14–4 Medical Applications of Programmable Audio-Visual Displays

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Few would deny the importance of preserving as much as possible of the traditional personal relationship between doctor and patient as a central feature of future medical systems. At the same time it is becoming increasingly apparent that the demand for personal medical services exceeds, and will continue to exceed, the resources available to meet it. Any developments, consistent with an acceptable standard of practice, which will enable doctors to delegate some of the direct responsibility for the conduct of the patient's interaction with the medical system must, therefore, be encouraged. Only in this way will it be possible to guarantee that scarce professional skills will be available where they are really needed.

Active Interfaces Modern technology, by means of such instruments as the telephone, television, and associated recording devices, has added new dimensions to the use of natural language by providing interfaces which allow communication to take place under circumstances where direct contact would be impossible. Hitherto most such interfaces have acted passively to make man-machine-man communication as similar to direct man-man communication as possible, but now it is feasible to consider active interfaces relying on stored information, which can take over some of the functions of the human elements involved - a 'Teaching Machine' is, for example, an active interface in which the relationship between the communicators is that of teacher to pupil.

We shall present a design for an active interface which may best be described as a Programmable Audio-Visual Display. The essential feature is a store with a frame of audio-visual information associated with most stored words. Each word provides a control instruction which determines the mode of presentation of information to the subject, the processing of data related to his response, and the next address in store. In the interests of low cost and simplicity in program reproduction, the design is based on the maximum allocation of word storage to a read-only store accessed at the same time as the audio-visual frame.

So far our practical experience has been confined to the development prototype of the (commercially available) ESL av ts 512, a programmable random-access audio-visual (magnetic tape and film-strip) display device, with associated control and recording facilities. This system satisfies many of the requirements for an active interface, and has enabled the concept to be evaluated in clinical situations.

Applications The active interface has been used with geriatric patients to perform a preliminary evaluation of its application in clinical trials of therapeutically useful agents. A similar evaluation is being carried out of its utility in the diagnosis of orientation disability in air-crew. These preliminary studies have indicated that the techniques used are as rapid, efficient and acceptable as previous means for administering similar tests, and afford far better control of test conditions and uniformity together with the collection of information in depth.

A particularly important application of the interface is as an interrogation system for collecting and collating clinical data, supplementing or replacing the written record and the administration of questionnaires. Automatic interrogation procedures are increasingly required in preventive medicine as greater emphasis is placed upon routine clinical screening for large populations.

One example of the potential application of these various procedures using the active interface is in the follow-up of patients following an operation such as thyroidectomy. This may have undesirable side-effects capable of both indirect detection by questioning the patient, and direct detection by the use of a psychological test. It is feasible to program both procedures for the interface and, given computing facilities, to have the results of both analysed and collated for presentation to the doctor prior to face-to-face consultation. After consultation the doctor might use a similar system to record his own observations and opinions; there are indications that the use of such auto-interrogation programs by the doctor may well be a natural stage in the development of interrogation and test programs for direct use by the patient.

Development Work is proceeding at present on both the technical development of audio-visual displays and their application as active interfaces in a variety of situations.

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