# DOCUMENTATION OF CASTLES IN A SPECIAL G.I.S.

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## 1. Introduction

Although archaeological and architectural restitutions of monuments have undergone considerable developments and improvements over the years, they have generally been developed independently from each other isolated to a great extent from other activities related to each.Unfortunately, due to the lack of collaboration and interdisciplinary cooperation, the products of the various scientific approaches to a particular monument are usually scattered and extremely difficult to collect and use efficiently. Even more difficult is the collation and modification of the enormous amount of existing information arising from various sources for many practical reasons: e.g. matters of scales, reference frames etc. Many countries and institutions have already tried to face up to the problem by organising systematic archives related to monuments.

As was reported in an earlier C.I.P.A. meeting, the modern alternative answer is the creation of a Special Geographic Information System - G.I.S. A special G.I.S. not only constitutes an updated archive, making use of the highest degree of automation, but it allows the correlation of data and thus the creation and retrieval of new information as well. A G.I.S. is a combination of human and technical resources, together with a set of organising procedures, which result in the collection, strorage, retrieval, dissemination and use of land information in a systematic manner. The G.I.S. methodology has been developed, initially, for administrative and financial aid in urban planning and development, but recentrly it has been used for the efficient documentation and management of monuments.

In this respect, national, local and other special GIS´s, Byzantine, Classical etc have been developed. One such special system would be a system related to monuments. The structure of such a system would be complicated and very critical for its success. It could be established at a local level, especially in countries with many monuments, or at a district or national level. It could also be structured for particular subjects such as a GIS for the Church, Christian, Classical, Cycladic, Roman or Medieval monuments. A GIS based on particular subjects is more uniform and thus easier to establish and operate. A GIS based on districts is more diversified but the

benefit of its operation has a more general appeal. It is not difficult to foresee that systems of both kinds will be operating in several countries. The integration of these systems will constitute the larger systems which will follow as a "second generation".

The proposal put forward by this paper is the establishment, in Greece, of a special information system containing the documentation of Castles. This is of national importance for the simple reason that previous archaeological activities in Greece have, over the years, tended to focus on classical and pre-classical monuments and castles-usually medieval; Venetian and Byzantine taking a very second place. For this reason, the documentation on castles is extremely limited, but they can, on the other hand, unlike other antiquities, serve a positive modern purpose as tourism or recreation centres etc. Presently, conference centres, research facilities, even prisons are making full use of suitably adapted castles.

This paper discusses the structure of an information system of such a kind and describes the first stage of a pilot project which is being developed in the Laboratory of Photogrammetry of the National Technical University of Athens. The system used counsists of

- referring to hardware: the cheapest instrumentation possible - e.g. Stereocord G2 connected to a PC AT286 for photogrammetric restitutions
- referring to software: AUTOCAD for the editing of analytical photogrammetric restitutions and digitized data, and selected sections of ARC/ INFO (PC version), which is a general GIS package.

As a pilot project, the castle on Acrocorinth was chosen. The main reason for this is that Corinth is wihtin easy reach of Athens. It proved to be a successful choice because of access to a wealth of material coming from two main sources / Carpenter & Bon (1936)/ and / Theodorou et al (1990)/.

## 2. Information contained in the Special GIS

The structure of the system follows the basic figure of all GIS´s (see fig.1).

After a thorough study of complex aspects and characteristics an efficient system may be planned. However in this early stage of structuring a GIS only a general analysis of the information to be contained is most important. This factor defines almost all the others. Determination of the kind of information to be contained is a specialised interdisciplinary and scientific task, demanding a detailed examination of all aspects of

