LERNIE - Phase V

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The 'Microprocessor Revolution' (see p.) and escalating associated developments have brought direct pictorial storage within our reach. Process Peripherals' 121 LMD image processing system will digitise static images - from photographs or 'live' TV scans - and store them in any form of digital storage. They can then be reconstituted to be displayed as a grey level TV image.

The advantage of this particular system is that it can refresh images at about 1/15 of the cost of normal solid state frame stores. One image can be stored on a single track. Software is available for digitising finger prints and faces, so the extension of the system to archaeological small finds is a relatively simple development. There is every chance, therefore, of a colour demonstration along the lines projected in Conf.Proc.1976, at the next Conference. A 3D image of an artefact could then be rotated (see Conf.Proc.1977) for close specialist study when required, but only 2 or 3 images would need to be stored. The next step could be holographic?

As previously suggested (Conf.Proc.1977) this kind of treatment is equally suitable for large structures; indeed, the Computer Aided Design Centre (CAD) at Cambridge already has a program by which (a model of)

Stonehenge can be approached from all directions. The generalised system, BUGSTORE, is available and enquiries are invited by this laboratory of the Department of Industry, but it is difficult to demonstrate away from base.

BUGSTORE is a colour raster scan display designed to operate as a peripheral connected to any 16 bit computer. It consists of seven modules (Fig.1).

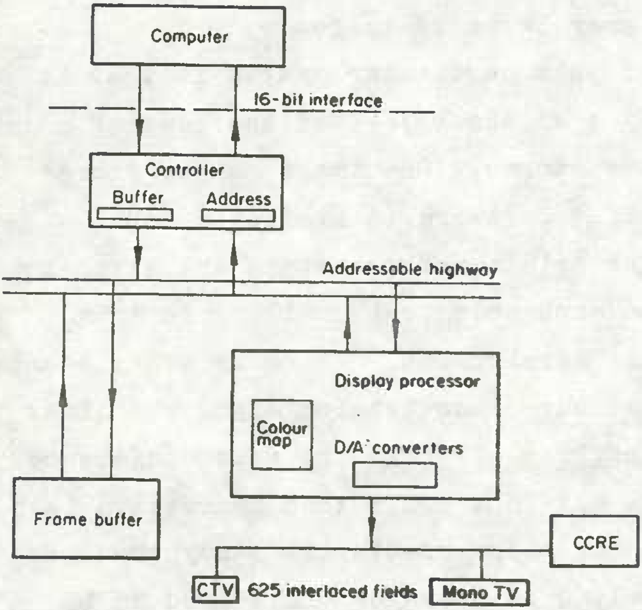


Figure 1. AGDT schematic

(Courtesy Gordon Freeman, CAD Centre;
Computer Aided Design 1977, 9(4), 291-4)

The Frame Buffer is a random accessstore; cycle time 400 nano secs. to store 1½ million bits of picture information. It uses MOS technology and is pixel (picture element) addressable. Each pixel can be accessed individually and the system has the capability of changing a complete frame in less than 70 ms. Four modes of operation permit colour and geometric resolutions to be traded-off against each other. The 24-bit mode produces the greatest possible colour resolution - 16 million hue and intensity combinations-with a geometric resolution of 128 pixels per line and 512 lines per frame.

Compatible software enables two- and three-dimensional graphics on a range of equipment: storage tubes; intelligent terminals, plotters, etc.

Next, auto-comparison has been explored in relation to the X-radiographic texture of pottery. Slides were shown of an important new group of Middle Period Iron Age material from Little Waltham in Essex (Drury 1978). Some rare, 'imported' fine ware, evidently made at nearby Mucking, had been distinguished in its high tenor of glauconitic Thanet sand by David Peacock, University of Southampton, from its appearance in thin section. (This form of data is of course also amenable to image analysis. Equally, the rather unusual texture showed up clearly in X-radiograph.) However, the bulk of the 300 'coarse' sherds was undifferentiated in thin section.

It was then found that the combination of radiopaque grit and void patterns, the latter due to vegetable temper - both very distinctive in frequency, size and shape - gave visual discrimination readily and at a remarkably high level.

