

AN EXPERT SYSTEM FOR ASSISTANCE WITH ENROLMENT

THE PROBLEM

The University regulations are notoriously complex and involved; it can be quite hard to check that a student is enrolling in a permissible set of courses which satisfy the requirements for the faculty or faculties concerned. The problem is aggravated by the distributed nature of enrolment. A student enrolls for different papers in different places at different times in any order, and there is little, if any, effective check on the consistency of the various transactions until the end of the exercise. Pretty well anything that might help sort out the possible (and actual) tangles can't be a bad idea.

EXPERT SYSTEMS ?

The complexity of the problem area makes it quite difficult to handle using conventional programming techniques; while the majority of cases are simple and can be dealt with straightforwardly, an inordinate amount of effort, not to say programme, must be used to cater for all possible combinations of circumstances, however unlikely. That in itself is at best hard to achieve; all the possibilities must be foreseen and explicitly allowed for in the programme.

It is in such areas that the technology of expert systems comes into its own. In fact, of course, an expert system is simply another programme; but its architecture is such that the programme itself is expected to sort out the complications. An expert system is never likely to be as fast as a special purpose programme which deals with the same problems; but it is likely to be far easier to construct. In effect, one exchanges execution speed for ease of programming; and, if the initial problem was sufficiently complex, that can well amount to exchanging no computer system at all for one that works. It may be slow, but at least it's there.

An expert system operates by comparing each datum with a set of rules, called the "knowledge base" of the system. These rules encapsulate the expert knowledge of the area of application – for an enrolment system, they would include the relevant parts of the University Calendar, and also ideally (though these are things which can be added as they are found helpful) all the hints, tips, experience, dodges, and the rest which people use just as much as the Calendar itself. (For example : in a conjoint B.Com.-B.Sc. degree, it's better for a student to take stage 1 Computer Science as a B.Sc. topic and cross-credit to the B.Com. than the other way round; if you don't, you only get 5 B.Sc. credits for the papers.¹) The control part of the expert system – the "inference engine" – identifies the set of rules which apply to the new information, and acts accordingly. The details of the action taken depend on the design of the inference engine; different designs are appropriate for different applications. For example, all the applicable rules may precipitate action, or one may be selected; the action may be to remember the new datum as an addition to the knowledge base, or to search the knowledge base for information inconsistent with the new datum, or to enter into a dialogue with the person operating the system to request further information; and so on. A part of the task of setting up an expert system for a field is to determine what sort of inference engine is best suited to the work to be done.

Another, and obviously important, part is to set up the knowledge base. The expert knowledge must somehow be extracted from the expert, and encoded in a form suitable for use by the inference engine. (This operation is sometimes called "knowledge engineering".) This step usually requires detailed discussion between the expert and the computist constructing the system, except in the rather rare – and not necessarily desirable – circumstance that they are the same person. It is quite common to find that the effort of setting forth the expert knowledge in precise terms can yield new insights into the structure of the knowledge; so this exercise can have value, whether or not the expert system is ultimately found to be useful.

A SUGGESTION, ALMOST AMOUNTING TO A PROPOSAL.

It is hard to say a priori whether or not an expert system is worth considering as an answer to any specific problem; but it would be interesting to find out, and, on the face of it, the University regulations look like the sort of field where expert systems have achieved successes in the past.

The University regulations also look forbiddingly extensive, and I would certainly not see it as sensible to attempt to encompass the whole lot at one bite. I believe it would be useful, though, to work on a simplified prototype, both to explore the utility of the method, and to demonstrate its potential. I would aim for a truncated, though still tangled, set of regulations, which would form the knowledge base for the system. I would then investigate the performance of the system against a small, but again reasonably realistic, set of students' enrolments and withdrawals, concentrating on the tricky cases – conjoint degrees, lots of transfers of credit between faculties, and so on. I would expect the system to keep track of each student's current position, to point out inconsistencies in enrolments, to accept changes in enrolments and reassess its judgments, to respond to questions as to the current state of the system, and so on.

This need not be a large project. The Computer Science Department has ample expertise in the field of expert systems to make a reasonable job of it; it could be started more or less forthwith, without committing anyone to anything irrevocable; and it would give everyone concerned a much better idea of what we were talking about. It would require some significant contribution from registry staff in helping to interpret existing regulations, or commenting on "synthetic" substitutes; but they may well be rewarded with deeper insights into the workings of the regulations from that analytical exercise alone.

SUMMARY

I suggest that we explore the possibility of setting up an exploratory project of the sort suggested. I believe it would assist everyone concerned to evaluate the prospects of a full-scale system; it would certainly provide a useful project for a Master's student in this Department; and it fits in well with the Department's research programme.

REFERENCES

1. P.M. Fenwick, private communication, 7 April 1986.