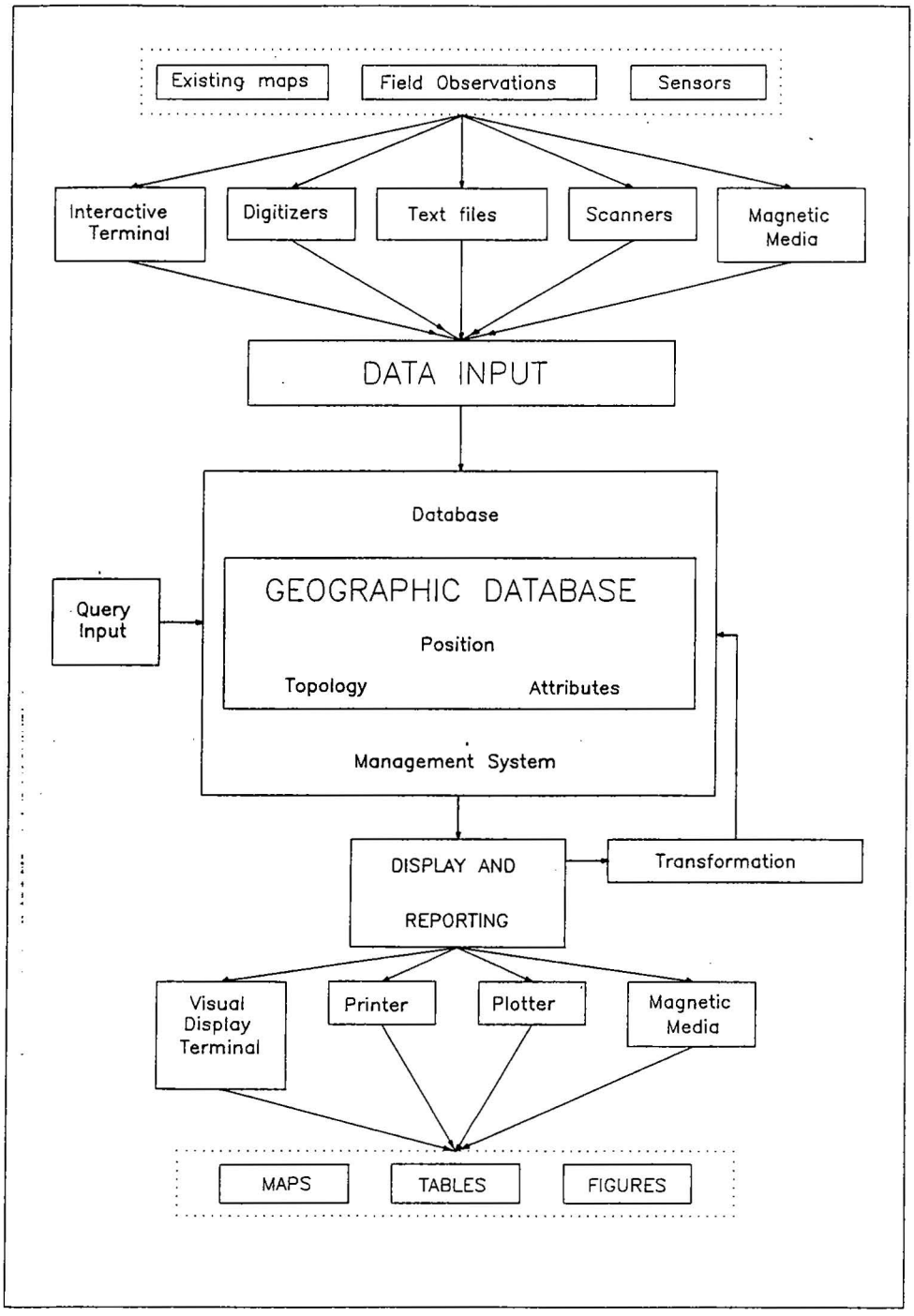


Fig. 1 Typical structure of a G.I.S.

GIS such as: hardware demand, man-hour cost etc.

According to the experience of the Laboratory, the following groups of recorded information were identified:

| | |
|---|---|
| 1. General information: | location of the monument, land use, ownership, administrative information, meteorological data etc. |
| 2. Historical information: | Dates of constructions, occupations, battles, important visits etc. |
| 3. Publications: | Books, reports, manuscripts etc. |
| 4. Images: | Post-cards, photographs, aerial photographs, images from other sensors, video etc. |
| 5. Measurements: | Topographical, architectural and technical measurements, surveys, maps, coordinates, digital terrain models etc. |
| 6. Archaeological information: | Results of archaeological excavations etc. |
| 7. Architectural infrormation: | Style of constructions, masonry, style of columes etc. |
| 8. Technical information: | Building material, quarries, pedological, geological, utility networks. |
| 9. Caltural information: | Languages spoken, fairs, population etc. |
| 10. Pieces of art: | Ikons, statues, idoles etc |
| 11. Restorations and interventions: | Dates of restorations and interventions, plans and surveys of restorations and interventions etc. |

The data will be stored in digital and alphanumeric form in the data base which constitutes the heart of the system. A fundamental question concerns the data acquired from pictures and plans.

As the amount of data derived form an image is large and the number of pictures relating to a given monument profuse, powerful computers are needed. Peripheral scanning facilities are also needed for the digitizing of images, but as yet they are uncommon. Although, in the long run the handling of image data will become commonplace, it does not seem indispensible at the moment to have all images in digital form.

