the interface.

By realizing this multimedia product we wished to contribute in a active way to the work of reconstruction and to the started of the tourist and cultural promotion of all the valley of Tiétar generally and the site of Adrada in particular.

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ENCLOSE I. Identification sheets of the network's marks

ENCLOSE I. Identification sheets of the network's marks

Número: 21000
Nombre: 21000
Municipio: La Adrada
Provincia: Ávila

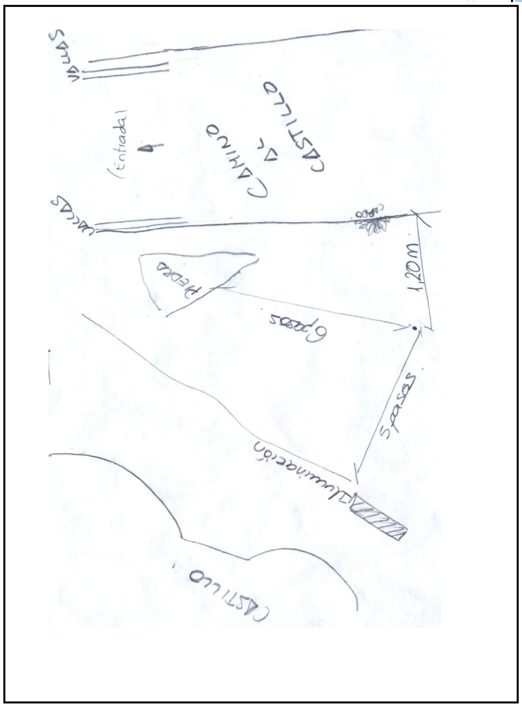
Fecha de colocación:
Tipo de señal: Clavo de punta acerada.

Coordenadas geodésicas WGS84:
Longitud: 4° 38' 22.13879" W
Latitud: 40° 17' 55.87127" N
Altura elipsoidal: 716,146 m

Coordenadas UTM ED50 Huso 30:
X UTM: 360772.918 m
Y UTM: 4462424.425 m
Altura ortométrica: 662.166 m

Observaciones:
Horizonte despejado.

Acceso:
Siguiendo el camino de tierra que rodea el castillo desde la puerta de castillo hacia la parte redonda de la muralla , esta situada entre la primera torre de la muralla(la que no es totalmente cilíndrica) y la segunda torre.



ENCLOSE II. PLANS

ENCLOSE II. PLANS.

General plan of the castle with scale of 1:500