
1 Strategies for Gravestone Recording

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1.1 Introduction

1.2 Introduction

In recent years there has been a growing interest in the recording of graveyards and cemeteries for archaeological and historical purposes (Jones 1979), as a result of which there has been a number of computer programs written, and database packages used to record and analyse the information. However, such programs and packages have tended to be solely concerned with producing immediate answers to relatively simple prosopographical questions (for example, graphs showing number of deaths per decade, average age of death etc—see Mytum 1986), and have not explicitly addressed the limitations imposed by the recorded data, or taken into account the needs of long-term research. This paper aims to show what we consider to be an ideal structure of database systems for the storage and manipulation of cemetery data, and how we arrived at this ideal. Examples quoted will, unless otherwise stated, be from the Protestant Cemetery in Rome, which was recorded on computer between 1984 and 1986, although the methodology can be applied to any graveyard or cemetery. The cemetery has been the last resting place of non-Catholic foreigners in Rome since the mid 18th century, and contains some 2600 stones commemorating over 4000 people from over 40 countries. The recording is part of a multinational project under the auspices of the *Unione degli Istituti di Archeologia, Storia e Storia dell'Arte* in Rome, organised by the Swedish Institute.

The cemetery was not recorded using the scheme we are about to outline (see also Rahtz 1981); while in some ways this paper is an attempt to shut the stable door after the horse has bolted, it does have the merit that all the peculiar possibilities we discuss have actually been encountered in the field, and caused problems—maybe this is the only practical way of devising a database structure, to do it wrongly and discover the pitfalls as one goes along. We would accept that while the Protestant Cemetery is not at all typical of what one would encounter in an English churchyard, nothing that we have met is specific to Italy or Protestants, and we suggest that gravestone recording which hopes to add to a long-term research archive must assume a situation at least as complicated as ours.

1.3 Establishing a ‘Universe of Discourse’ and a conceptual schema

According to the principles of database design, as recently expounded by Lou Burnard (Burnard 1987), the first step in producing an ideal database system (in this case for the

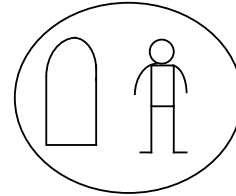


Figure 1 A simple model of a cemetery

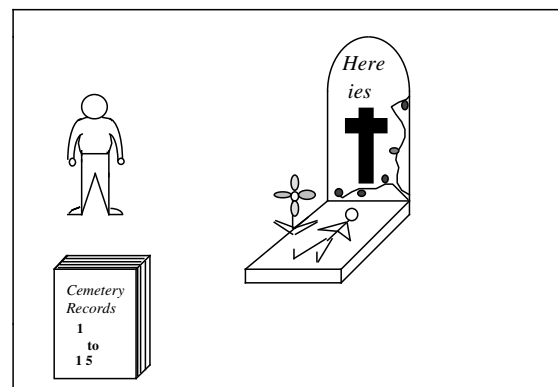


Figure 2 A more complex view of a cemetery

storage and manipulation of cemetery data) is establishing a ‘Universe of Discourse’, or defining the limits of our recording and our enquiry. This immediately forces us to think about the world of the cemetery, the elements it consists of, and how they relate to each other. All the elements must be considered whether one intends recording them or not, as they will affect the overall conceptual model of a cemetery which one is aiming to produce.

First, then, we have to decide what the cemetery consists of. At first sight this seems relatively simple; we all know that cemeteries consist of memorials which commemorate people (Fig. 1). However, on closer observation we notice that the memorials have inscriptions, and decorations which consist of motifs, and that the people they commemorate have probably entered the cemetery through burial, and that there may be plant life on the grave, and that the cemetery may have an archive of the burials. As we can see, then, there is more to a cemetery than just stones and people (Fig. 2).

Although we can now establish a list of ‘cemetery’ elements (Fig. 3), we still have to decide how they relate to each other, and how to express these relationships in a clear manner. The way in which we can do this is by producing a conceptual schema diagram, where the types of relationships between elements are represented by different symbols, the meaning of which should become clear as I explain how we arrived at our conceptual schema.