The new Quantimet 720 (Cambridge Instruments) can count and measure this type of contrast pattern in a variety of ways (Lawson 1976). The most relevant work has recently dealt with soil morphology (Murphy 1977) and this method could be adapted to classify X-radiographic pottery texture in a similar way.

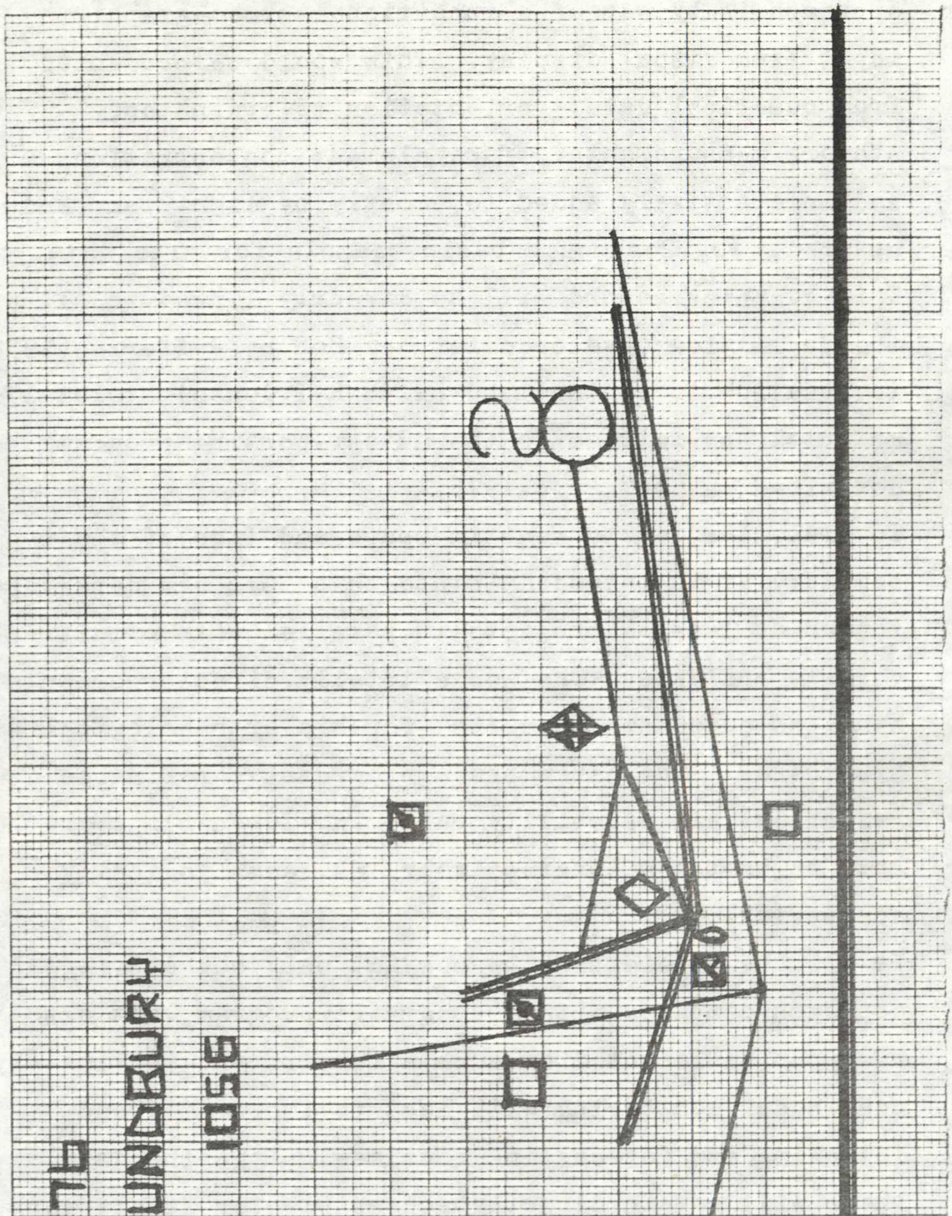
Other Quantimet users have applied it to a great many quite different projects, ranging from glacial varves (Peach 1975) and metallography (Ali 1975) to photogrammetry (Boyde 1975) and bone disorders (Faccini 1976). Thus the system has a number of other applications inthe archaeological sphere.

