

ODENSE BYGIS - ODENSE URBAN ARCHAEOLOGICAL GIS

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ABSTRACT

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The Danish town Odense is not only the birthplace of the famous writer of the fairy-tales Hans Christian Andersen (The Little Mermaid, The Ugly Duckling, etc.), but also has a heritage of Viking and Medieval origin.

Odense City Museums have the latest years developed an online database and GIS system handling the archaeological excavations in the county (www.arkdata.dk), primarily those most recently completed. However a full geographical overview of the excavations, test pits etc. from the previous decades in the medieval city centre do not exist at present time. Consequently in 2001 the author finished his MSc dissertation from University of Newcastle, UK, dealing with the subject of mapping these investigative activities. The ambition was to reach the most low cost and basic way of recording needed.

At home at the University of Aarhus a new dissertation for the MA is now prepared, coping with the modelling of the deposits and mapping of the medieval cultural heritage still left beneath the modern city surface. The different methods will be discussed and the problems and drawbacks accounted for, as well as the possible achievements. This is the initial stage of the project, so pieces of good advice are very much appreciated.

INTRODUCTION

The archaeological resource is a valuable element of the urban heritage, and excavations in urban environments are exciting and complex, but expensive projects are damaging to the sponsors purse and the archaeological resource.

The author's studies deal with the urban deposits in the medieval city of Odense, Denmark, by applying GIS deposit modelling, terrain analysis and spatial statistics to the material. The prime aim is to encourage the Danish medievalists to better understand the 3D development of the medieval town and be aware of the situation of the archaeological resource for the improvement of future strategies for its preservation and study. The result will be a deposit terrain model to support better-informed decisions and priorities prior to intensive investigations and planning schemes.

MANAGING AND PRESERVING THE CULTURAL RESOURCE

[1] Handling the pressure of development on urban archaeology

Until recently archaeological excavations have been carried out prior to construction works with substantial sacrifices for both the developer's finances (or government funds) and the archaeological remains - particularly in urban locations. Though knowledge of the town's history feels natural to the archaeologist, often only little is known about archaeological survival on-site until the digging begins. Well-informed decisions concerning the archaeological remains prior to development planning and constructions are crucial. The local curators need to have strategies for the urban archaeological resource and the strategies should be shaped by archaeological knowledge and research priorities based on assessments

of the archaeology and maps or models of the deposits' conditions. The strategy, assessment and deposit map form the framework of the local site evaluations, producing a more detailed picture ahead of excavation works for the benefit of the archaeological judgments and efforts.

[2] Estimating the archaeological resource

Prediction of archaeological settlements and interpolation of archaeological deposits in the open landscape and the crowded city is not novel. Particularly the landscape-wide applications are widespread in North America and to some extent in Europe and other continents, e.g. Highway projects in Slovenia (CAA 2000). Volume computation of urban archaeological deposits is slightly more rare, although introduced early in United Kingdom and France on an analogue basis. The first projects by British researchers include *The Future of London's Past* (Biddle et al. 1973) and research by Martin Carver (Carver 1983), both emphasising the importance of the three-dimensional body of deposits representing the archaeology rather than isolated monuments and the usual two-dimensional plane recording approach. The development in the recent decades of the GIS software has emphasised the three-dimensional methodology. As Paul Miller points out: "The data we model do not exist on a two-dimensional plane, but in a three dimensional world where the extremes of topography have a significant effect upon the use of space both now and in the past" (Miller 1997:100).

Estimation of urban deposits usually has a different ambition to prediction modelling on landscape level; the aim is often to assess the deposit distribution and accumulation and the topography of a known urban settlement - e.g. Roman London or York. Landscape predictive modelling is often based on the calculation of probability of the location of cer-

tain phenomena and deduction from known situations to more or less unknown wider contexts (Andresen, pers.comm.). Modelling in urban environments is not less environmentally deterministic than traditional landscape predictive modelling: the predominant data sources are known archaeological excavations and boreholes, and the aim is the calculation via interpolation of deposit volume, accumulation and survival. The detailed knowledge of depth and quality of deposits and structures is important to measure the expected impact on archaeology from developments, prior to urban site evaluation (Richards 1990:32, Carver 1983).

Archaeological predictive modelling is often viewed with scepticism offering no alternative for archaeological investigation and research whatsoever (Carver 1983:341). Prediction and interpolation is naturally a best guess depending on data and use of algorithms and one can never produce an exact result. Particularly if the model avoids areas of archaeological importance, scepticism is provoked - often rightly - and as Martin Carver highlights "emphasis of these exercises is always on the positive rather than the negative results" and "no archaeological map, can or should be taken as complete" (Carver 1983:369). However, deposit interpolation and computation in urban environs does have its justification when used consciously for the benefit rather than to the detriment and negligence of the archaeological resource, particularly as a tool for assessing the resource and formation of strategies for its preservation and investigation. Examples from United Kingdom will illustrate this approach in the following chapters.

MAPPING URBAN ARCHAEOLOGY IN ENGLAND: UAD AND YAA

[1] The Urban Archaeological Database programme

The necessity of strategies for urban archaeology has been recognised at national level in England through the English Heritage (EH) programme Urban Archaeological Databases (UAD), which is still in progress. A number of towns of chronological depth, good preservation and clear development pressures have been mapped and recorded intensively or extensively (English Heritage 2001, Thomas, pers. comm.). The GIS and databases form the starting point for new and repetitive assessments of the urban archaeology preceding the development of strategies for preservation of the archaeological resource and its role in the modern urban environment.