Starting with the most obvious element, *memorials*, we knew that they could be divided into *parts*, for example

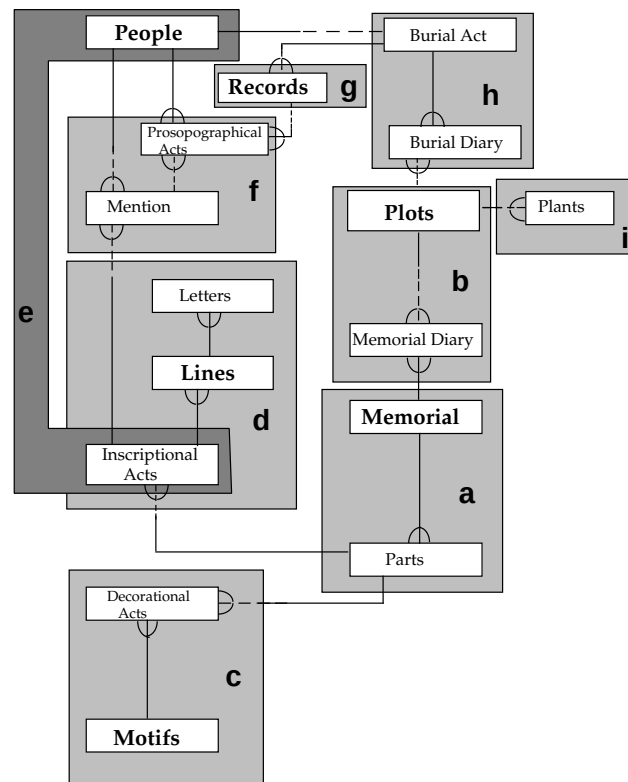


Figure 4 A conceptual scheme for cemetery records

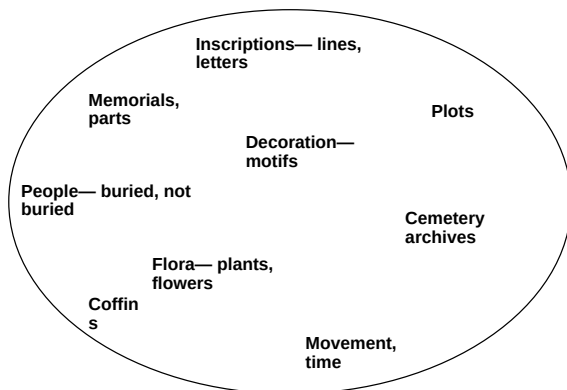


Figure 3 The elements of a cemetery

headstone, footstone, kerb etc. We also decided that, for recording purposes, it would be necessary to define which part of the memorial had, for example, an inscription on it, and that therefore all memorials had to consist of at least one part. This relationship is expressed in Fig. 4 section a. We also decided that for ease of recording it would be better to actually plan burial plots rather than the memorials themselves, as experience in the Protestant Cemetery has shown that memorials may move frequently, making updating of the cemetery plan difficult. This decision however necessitated defining what we meant by a plot. We decided that a plot is an area of action within the cemetery, which may be the subject of a burial or the erection of a memorial, or both, in the past, present or future; we must allow for not only the simple plot with a headstone, but also the plaque on the wall acting simply as a memorial, and the plot of ground purchased by a future 'client' but not yet in use. Basically it is a grid reference by which we can produce a meaningful plan of the cemetery

without having to drastically alter it every time a memorial is moved. The actual recording of the extent of a plot may be somewhat arbitrary.

Expressing the relationship between plots and memorials is not as simple as for memorials and parts because, as has already been observed, memorials may be moved and can therefore be related to more than one plot. Also, plots may contain more than one memorial, as, for example, in a family plot. In order to take this into account we introduced the concept of a memorial diary, which represents every action memorials go through, including its initial erection. We can now show the relationship between memorials and plots (Fig. 4 section b). This states that memorials may be subjected to one or many actions that each entry in the memorial diary has to be related to a memorial, and also to a plot, and that each plot may be related to many memorial actions, although it does not have to be related to any. Thus, at any given point in time a plot may have none, one, or many memorials on it, and one memorial may be moved from one plot to another through time.

Let us next consider decoration. Some memorials are highly decorated, whilst others are plain. Decoration can be of many sorts, for example traditional Christian symbols, classical scenes, or portraits of the deceased, and one memorial may have a combination of these, and they may appear on different parts of the memorial. We also recognised that decoration of memorials may take place gradually through time, so we decided to call each definable piece of decoration a decorational act to allow for this. (Fig. 4 section c). As we have just noted, decorations can be categorised into a number of forms, each form being what we have decided to call a motif. This can be anything from a complete scene to a cross. Each decorational act has to consist of a motif of some sort. One motif can appear

in many decorative acts. Each decorative act has to be related to a part of a memorial, and any one part of a memorial may contain several decorative acts, although it does not have to contain any.