Lastly all these developments have forced a complete re-appraisal of the treatment of evidence from large cemeteries. The obvious solution is to photograph with a minimum of suitable markers - standard practice in some cases (e.g. Rahtz at Bordesley Abbey). The resultant data bank of 2-3 shots for each excavated grave could be analysed by a variety of comparative and statistical routines for purposes of conventional interpretation and report.

In the present case, where excavation is incomplete but the bulk of records already exists, the best approach is by way of a transitional symbo-graphic input from visual display. This would be projected from numerical data - orientation co-ordinates, stature measurements, trace element concentrations - and interactively added to, mostly by light pen, and updated. Fig.2 shows a basic example for site data. This graphics record will be directly linked to all the facilities developed for the DoE by Jefferies(1978) in relation to context and (with R.T.Jones) skeletal material, as well as to the auto-reporting program described in Conf.Proc.1976.

To trace the development in space and time of the cemetery it is intended, since this is a new departure, to run at least 2 projects in parallel with a multi-variate analysis. One has a totally director-oriented bias: an automatic checklist for his archaeological hypotheses. The other has a progressive refinable 'experiential' capability built in, to enable short cuts to be taken interactively, as seems logically appropriate.

It will be interesting to see not only how a 'biased' approach compares with a pragmatic program, but also what can be 'learnt' from such a comparison. Ultimately, continuous monitoring will lead to improved trend-following and forecasting routines. Like the data, these will remain directly accessible for future work which, in this special context, may well lead to a rapid breakthrough in cumulative 'machine logic' and thus 'artificial intelligence'.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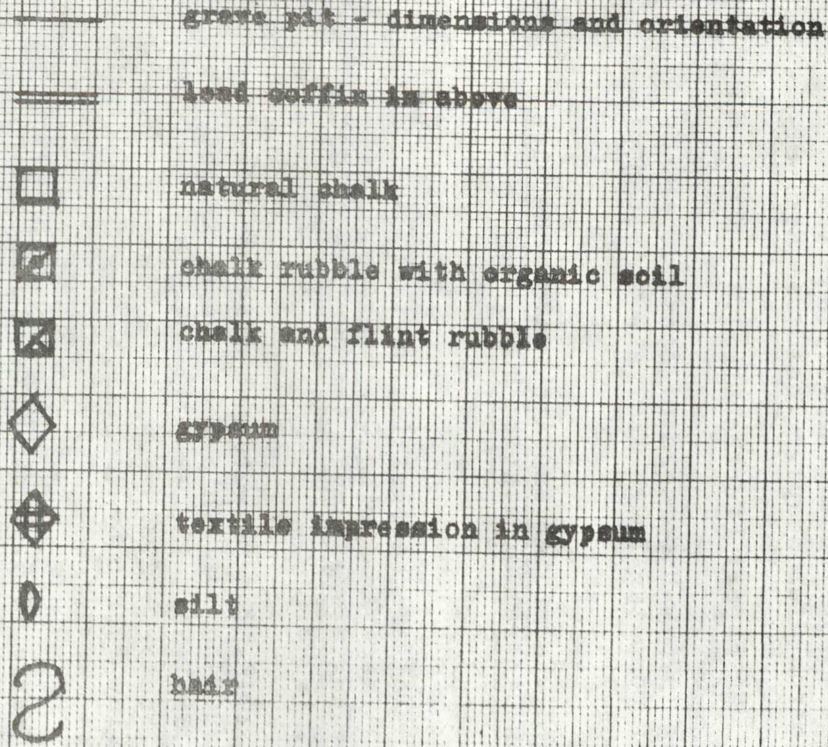

Fig.2. Symbo-graphic frame for adult male burial

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Also see R.H.Foster & J.S.Evans 1971. Image Analysis of Clay Fabric by Quantimet. The Microscope 19, 377-401

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