GIS and Space Analysis in the study of the Hospitallers' fortifications in the Dodecanese

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Abstract: The Knights of St. John landed, for the first time, on Rhodes in 1306 AD and, before the end of 1309A.D., they established a strong state in the islands of the Dodecanese.

The use of G.I.S and three dimensional geography has been utilized to support the analysis of the defensive system and the evaluation of its effectiveness.

Displaying data in three dimensional perspective supports the creation of visibility surfaces, which describe the area of surveillance, in the sea or in the land, from each castle.

Analyzing visibility lines between neighbouring fortifications, or between fortifications on different islands, help us rebuild the network of communications, define the centres of administration, locate, with acceptable approximation, the places of completely demolished castles and understand better the defensive system in general.

Key words: Knights of St. John, Dodecanese, fortifications, visibility surfaces, visibility lines, network of communications.

After being forced to leave the castle of Acre, their last stronghold in the Holy Land, the Knights of the Order of St. John tried to find a suitable place from where they could continue their fight against the Islam.

They first went to Cyprus, and after a short stay they landed on Rhodes in 1306. In less than three years, that is before the end of 1309, they had conquered the island and they had established a powerful state in the Dodecanese, a state which would play a very important role for the next 213 years in the East Mediterranean area.

In times of turbulence, with the Ottoman Empire forcing its way towards the "West" and the countries of Europe defending themselves and trying to expand towards the "East", Rhodes, with its famous port, as well as the other islands of the Dodecanese, were perfectly situated to be used as an advanced military and naval base.

Facing a permanent threat from the Ottoman Empire, the Knights of the Order of St. John tried to strengthen the defence system of the islands in the best possible way. Ancient castles were rebuilt or modified. New fortresses were constructed to create a comprehensive defence network. The most advanced, for the time, structural knowledge had been applied in building the walls and towers of the town of Rhodes, the administrative centre of the Knights. Detailed orders were issued to both the Knights and the populace, in case of emergency, to move into assigned castles with their arms, livestock and harvest. Lonely watch towers had been erected along the coast to complete the surveillance and early warning system, detecting any suspicious movement of enemy vessels in the vicinity and forwarding messages to the nearby castles. More than eighty castles, fortresses and watchtowers on the islands, dating from that period, attract the admiration of visitors today. (fig.1)

On the satellite image of the island of Rhodes the various types of fortifications have been marked. Watch towers, small fortresses and large castles, all elements of a sophisticated and advanced defence system, were used to check sea-lanes, to protect the coasts and to control inner passages. (fig.2)

Not happy at all with the Knights established outside their door, Ottoman Turks had been continuously testing the effectiveness and trying to discover the weak points of the defence system with continuous raids and small-scale landings on the coasts of the islands. The knights organized their defence with the support of the local population and managed to withstand major sieges from the land or from the sea until 1522.

A systematic study of the fortresses of the Knights has been taking place in the Archaeological Institute of the Dodecanese during the last years supported by excavations, archaeological and historical research, measured drawings and detailed photographs.

Although originally designed to support decision-taking procedures, Geographic information systems and three-dimensional space analysis have proven valuable in the study of the past.

A variety of military and environmental applications as well as the rapid expansion of cellular telephony have created the need for digital terrain maps. It was only in recent years in Greece that such maps have become available at reasonable cost.

Using digital terrain maps and following a completely inverse approach, than expected, we have not been trying to find the most suitable place for the installation of a new cellular base station or antenna, or for the construction of an observation tower for forest fires. On the contrary we have tried to understand why specific places have been chosen for building castles, how they communicated with nearby fortifications, what part of the land or of the sea was under surveillance, how the defence system operated as a whole and how effective it was.

Common applications of digital terrain model analyzing software include procedures for defining the visibility surface from a specific point as well as for studying the line of sight between two points. The advantage of an analysis based on these procedures is that we are able to place an imaginary observer on the walls of castles, which are in ruinous condition today, and we can look through natural or man created contemporary obstacles in the vicinity, as in the case of the village of Kremasti, near the town of Rhodes, where modern houses have been built high and obscure vision to and from the medieval fortress.