Parts of memorials may also have inscriptions on them. As with decorations, in order to allow for the addition of inscriptions through time, we decided to call each separate inscription an inscriptional act (Fig. 4 section d). These have to be related to parts of memorials, and each part may have no, one or many inscriptional acts on it. Each inscriptional act has to be composed of lines, which in turn is composed of letters. Each inscriptional act may or may not mention one or more people; for example, an inscription may say 'here lieth Joe Bloggs,' or 'here lieth Jane Bloggs, wife of Joe', or it may just be a biblical quotation. The relationship between inscriptional acts and people is complicated by the fact that in order for us to know about a person who is in some way related to the cemetery, they do not necessarily have to be mentioned in an inscription: it is possible that they may be mentioned in a cemetery Archive. The relationship between people and inscriptions therefore appears (Fig. 4 section e), which means that each inscriptional act may or may not mention one or more people.

Another problem with people is that they do not have to be buried in the cemetery in order to achieve a mention in an inscription or for us to be interested in them. For example, monumental masons may sign their work, or dead peoples' relations may appear in inscriptions even though they are not buried there. Relationships and other facts about people, i.e. prosopography, may be either directly stated in inscriptions, or may be implicit—for example, a memorial may state the date of birth and death of a person, in which case that person's age is implicitly stated in so much as we can work it out. So, each mention may state or imply none or one or many prosopographical facts (Fig. 4 section f), and each prosopographical fact relates to a person. Prosopographical facts must relate to people, and people must have a prosopographical fact related to them, even if it is only their name. However, prosopographical facts do not have to appear in mentions, as they may appear in the cemetery records (Fig. 4 section g).

We now have to consider how actual burials fit into this scheme (Fig. 4 section h). Like memorials, burials may be subjected to movement through time, hence the necessity for a burial diary to cater for this. Obviously each burial act has to be related to a person, but a person does not have to be related to a burial act, although one person may be related to many burial movements through time. Burial acts and movements have to be related to a plot, and one plot may be subjected to many burials through time. Burials may be recorded in the cemetery records, and the records have to state burial acts.

The final category is the flora of the Cemetery (Fig. 4 section i). By this we mean the deliberate planting of flora on graves rather than trees or plants which are planted to enhance the landscaping of the cemetery. This establishes the fact that recorded plants have to relate to plots, but a plot may have none, one or many plants on it. This particular element of the record may seem odd to

an English audience, who are used to broad green areas and yew trees, but one must remember that the climate and culture in Italy make individual plants in pots more common. We may also mention two documented cases of conscious planting; firstly, there are the flowers around the grave of Keats, which were planted to mimic lines from one of his poems, and secondly, there is a small tree in a newer area of the cemetery which has an associated plaque recording its dedication in memory of a Danish artist.

We have, then, a conceptual schema of a cemetery, which points us to the things we may wish to record and shows us that we should state whether information is explicit or implicit. The actual methodology of recording these entries need not concern us here. What we must now do is establish the most efficient system of databases for storage and manipulation of the data generated by such recording.

1.4 Implementing a database

The analysis we have described of a cemetery record is, of course, idealised. It could, however, be implemented straightforwardly in a conventional relational or network database, and appropriate access strategies worked out. The primary needs in a working database fall into two parts, firstly those concerned with the extraction of information related to people, and secondly those which are concerned with memorial stones in abstract and their contents. We will need to take into account the following:

- Accessing the data by the names of the people buried or commemorated is an obvious route to take (but see below for problems).
- The cemetery records provide an important means of access for prosopographical information, based on dates of entry.
- Access by means of either a plot number or a grid reference is essential, as this will control whether things can be re-identified on the ground. It will be clear that there cannot be a single numbering system to categorize the gravestones, and that separate catalogue numbers will have to be allocated to a plot and to a memorial. The Protestant Cemetery has many examples of migrating gravestones, despite the apparently timeless stability of a graveyard, and complete plots undergo a thorough re-use.
- We need some way of quickly identifying information about a particular gravestone. For one major part of analysis, this will be the primary concern.
- For study of the inscriptions, we would like to access the texts word by word. This will be further discussed below.
- For art-historical purposes, getting at the stones by a particular design will be important, and we should therefore support access to the structure by motif.

With the exception of the words of the inscriptions, conventional indices will provide what is needed, and relational joins will provide the output we need for any purpose, such as input to a statistical program, as well as answering interactive queries.

1.4.1 Specific Problems

There are a number of detailed problems to do with the recording systems which must be solved once we have devised a global scheme. We shall examine two obvious, and one not-so-obvious, difficulties.