Similar reservations may be made in digitizing plans. The digitizing of all the plans of the monuments in a district is both time-consuming and expensive. Thus, for the time being, the digitizing should be carried out selectively.

The ability to use both raster and vector data is important, however, even in this early stage.

## 3. The pilot project

As has been already mentioned, the Castle on Acrocorinth was chosen. Southwest of the ancient city of Corinth rises the rock of Acrocorinth, an important mass of limestone, abrupt and isolated on every side, on the west a narrow and lower ridge connects it with more distant hills. It is the oldest castle in continous use in Greece after the Acropolis of Athens.

The circuit of the wall is about 3,000 m and the surface included 240,000 $m^2$. More information, distributed into the groups given above, is as follows.

### 3.1. General information

Acrocorinth is located southwest from Corinth. The coordinates of its centroid are:

X= - 8.150 m Y = 15.600 m

in azimouthal projection centered at:

$\varphi = 37^o\ 50'$ $\lambda = -\ 0^o\ 40'$ from Athens.

The highest point is 575 m above sea level.

It belongs to the prefecture of Corinth and to the county of Ancient Corinth. Archaeologically it belongs to the 6th sector of Byzantine and Medieval Monuments, which has its central office in Patras and a local office in Ancient Corinth.

### 3.2. Historical information

Attack by Mommios who distroyed the north and west section.

The castle is first discribed in literature by Procopios, who reports about the king Ioustinianos 527-565 a.C.

| | |
|---|---|
| 8th and 9th century | : distructions by Slavic inventors |
| 886-912 a.C. | : reconstructions by king Leon VI |
| 1147 a.C. | : attack by Normands |
| 12th century | : repaired by Byzantins |
| 1210-1250 | : Villeardoin |
| 1250-1350 | : Franks - John of Gravina |
| 1358-1394 | : Acciajuodi |
| 1400-1404 | : Knights of St. John |
| 1458-1687 | : Turks |
| 1687-1715 | : Venetians |
| 1715-1821 | : Turks |
| 1821- | : Greeks |

3.3. Publications

There are many publications referring to Acrocorinth. Some of them are given in the bibliography (1, 2 ,4 ,8, 9).

3.4. Images

There are photographs from amateur cameras, post-cards and pictures taken during excavations which require systematic classification. Only one of the references contains about 100 photographs! Also, there are many aerial photographs which cover the monument, the first dating from before 1936 and the rest taken periodically since then.

There exist coloured aerial photographs and satellite images from Landsat and Spot. Although no special investigation was carried out it is considered certain that several videos of the castle already exist.

3.5. Measurements

Topographic or any other kind of measurements do not exist. Yet, there are old sketches drawn from a cartographic view point (Fig. 2), which can be included into this group of information, and old topographic maps. The first map was made by Coroneli in the 17th century (Fig. 3).