For our study we used the digital terrain map of the islands of the Dodecanese prepared by the Greek Military Geographic Service. Using elevation contours on 20 metres intervals a TIN model has been created. On this map we placed the fortifications of the Knights and we distinguished the different types, which are watchtowers, fortresses, large castles and the administrative centre, the walled town of Rhodes.

The step of elevation contour lines of 20 metres created computing problems of two different types:

a. There have been some cases where the location of the fortress proved to be critical and minor displacement on the digital map could lead to different results in the definition of the visible surface.
b. Visibility calculations for such an extended area were time consuming, reaching the limits of both the software and the hardware at our disposition. It was thus proved necessary to divide the area of the Dodecanese into two sectors, the northern and the southern and to perform calculations on each one respectively. The division was not very easy, as we found out that the surveillance of the coastal zone of some islands was based on a combination of observation points on them as well as on nearby islands.

In all defence systems, ancient or contemporary, early warning of the presence of an enemy and close surveillance of his movements are of vital importance. In an island area, such as the state of the Knights of the Order of St. John in the Dodecanese, the enemy was expected to come from the sea. With observation points on castles and watch towers along the coasts and with visibility conditions fair (10 Km) or good (15 Km) we defined the area of the sea and of the land under surveillance and we realized that there was practically no sea lane that an enemy vessel could follow and no coastal zone that landing could take place without being noticed. (fig.3)

Defence systems depend heavily on communication connecting observation points and advanced units to the administrative centres and central units. Communication at that time was based on optical signs using flags or fires. Analyzing the lines of sight between castles we reconstructed the communication network of the Knights, a network that proved to be not only complete but also providing alternative ways for message transmission in case of destruction of a defence unit by the enemy. (figs 4-5)

The analysis of the communication network provides helpful information on how the Knights have organized their defence and expands our historical knowledge. Points with multiple connections were probably administrative centres or important military units. A dense communication network in an area indicates its military importance, as in the case of Lindos (fig.6) and of the medieval Town of Rhodes. (fig.7) At first we could not understand the presence of strong castles and numerous watchtowers in the straits between Rhodes and the islands of Chalki and Alimia. This observation seems not to be unrelated to the fact that the Ottoman fleet, before their major landing on the island of Rhodes in 1522, attacked first and destroyed the castles of Chalki and Alimia. We also know that during the Second World War the natural port of the island of Alimia was used as a major naval base for submarines. Remains of the iron net closing the entrance of the port can still be seen today. Combining these pieces of information we could possibly suggest that the Knights have also used the port of Alimia as a base for a squadron of their fleet. The dense communication network could thus be explained by the necessity to detect, as soon as possible, any enemy vessel approaching the naval base. It is thus understood why the Ottomans, not wanting to have the squadron of the navy of the Knights at their back during the landing, decided to attack its base in advance. (fig.8)

The importance of communication between nearby castles can also help us to define with better accuracy the position of fortresses that don't exist any more. For example we know that in Paradisi area, near the airport of the island of Rhodes, on a hill called "Koufa" there was a fortress of the Knights not existing any more. For years it has been thought that this castle was built somewhere on the top of the hill. The natural shape of this hill, having two peaks, makes it impossible for the castle to have visual contact with both the nearby castles of Fanes and Kremasti. Analyzing visibility we could suggest that the castle was built lower on the hill, at the intersection of the visibility surfaces of the adjacent castles. This location proved to be a

more favourable place as from there the Knights could more easily protect the coast and control the land passage leading towards the Town of Rhodes. (fig.9)

Our enthusiasm on the results of the applications of three dimensional space analysis and of Geographic Information Systems, in the study of the fortifications of the Knights lead us to another research. We considered as possible areas for enemy landing the sandy shores with low inclination of the soil in the coastal zone. Then we described as easily defensible area a zone of 5Km around each castle or fortress. Combining these coverages we located the weakest points in the protection of the coastal zone. This approach from the point of view of the Geographic Information Systems appears interesting, but it was misleading, as it was wrong from the historical point of view. At this time the navy did not have the means to take into consideration the combination of sandy beaches and low soil inclination for choosing a landing position. Their interest was to land as close as possible to the capital, the town of Rhodes, to be able to move their army and heavy weapons easily.

