

Archaeological Theory, Techniques and Technologies: Beyond Quantification and Visualization Methods

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Abstract. This position paper summarizes the goal of the session at CAA2004 and sets the framework for the discussion.

Introduction

What is archaeology? There are still many archaeologists working in a self-limited discipline dedicated to the unearthing of past treasures, and the static description of past ways of life. In that sense, most archaeological information seems to be *artifactual*, because it deals with the relevance of archaeological finds as self-important entities, which must be studied in themselves, as muted witnesses of unknown past facts. Social action is here reduced to a mere description of some objects made by human agents. This is a positivist approach where only directly observable entities (archaeological artefacts, natural landscape) are taken into account. “Society” is here artificially restricted to the notion of Artefact, because “artefacts” are the only observable feature usually associated with the concept of “social action”.

Computers can be applied to these kind of research. They serve as repositories of data, but no inferential activity can be made. Thinking is here equated with a mere data query.

However, we can imagine a much more developed definition of archaeology, that of a discipline dealing with the *history* of our society, that is, those processes which have *caused* our present. In this approach, emphasis is not directed to empirical things, but to events and non-observable concepts-processes or social actions. In this sense, the goal of archaeology would not be the documentation of ancient sites and objects, but studying the dynamics of society. Archaeological record is the “medium” by which this study is scientifically possible. We are looking for the formation process of our own social actions, using ancient artefacts as their observable consequences at specific time intervals. The purpose is to discover what cannot be seen (*social causes*) in terms of what is actually seen (*material effects*).

All this means is that in Archaeology we should deal with events and not with objects. An event is an expression of the fact that any entity has some feature f , that this entity is in a state s and that the features defining state s of that entity are changing or not. The fact that a vessel has shape x , and the fact

that a sculpture has texture t , and a spear has a composition c , are events, because a social action has been performed at this spatial and temporal location (event), resulting in an artefact with, among other things some specific shape, texture and composition properties.

Objects have given physical properties because they were produced so that they had those characteristics and not other. And they were produced in that way such were, at least in part, because those things were intended for some given uses and not to other: they were tools, or consumed waste material, or buildings, or containers, or fuel, etc. If objects appear in some locations and not in other, it was because the actions of use were performed in those places and in those moments.

That is to say, the changes and modifications in the form, size, texture, composition and location that experiences nature as a result of human action are determined somehow by these actions having provoked their existence. We also must take into account the circumstances and contexts (social and natural) where actions were performed and the processes (both social and natural) having acted on that place after the original cause, because they may have altered the original effects of primary actions.

The purpose of computing is insight, not numbers. Therefore, we should go beyond mere number crunching to *solve* archaeological problems.

What is an Archaeological Problem?

In a sense, we can say that Problem-Solving is any goal-directed sequence of cognitive operations”. We say then:

PROBLEM= OBJECTIVE+OBSTACLE

When a goal is blocked we have a problem; when we know ways round the block or how to remove it, we have less a problem.

In Archaeology, like in most sciences, the unobservable cause of an observed material effect is the *Problem* to be *solved*. That is, we have a difficulty when trying to learn:

**WHAT SOCIAL ACTION HAS CAUSED
THE MATERIAL EFFECT THAT WE ARE
OBSERVING**

**WHAT SOCIAL ACTION HAS CAUSED
(IN THE PAST) THE SOCIAL ACTION I'M
PERFORMING IN THE PRESENT**

In which way can computers help us in this endeavour? This is the reason of this session. We ask archaeologists and computer scientists to go beyond their data and algorithms, to look for the way their problems have been asked, and in which way a quantitative technique or a visualization method can help in looking for a solution.

A paradox of Philosophy of Science and Artificial Intelligence is that we need to know the solution to solve a problem. That means, that we have to build a series of alternative *possible* solutions, and then build some inference rules to select one or more relevant solutions to our purposes. Mathematical and Visual Models can be used both as a language to express this body of alternative solutions, or as the blackbones for the inference rules.