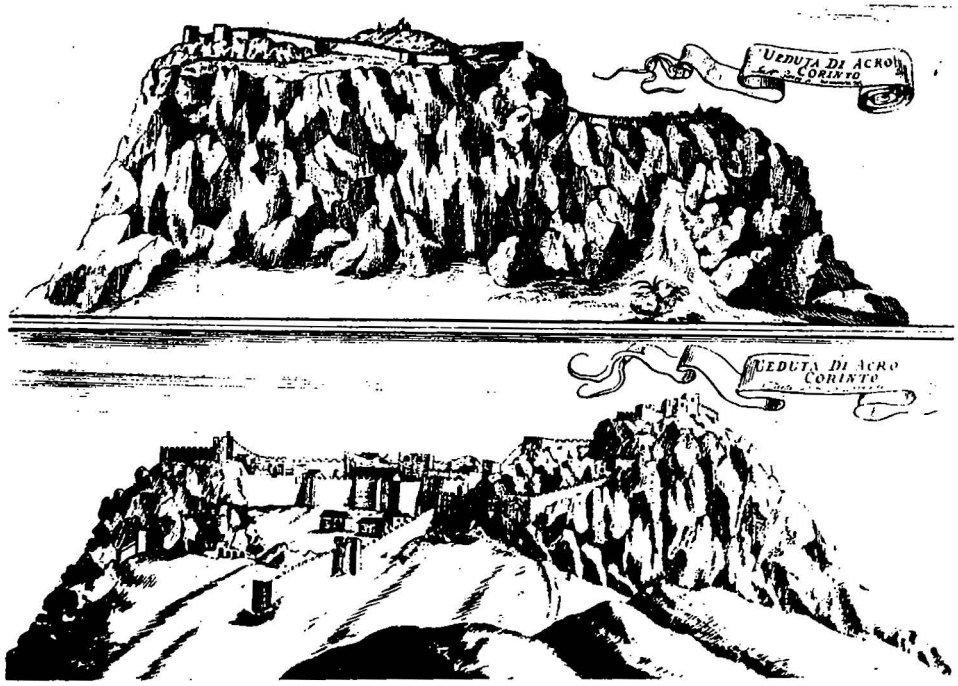


Fig. 2 Old sketches of Acrocorinth

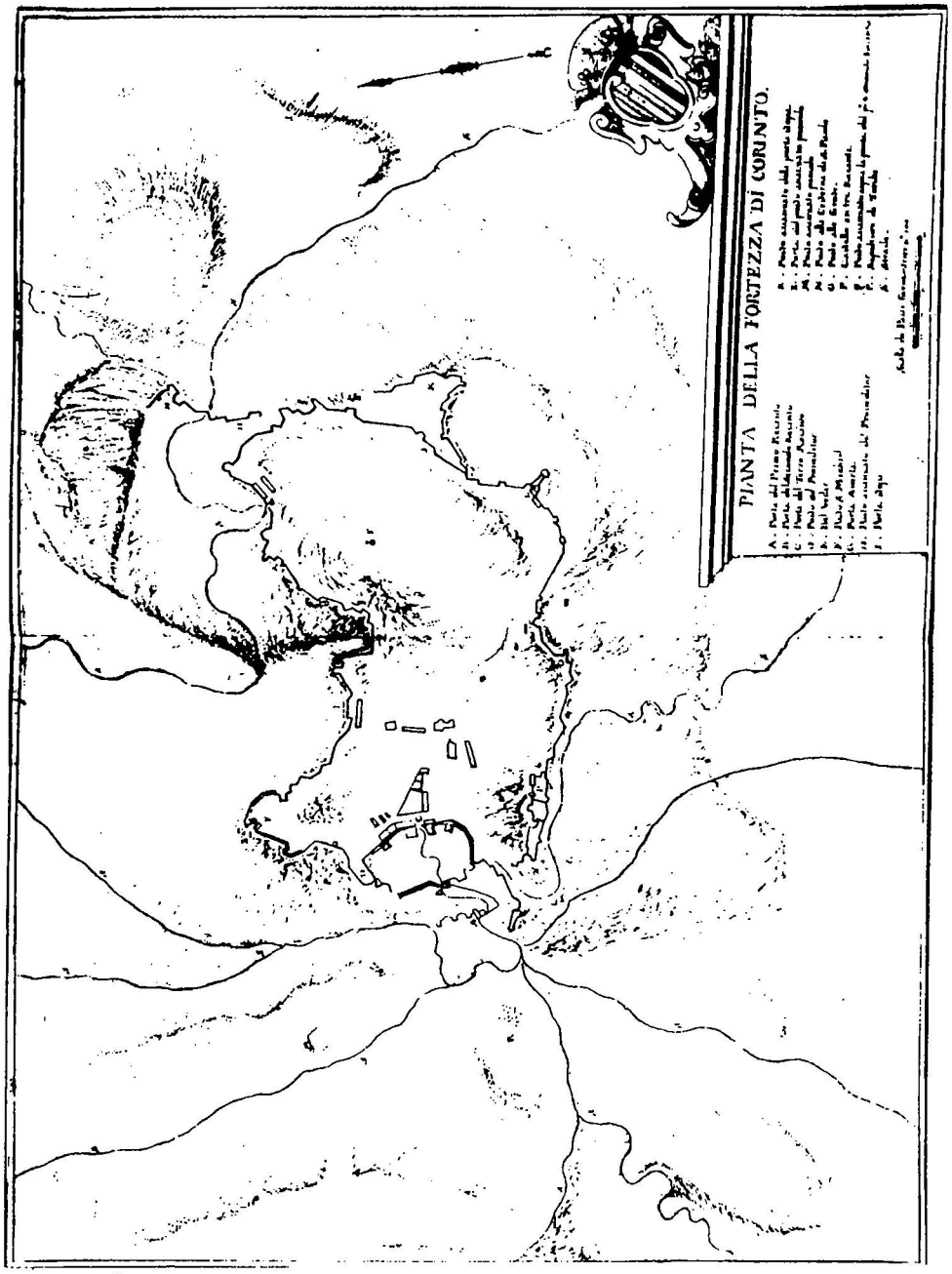


Fig. 3 A17th century Survey of Acrocorinth

The most complete survey of the castle was carried out in 1931 by Fritz van Schagen and Joseph Eigenman, at a scale of 1:1000 and was published in 1936. There are also numerous detailed surveys completed during excavations in about 1930.