The fortresses of the Knights in the Dodecanese attract the interest of the visitor as important structures of military architecture. They also attract the interest and the admiration of the researcher who approaches them using modern tools of space analysis, as belonging to a comprehensive defence network, covering completely the area to be protected and having an effective and sophisticated communications network.

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Figures

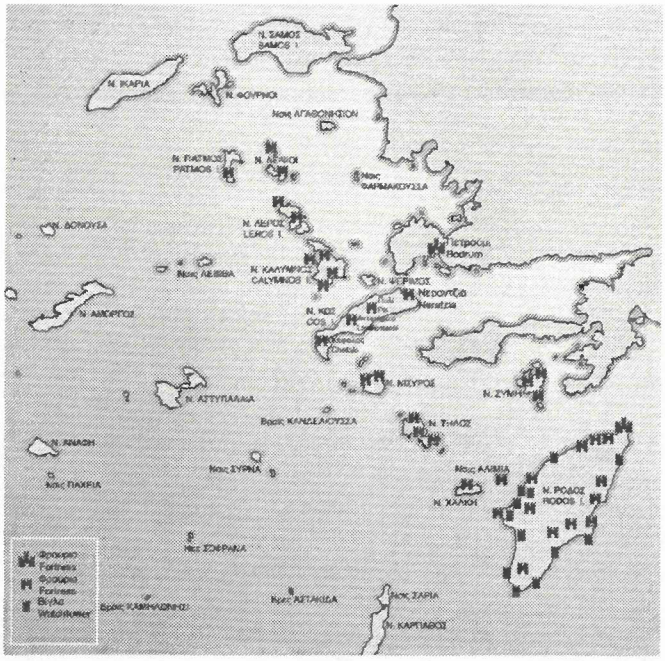
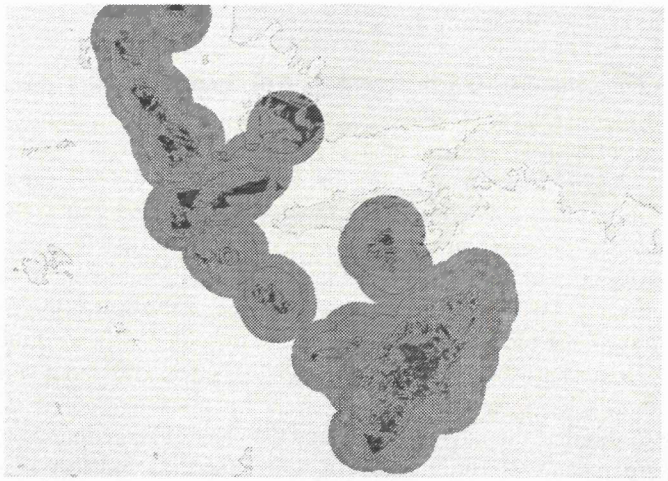


Figure 1.

Figure 2.



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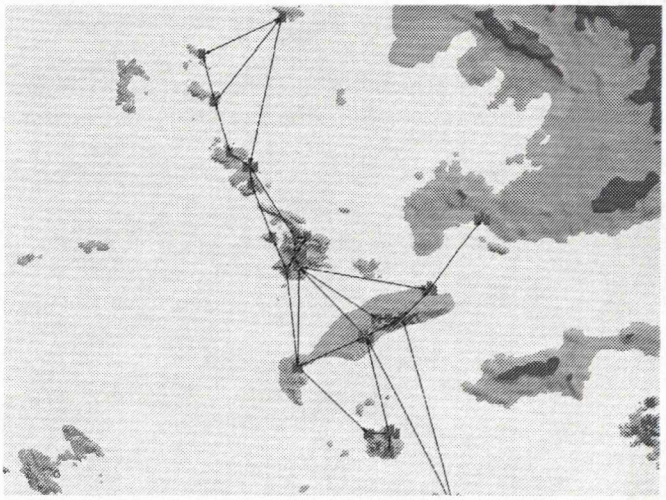

