Modern Technologies for the Conservation of Cultural Heritage

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Summary

1. Remote sensing and pattern recognition. Use of aerial and satellite imagery for:

1. site detection and monitoring.
2. site and monument recording and management.
3. land use monitoring and planning

- Discovering/Recognising Paleo-Environment & new Settlements
- Mapping Landscape & Archaeological Features
Summary

1. Data capture and management. Data acquisition from other repositories, historical maps and spatial technologies (GPS, Historical Maps, Surveys).

   1. GPS
   2. Scanning & Geo-referencing Historical/Modern Maps
   3. Surveys

Summary

1. GIS use for Cultural Heritage management. Use of GIS systems for:

   1. managing geo-data relevant for CH management (Landscape reconstruction)

   2. mapping the risk for heritage sites deriving from anthropic and/or natural activities and events.

      1. Managing Archaeological Spatial-Data
      2. Archaeological Risk Maps
Summary

1. Data capture (Laser 3D).

   1. LaserScanner3D

WARNINGS!!

Some Useful Remarks (for surviving...)

F. Bacon

“Truth emerges more easily from mistake than from confusion”, Novum Organum (1620)

A. Einstein

“...as far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.”, Geometry and Experience (1921)
• The protection cannot be based upon the application of archaeological techniques alone. It requires a wider basis of professional and scientific knowledge and skills.

• The archaeological heritage is a fragile and non-renewable cultural resource. Land use must therefore be controlled and developed in order to minimize the destruction of the archaeological heritage.

• Archaeological knowledge is based principally on the scientific investigation of the archaeological heritage. Such investigation embraces the whole range of methods from non-destructive techniques through sampling to total excavation.

• Non-destructive techniques, aerial and ground survey, and sampling should therefore be encouraged wherever possible, in preference to total excavation.
ICOMOS Charter
Protection and Management of the Archaeological Heritage

• Excavation should be carried out on sites and monuments threatened by development, land-use change, looting, or natural deterioration.

• Excavations should be conducted in accordance with the principles embodied in the 1956 UNESCO Recommendations on International Principles Applicable to Archaeological Excavations and with agreed international and national professional standards.

Some Basic Issues

• A general reconstruction of the paleo- and modern environment can be inferred from geological, geo-archaeological and palynological evidences, as well as historical records (maps, reports, etc).

• We can use many methods and technologies for capturing, collecting and integrating this data

• The issue is: How I can manage this huge amount of data?
Discovering/recognising Paleo-Environment

Ethiopia - Aksum

The ruins of the ancient city of Aksum are found close to Ethiopia's northern border. They mark the location of the heart of ancient Ethiopia, when the kingdom of Aksum was the most powerful state between the Eastern Roman Empire and Persia. The massive ruins, dating from between the 1st and the 13th century A.D., include monumental obelisks, giant stelae, royal tombs, and the ruins of ancient castles. Long after its public life ended in the 9th century, Ethiopian emperors continued to be crowned in Aksum.
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Main Goals

• Description and analysis of the environmental context, as well the reconstruction of the local environmental history

• Analysis of the geographical setting in order to define better the territory of the ancient archaeological settlements and thus the extension of the archaeological area.
Discovering/recognising Paleo-Environment

Main Goals

- Geological study of a region in order to contribute to a better understanding for the conservation and preservation of the archaeological area, and site use.

- Reconstruction of the environmental history of a region for contributing to a more detailed interpretation of the processes of site formation, and for providing a background to a predictive models of site distribution in the area.

ITALY - Pontecagnano
ITALY - Pontecagnano

Pontecagnano is a large Etrusco-Campanian settlement in southern Italy, 70 km south of Naples, where over 8000 tombs dated from the 9th century BC to the Roman period have been excavated so far.

ITALY - Pontecagnano

The ancient town occupies a travertine platform delimited by two streams, the Picentino to the west and the Frestola to the east.
ITALY - Pontecagnano

While the exploration of the ancient town has been limited to part of its center, the necropolis, having been overrun by the urban expansion of the modern town of Pontecagnano, has been investigated more thoroughly.

To face this rapid urban expansion, since the Sixties a systematic excavation of the funerary evidence has been going on.
Discovering/Recognising new Settlements

ITALY - Pontecagnano Geo-archaeological map

ITALY - Pontecagnano Aerial Photo-Interpretation by A. D'Andrea
Discovering/Recognising new Settlements

ITALY - Pontecagnano Aerial Photo-Interpretation by A. D’Andrea

YEMEN - Baraquish Mapping Landscape Features
YEMEN – Baraquish

Baraqish is an old city close to Marib, located in the semi-arid area on the road to Hazm Al-Jawf. Baraqish stands on top of a hill with a magnificent castle sealed off by a highly fortified wall, as high as 8 meters in some places. The wall has 57 towers and town gates, one in the east and one in the western part of the wall. The most striking feature of the city is the ruins of the temple, located in the southern part of the city. The temple reflects the dominant from of architecture used by the Ma’eenis and consists of 16 columns and beams.
YEMEN - Wadi Bayhan

The Wadi Bayhan Valley since the first millennium B.C. to the first centuries of the Christian era was the centre of the ancient South Arabian kingdom of Qataban.

The rains, which are linked to the monsoons, cause as in the past violent irregular floods which fill the main Wadi Bayhan and the small tributary wadies, thus creating favourable hydrological conditions for their exploitation for irrigation.
25-28 November 2005 - Campeche - Space technologies to support the conservation of natural and cultural heritage

Discovering/Recognising new Settlements

ITALY - Cuma

Discovering/recognising Paleo-Environmental

ITALY - Cuma

Aerial Photo-Interpretation

by B. Marcolongo et Alii
25-28 November 2005 - Campeche - Space technologies to support the conservation of natural and cultural heritage

Discovering/Recognising new Settlements

ITALY - Cuma Aerial Photo-Interpretation by B. Marcolongo et Alii

Aerial Photo 1995

ITALY - Cuma - Modern Landscape and Aerial Photos
Preservation of Archaeological record

Preservation of the archaeological record depends on several factors:

1. Cultural and natural processes that affected the formation of the archaeological area and the archaeological deposits in sites

2. Local environment hazard that may have caused (and may still cause) damage to the archaeological remains

MULTISPECTRAL IMAGE DATA ANALYSIS

Free Software

http://dynamo.ecn.purdue.edu/~biehl/MultiSpec/
GRASS

Geographic Resources Analysis Support System

Free Software

http://grass.baylor.edu/

http://grass.baylor.edu/download/index.php
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