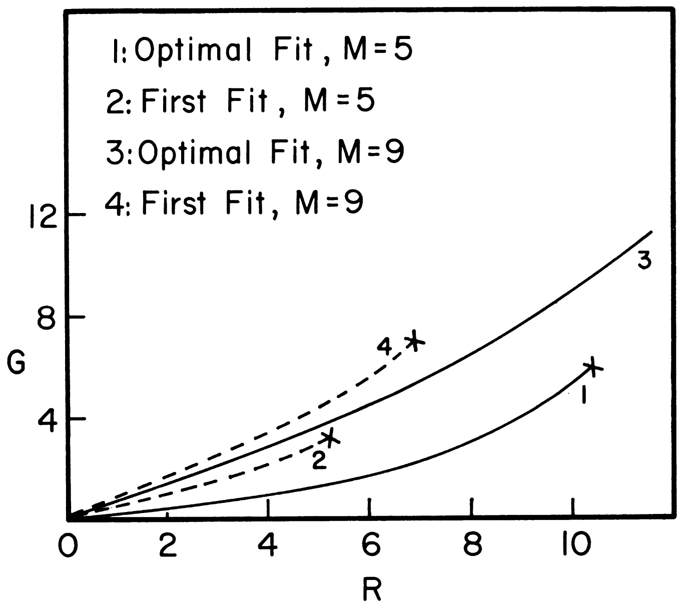

Fig. 1. Curves of G, the number of garbage collections, against R, an index of length or difficulty of the computations, for the two strategies

show the stages at which computations exhaust the available space in storage before finishing. The chief advantage of the optimal-fit method from this point of view, as Fig. 1 shows, is not that it leads to more economy in garbage collection (although that is true), but that it gives a long calculation a better chance of finishing in general. The smallest value of M on Fig. 1 is $M = 5$, because the trial computations did not reveal any obvious advantages of one method over the other for $M < 5$, except perhaps that the first-fit computations tended to run faster. For $5 < M < 9$, the curves of G against R for either method fall into the region between the curves shown for $M = 5$ and $M = 9$ for that method in a regular way. The value $M = 9$ is the largest that has been used here, because no non-commuting quantities which the programs have analysed successfully so far have required blocks of more than nine words.

Table 1 contains some typical details from trial computations. The column *FIT* has been mentioned already. The columns W_1, W_2 and S illustrate why it is that the optimal-fit method is generally able to sustain a computation beyond the point where the first-fit method runs out of space. Even when the technique of starting each search for a block at a randomly-chosen place on the free-storage list is used, the first-fit method eventually leads to a list which is choked with small blocks, so that a request for some large block cannot be filled. When that happens for the first time, the program is designed to stop. It is possible to see from Fig. 1 that the optimal-fit method postpones this difficulty. In Table 1, W_1 is the ratio of the fraction of one-word blocks present in free storage at the end of a trial computation to the fraction present at the beginning, and W_2 has the same meaning for two-word blocks. These numbers are significantly larger in the first-fit cases, which indicates that the store is robbed of large blocks rather less quickly if the optimal-fit algorithm is used. The column for S, which is the ratio of the total number of blocks on the free-storage list at the end of a computation to the number located there initially, shows that the optimal-fit method keeps the list noticeably more compact. This adds to a computation's prospects of being completed without failure to fulfil a request for a large block of storage at any point, because the distribution of block sizes always remains close to the initial distribution even when the free-storage list becomes very short ($S < 1$). The contrast between the values of W_1, W_2 and S for the two strategies is even more striking if it is remembered that the entries in Table 1 describe computations which have run to completion with the optimal-fit method, but which have stopped at some intermediate stage in the case of the first-fit method. For each M in Table 1, the displayed values of R are chosen to be the smallest integer values for which optimal-fit computations have finished while first-fit computations have not.

Although the algorithm described here has been applied to lists of blocks containing $1, 2, \ldots, M$ words, in principle the method and the accompanying theory can be applied without change to lists of blocks of sizes $x, 2x, \ldots, Mx$, which increases its potential usefulness. I am indebted to the referee for pointing out that fact.

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Correspondence

To the Editor
The Computer Journal

Sir,

With reference to my paper published in the November, 1970 issue of this *Journal*, 'Surfaces for Interactive Graphical Design', I would like to point out an error which has been indicated to me.

In listing the conditions under which a curve will retain its character, I state in (d) that the new curve should lie totally on the same side of the original curve. This condition is wrong as it is only necessary that the displacement of every point on the curve should be in the same direction. This change does not affect any other part of the paper.

Yours faithfully,

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