The first is to do with the prosopographical records. There are three conventional problems in such databases:

1. The fact that a European name has no universally accepted, life-long, form. It is quite possible to be born Mary Smith, and die Wendy Bloggs, with any number of names in between. No one name is 'right'.
2. The difficulty of establishing family or other links—is Mrs Trewhella *here* the wife of Mr Trewhella *there*?
3. The cultural and political dimension in recording an apparently innocuous field such as nationality. Do we record the name of the country in which the town of birth is now situated? This could make Anglo-Indian children come out as Pakistani. Or do we take the nationality at time of death? This would make the English woman who marries a White Russian in Rome become Italian. Do we record the nineteenth-century citizen of an obscure North European state as a Ruritanian or call him Russian?

There are no simple answers to these problems, and it is the *temporal* dimension of prosopographical records that our concept of *prosopographical acts* is designed to cater for.

The second problem relates to iconography; do we describe the decoration on each stone in free text, and treat each one as unique? Or do we decide that there are a number of known possibilities (such as 'Classical mourning tableau', 'representation of the deceased', 'figure of Christ'), and categorize accordingly, with sub-groups ('with or without ivy leaves')? Or we do adopt a system of multiple keywords, recording the presence and absence of a known range of motifs? The latter was the system adopted for the Protestant Cemetery, on the grounds that this most accurately represented the needs of research—for instance, the Cemetery was under Papal authority until 1870, and the Pope forbade the use of the cross on Protestant gravestones. It is therefore of interest to locate easily the presence or absence of a cross on any particular tomb. This type of query is catered for by some degree of hierarchy in the coding list. Although each motif is given a number, and records are made using that number, there is an additional group number assigned to each motif for queries at a higher level (eg all Christian symbols are in the same group).

A third problem relates to the texts of the inscriptions; there is the simple problem of transcriptions of alphabets, particularly acute in the Protestant Cemetery, where conventional Greek, Russian and Latin alphabets mingle with various Slavonic, Japanese, Chinese, Arabic and other scripts. Even within the Latin family, there are problems of accentuation and other marks which must be encoded using the ASCII character set. To what extent should we record the style of the lettering, or is this best left to a photograph? Any one inscription can demonstrate a whole variety of different letters, and a detailed study of the inscriptions in the oldest part of the cemetery suggests that it may be pos-

sible to identify different masons' styles or at least stylistic periods in the cemetery. An allied question arises when we come to investigate the language used in funerary inscriptions; if we suspect that the same sentiments are used at a particular period, regardless of nationality, we must either translate all the texts into a common language, either real (Latin? English?) or imaginary, or we must impose a concept of a range of known 'sentiments', parallel to the motifs in decoration, and somehow generate sentimental records from the actual texts.

1.4.2 Actual implementations

The Protestant Cemetery records have used a number of different systems, and it may be instructive to briefly outline the good and bad points of some of them. When the work started in 1984, a much simpler system than that suggested here was used, and has proved to be a limitation for the reasons shown in the first section of this paper. It involved five basic record types, which are linked together on a single numbering scheme for stones:

1. Stones; this covers both the memorial itself and the plot on which it rests, and includes such information as dimensions, type (within a restricted range of possibilities), presence/absence of kerb and flora, and position.
2. Persons; this includes the basic prosopographical data, which is tagged as being a) given explicitly, b) supplied implicitly (such as age derived from birth and death dates) and c) known from other sources (such as cemetery records and reference books).
3. Inscriptions; one record is created for every 'inscriptional act' as discussed earlier, and includes information on language, position on stone and type (primary, secondary, genuinely commemorative or just 'comment').
4. Lines; one record is made for every line of inscription, containing the actual text, and the method and style (ie whether it is raised metal, incised in stone, incised and then painted etc, and whether it is gothic, roman or italic script).
5. Iconography; one record is made for every 'iconographical act' on a stone. This is probably the most controversial aspect of the recording. The solution adopted was as described above, with a keyword list and a note of whether a given act was regarded as a) dominating, b) major or c) minor importance.

The recording was done in the cemetery using pre-printed forms, and transferred onto computer within a day or two for validation and cross-checking. dBaseII and dBaseIII were used to hold the information and generate working handlists, although the actual inscription texts were typed in using a conventional word-processor (Microsoft Word) and later decomposed into a form suitable for loading into dBase.