The latest measurements are:

- the photogrammetric restitution of the three gates of the castle (Fig. 4) and
- the altitudes of the castle wall

excecuted by the Photogrammetric Laboratory of the National University of Athens and completed a short time ago. These digital data were properly combined with the data derived from the digitizing of

- the map (1:1000) of 1931 and
- the relevant sheet of photogrammetric diagram of 1: 5000, that cover the whole country,

so that a complete degital restitution of the planimetry and the altimetry of the area achieved.

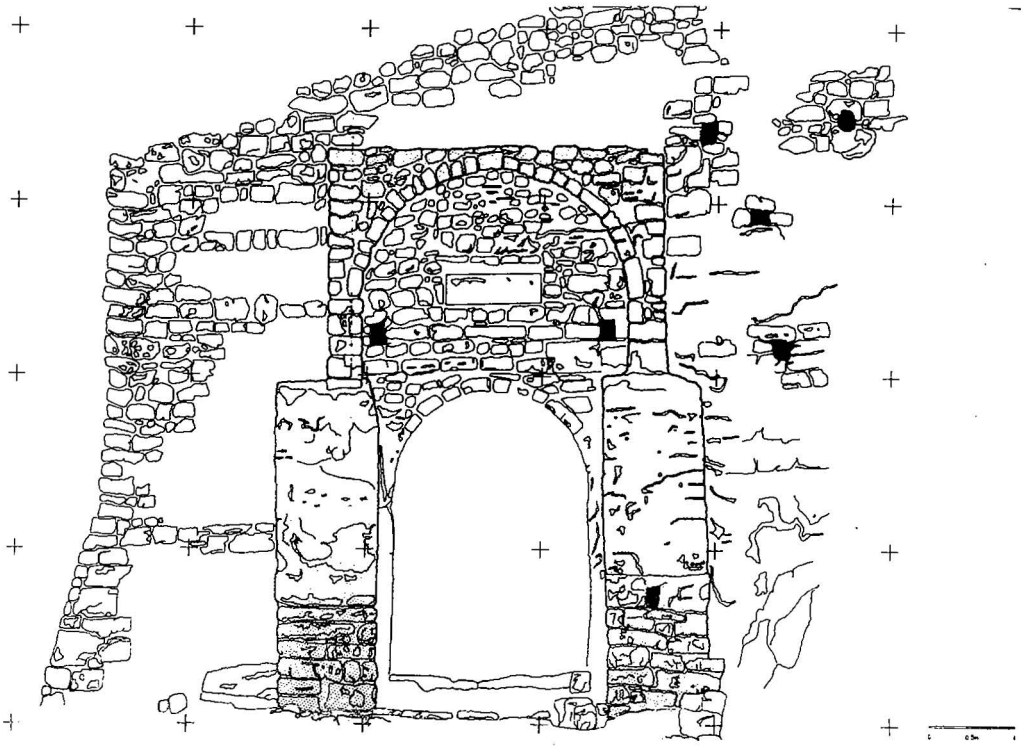

Fig. 4 First Gate of the Castle of Acrocorinth

3.6. Archaeological information

There is a great deal of archaeological information. The large blocks (up to 1.07x 0.92 m) characterised as megalithic imply that the first construction of the castle was carreid out by the end of 7th century b.C. and the beginning of the 6th century b.C. Other archaeological evidence shows constructions that are of the 4th century b.C. etc.

3.7. Architectural information

Plenty of architectural information is available: ancient Greek temples, paleochristianic churches, minarets mosques etc.