In the UAD structure the urban archaeology is considered as a collection of monuments following an Event-Monument partition (Thomas, pers.comm., Hopkinson 2002:18). The UADs incorporate from time to time relatively simple maps of the distribution of deposits, but seldom by a full-scale deposit model.

[2] The York studies

The York Archaeological Assessment (YAA) project was a pilot project of EH and York City Council prior to the UAD programme, but the approach of YAA was different. The town was perceived in a more holistic way as an undivided and integrated entity with focus on the distribution and qua-

lity of deposits rather than a number of separated monuments - a concept based on research by Martin O.H. Carver (Oxley, pers.comm., Carver 1983, Richards 1990). The YAA embodied a collection of data and a series of map layers displaying the archaeological development and characteristics, including a 'four dimensional' model of the topography of deposits. With his PhD thesis in 1997 from University of York Paul Miller enhanced the value of YAA adding supplementary technical and conceptual discussions on the capabilities of applying GIS methodologies to study the multi-dimensional and multi-temporal sequence of deposits in the city (Miller 1997).

Recent studies in York by Guy Hopkinson have addressed the deposit analysis and modelling from a task-based perspective in the hands of the contracting archaeologists in archaeological site evaluations (Hopkinson 2002). Data from the urban database were enhanced with supplementary borehole data and a context-based data structure for a more detailed analysis. Hopkinson points out that any new site evaluation might ask new questions of the material, which the existing data set might not be suitable for. Conversely much of the detailed site evaluation data will be superfluous to the scope of the urban database and GIS (Hopkinson 2002:19).

THE ODENSE STUDIES: ODENSE BYGIS - URBAN GIS AND DEPOSIT MODEL

The Danish city of Odense has a rich Viking and Medieval origin and the archaeology is managed, conducted and archived by the Odense Bys Museer (Odense City Museums) archaeological unit.

The author's MSc dissertation 'Odense ByGIS' was the first project to deal digitally with the full body of archaeological excavations in Odense producing a relatively straightforward database and GIS handling of the excavations and their basic information for curatorial use (Zinglensen 2001). The topic of my current MA dissertation includes the issues of deposit modelling and mapping of the urban archaeological resource.

[1] The first project: Mapping the antiquarian events basically - the Newcastle Dissertation

The initial stage of the Odense ByGIS (or urban GIS) dealt with the antiquarian events: boreholes, watching briefs, excavations, trial trenches etc. and their data of an administrative and interpretative nature, approximating to what in England would be termed a UAD, though just slightly more basic. The system was intended to assist the curator in managing the archaeological investigations by providing him with the basic information and a geographical overview for the initial site evaluation prior to examination of the extensive analogue archive.

The system consists of a MapInfo and an MS Access application - the software packages in use at the archaeological unit. The Access database is holding, managing, modifying and sorting the records with their information and values, and then distributes the results as flat tables to MapInfo automatically. The data included describe the archaeological investi-

gations and the listed buildings of the city. MapInfo displays the data connected to the digitalised spatial entities, together with a series of map overlays.

The system is designed for basic input and retrieval of information and relatively fast and cheap implementation in the organisation using existing data sources. The project is currently only submitted as a dissertation from the University of Newcastle, being a pilot study for further implementation, hopefully to be realised within a short time. It is planned to expand the system with a database on written sources including estate tax registers.

[2] The new project: Deposit Modelling - the Aarhus Dissertation

Inspired by a Danish national scheme on mapping areas of cultural heritage, including the medieval urban centres, and by the English Heritage and York projects my MA thesis from University of Aarhus deals with the matters of archaeological resources in the field of urban archaeological deposit modelling and preservation using GIS.

The prime ambition of the project is to boost the discussion in Denmark on the priorities of urban archaeology and the understanding of the three- and four-dimensional development of the medieval town. Initially the result of the project provides the Odense Bys Museer with an enhanced GIS tool for mapping, recording and managing the archaeological resource. The project will identify the advantages and limitations of Deposit Modelling in urban environments and the technical and theoretical methodologies to be applied.

A detailed study answers the questions on how to digitally record, map and model the resource using different sources; on how to employ the results in the research, the management and preservation of urban archaeology in practice, particularly in the estimation of deposit volume and character in site evaluations.

Data acquisition and estimation of data quality is the initial concern. The types of sources are excavation plans and data,

boreholes, watching briefs and other surveys, modern digital maps, geological maps and if possible cellar surveys. Each type of data is handled individually including its own variety of inaccuracies, biases and oddities recorded as metadata for mapping their effect on the result.

The next issue is modelling of the deposits. A range of interpolation methods (Triangulations, Krigings, and Inverse Distance Weighting etc.) will be considered and tested for their usefulness on the data set and the results analysed with spatial statistics.

The resulting assessment, models and maps should preferably display the calculated capacity and state of preservation of the urban medieval archaeological deposits, and give a general presumption of the correlation between the distribution of deposits and the topography and development of the medieval town as outset for more detailed future studies.

For a fuller explanation of the project and for reviews of Danish projects on mapping the cultural heritage areas as well as on the UAD and YAA projects, please read the CD-ROM.

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¹The author is currently an MA student at the Department of Medieval Archaeology at the University of Aarhus and holds an MSc in 'GIS and Archaeology' from the University of Newcastle upon Tyne. The MSc dissertation dealt with the construction of a straightforward GIS tool for managing the excavations of Odense; the MA dissertation in progress deals with deposit modelling and preservation in Odense.

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