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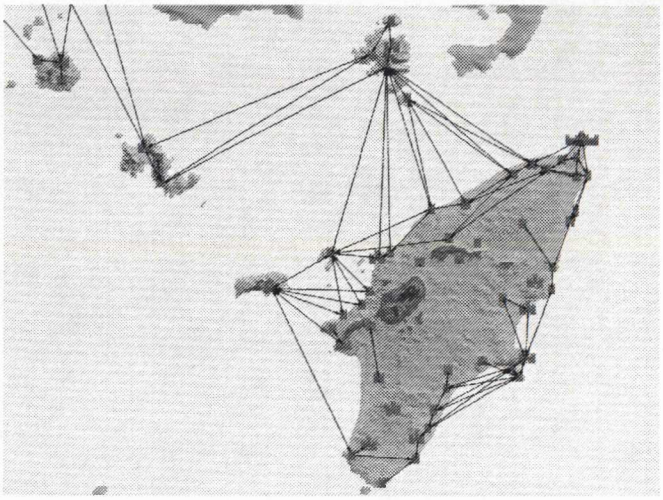

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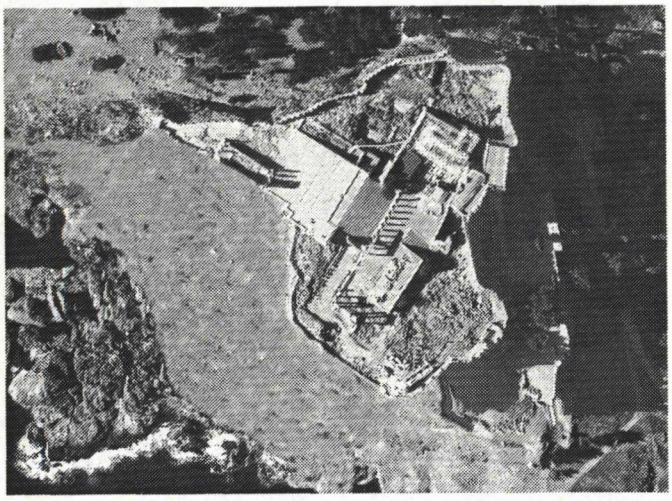

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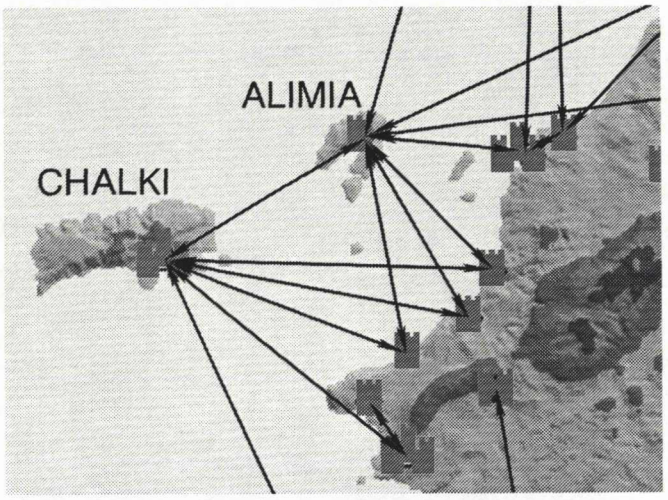

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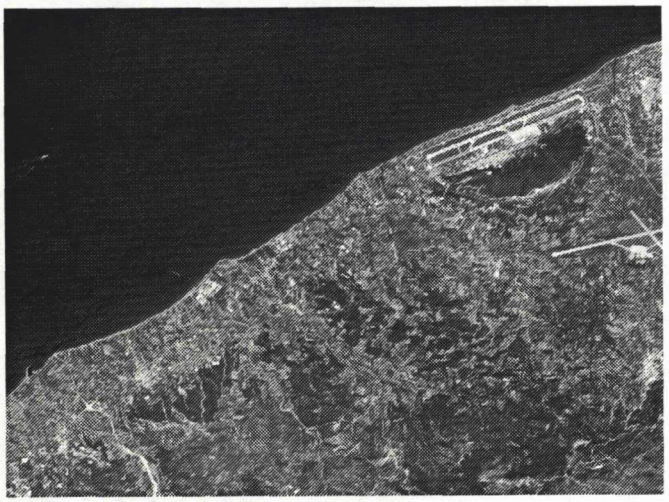

Figure 9.