Fourteen types of masonries have been indetified by Theodorou et al (1990) and photographs and plans are given (Fig. 5)

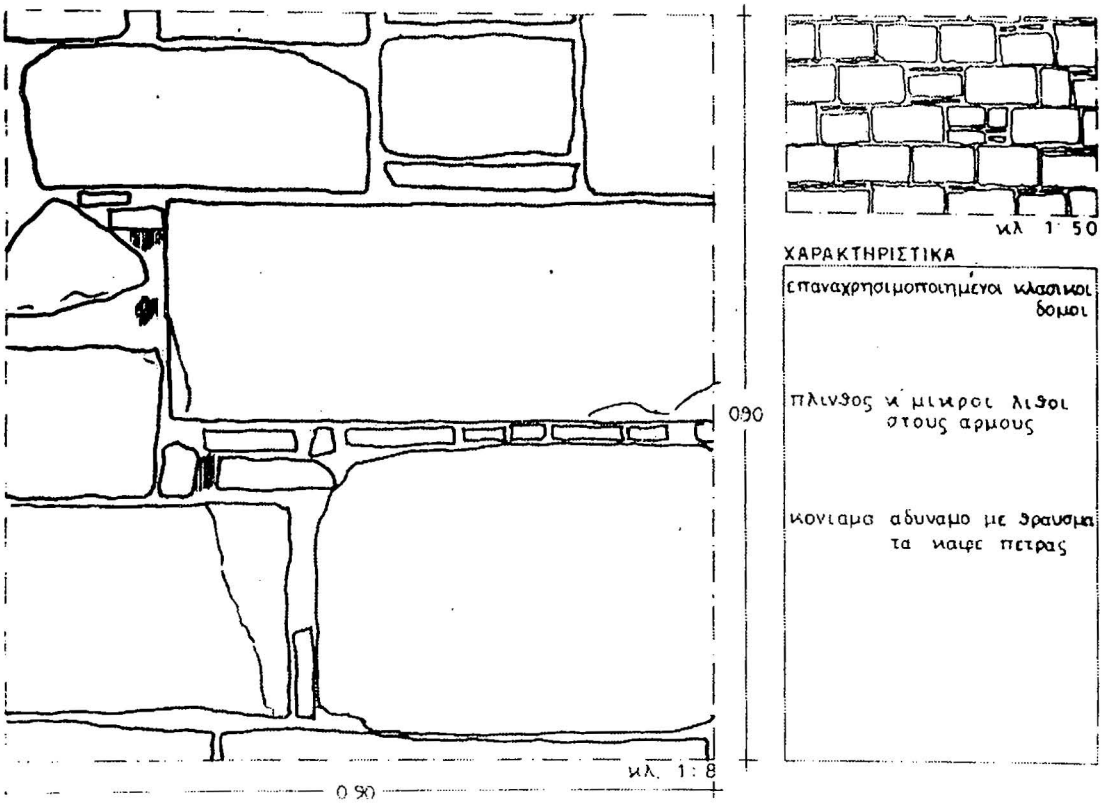


Fig. 5 Paleochristianic masonries

3.8. Technical information

There are many wheels, water tanks and a bridge which give much technical information.

Also a quarry has been indentified inside the castle and marked on the survey of 1931. There is much technical information related to the military function of the castle, such as the constructions for use of cannons.

3.9. Cultural information

Detailed analysis even of the existing data will reveal a lot of cultural information. There are several sources giving information about the population of the castle at particular periods or the number of soldiers defending the castle in particular battles.

Also the saints that were mostly respected at the Castle are shown in the existing churches.

3.10. Pieces of art

Nothing came out through our research in that field.

3.11. Restorations and interventions

Since the castle has had a life of about 27 centuries, many rebuildings, interventions and modifications have taken place through that period.

In 146 b.C. the castle was destroyed by Mommios. It was rebuilt in Roman times following the classical foundations and using the old material. This is the reason

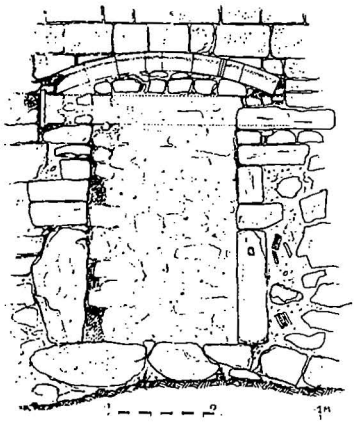

Fig. 6

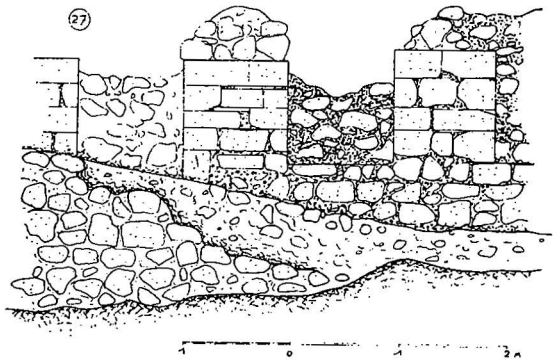

Fig. 7

why the study of the castle is greatly complicated. There were new parts of the castle added such as the two new lines of defence of the west side of the castle built by the Franks in 13th and 14th centuries. There are also minor interventions such as the walled-up gates (Fig. 6) or the rebuilt of wall-tops (Fig. 7).