The simplified structure of records as outlined worked well on dBaseIII, and the 2500 stones, 4000 people and 23000 lines of inscriptions fit comfortably on a PC-XT clone, with fast retrieval of all the details relating to a stone either by stone number, persons surname or stone

Code	Group	Motif	Code	Group	Motif
1	7	altar	94		skull and cross bones
2	6	anchor	95	8	soul
4	1	angel	96	3	sphinx
5	7	arch	97		star
8	6	arrows	98		star of David
9	2	palette and brushes	99	2	statue, of deceased
12	0	bird in bush	100	1	statue, male (not deceased)
14	6	book	101	1	statue, female (not deceased)
16	7	column, broken	102		sun
19	4	bust	104		swastika
20	3	butterfly	105	5	thistle
21	6	caduceus	106	6	torch
22		celtic rope work	107	5	tree
23	6	chalice	108		triangle
24	8	chi rho	109		urn
25	2	children's toys	111		wings
26	1	christ	112	5	wreath
28	5	clover	113	8	cross
29	2	coat of arms	114		star and + symbols (birth and death)
30	7	column	115		alpha and omega
31	6	compass	116	8	IHS
33	6	crown	117	5	olive
34	6	dagger	118	6	lamp
35	6	disc	120	5	acanthus
36	3	dog	121	5	lotus
37	3	dolphin	122	5	vines
38	7	door	123	8	cross, Greek
39	3	dove	124	8	cross, Orthodox
41	3	evangelical animals	125	5	wreath, victors
43	1	figure	126		statuary, broken
44	3	fish	127		meander
45	5	floral, unknown	128	5	pine
47		fravashi	129	5	garlands
49	3	griffin	130	5	wheat
53	6	hourglass with wings	131	5	poppy
54	8	icon	132	5	flower, falling
55	6	jug	133	5	ivy
56	3	lamb	134	5	oak
57	5	lily	135	5	laurel
58	6	lyre	136	7	capital
59	8	cross, Maltese	137	6	boat
60	5	maple	138		trefoil
61	6	mask	139		heart
62	2	mason's tools	140		quatrefoil
63	2	medal	142	8	cross, Celtic
64	2	military accoutrements	143	6	sword
66		mosaic	145	6	medical staff
68	2	music	146		leaf stop
69	2	musical instrument	147	6	vase
70	6	oar	149	3	toad
71		"tictactoe board"	150	3	lizard
72	3	owl	151	3	dragonfly
74	5	palm	152	3	insect, unknown
75	3	peacock	153	3	ox skull
76	3	phoenix	154	5	shamrock
77	2	photograph	155	6	rope
79	2	portrait	156	5	tree of life
80		praying hands	157	3	eagle
80		praying hands	159	6	cushion
82		putto	160		romulus & remus
82		putto	162	8	cross with dots in corners
84		sarcophagus	163		clouds
85	5	rose	164	5	cross, St Georges
86		rosette	165	5	holly
87		scroll	166	3	mouse
88	3	serpent	167	7	sculptor's tools
89	6	shells	168	3	sparrow
91	6	sickle	999		Extra - see notes
92		skull	999		Extra - see notes

Table 1 Iconographical Motifs

type. Searching the inscriptions for particular words is not, however, so straightforward and is slow. A port of the data onto the Pick-based *Information* system on a Prime mini produced considerably reduced access times on anything but stone numbers (since *Information* has no concept of indices), but did show some improvement on inscription searching, the storage of which was aided by *Information*'s variable length records. The essentially linear search strategy ruled out any kind of interactive query loop, however. Probably the least successful port on all counts was to the SIR (Scientific Information Retrieval)

package on an ICL mainframe. Although SIR can in some ways think like a relational package, its basis is hierarchical, and the mapping of the gravestones was not straightforward; as an example, even indexing the people data on surname requires the generation by a small user-written program of a manual inverted index. The SQL interface was inefficient, again due to indexing problems, and fixed format tables were not very suitable for the retrieval of inscription texts (though one might note that this is not a criticism of SQL *per se*. A partial port onto a Unix-based *Unify* database produced much better results).

Taking a completely different route, a very efficient retrieval system was built in 1986 using CAFS (Content Addressable Filestore) hardware on an ICL mainframe, and joining information from a set of fixed format files by a Fortran program and CAFS brute force. An interactive program using CAFS to search the inscriptions produced excellent response for the most devious word-based query. Currently the records are held in fixed format files on a Unix system, and joins performed with *ad hoc* programs written in Icon, while we await installation of SQL/DS on the Southampton IBM mainframe to act as a permanent host which can be accessed over the networks.

1.5 Conclusions

We have purposely not shown any illustrations of grave-stones, shown you any plans of graveyards or attempted to give you any *results* of our work in the Protestant Cemetery, which is published elsewhere (Rahtz 1987; Vian & Menniti forthcoming 1988). Our sole purpose has been to demonstrate the complexity inherent in recording a cemetery, to show what sort of theoretical structure we think it is necessary to adopt, and to share some of the problems encountered in a real application.

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