Of particular interest are the plans for future interventions, such as the plan for new pedestrian paths (Fig. 8), which were derived through ARC/ INFO programme by combining the analytical topographic information of the area with the proposal mentioned by Theodorou et al (1990).

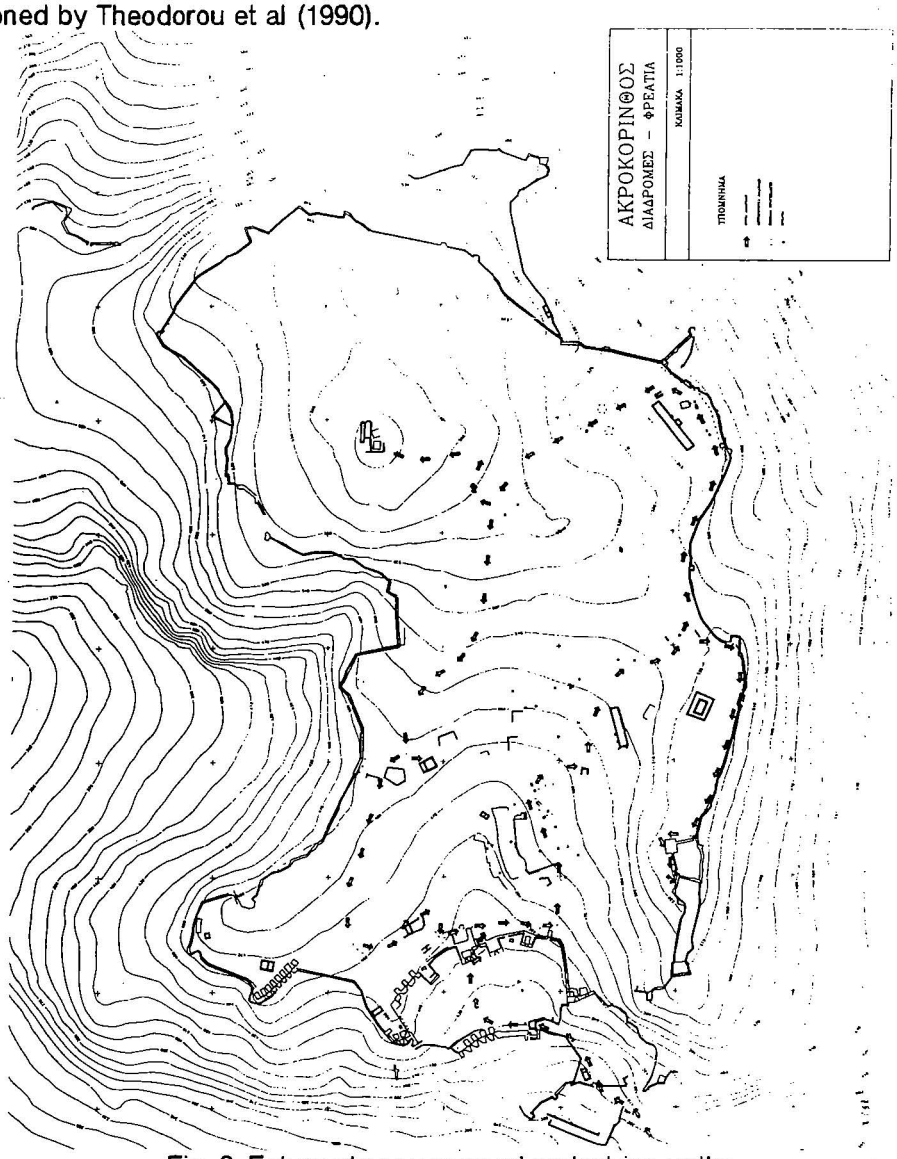


Fig. 8 Future plan : proposed pedestrian paths

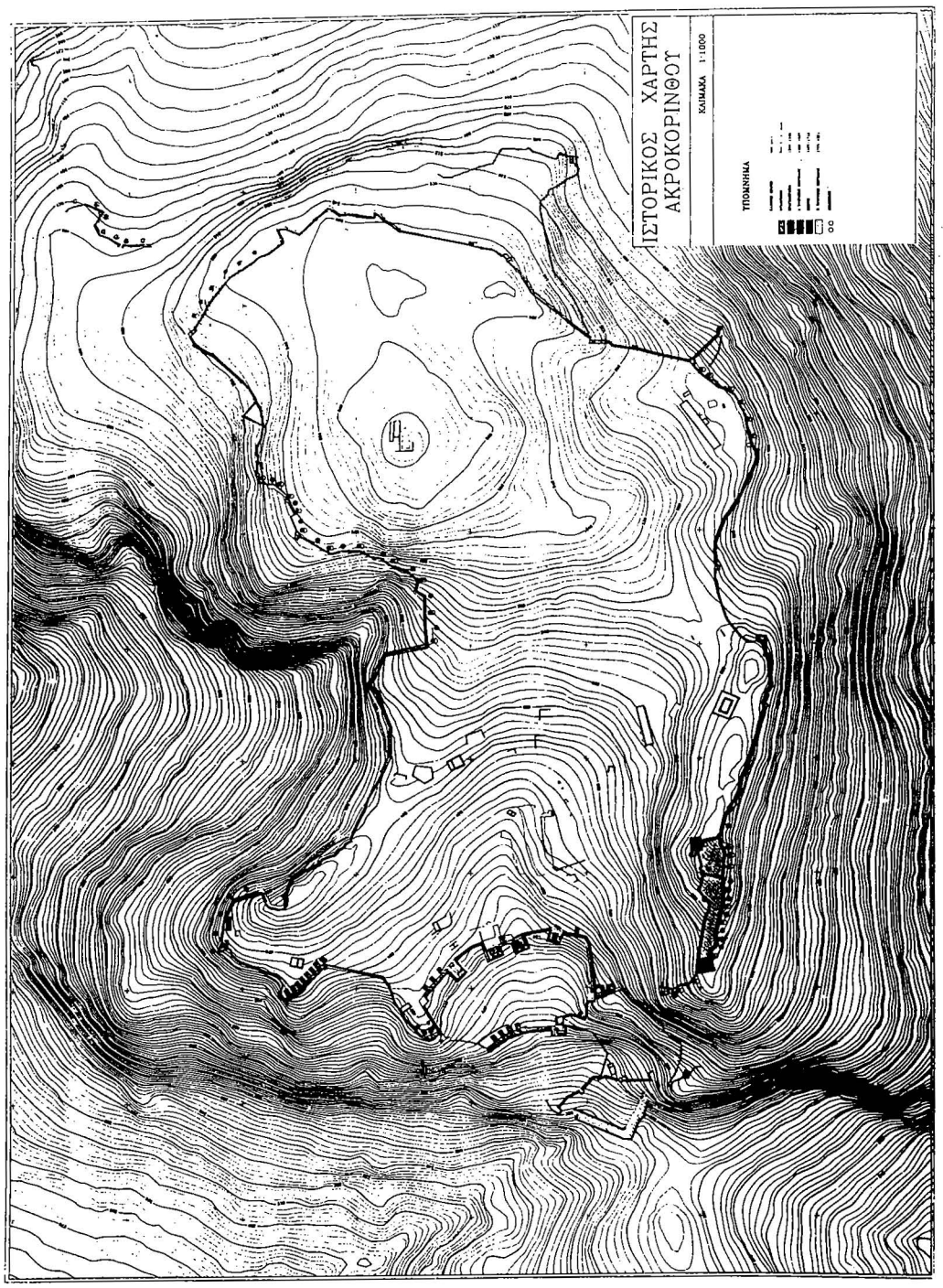


Fig. 9 Historical map : parts of the Castle been built in various periods (original in color)

## 4. Outputs of the system

After the integration of the systematic classification and insertion of all the necessary relevant to the castle information, a powerful tool for studing, managing, protecting and optimally using the castle will be developed.

A great advantage of the system is the provided ability to combine and modify existing data. For instance the combination of historical, archaeological and architectural evidence produced a new map, where the dates of construction of different parts of the monument are shown (Fig. 9).

Also maps giving various views of the castle in combination with other data may be made, e.g. the 3 - dimensional view of the castle together with the proposed pedestrian paths.

## 5. Conclusions

New technology gives more efficient tools for studying, protecting and managing our monuments. Hardware and software demands for this application are becoming more common, easy to operate and affordable.

The expected benefit from the use of these systems is great, especially for a country which has such a wealth of monuments but a low organisational level and thus has a tremendous task to undertake. The state has the means to introduce such systems. Thus the next important step should be the proper initiation and funding by the authorities of a complete system such as the one envisaged in this paper.

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