

Harvey Dearden wonders whether we're too dependent on technology

The singular virtue of the slide rule was that it only allowed you to work to three significant figures and you had to work out where the decimal point went for yourself. The slide rule was an aid to calculation, but you certainly had to understand where you were going for it to be useful. There was also a certain tactile joy in the fluent manipulation of a slide rule!

The crash in the slide rule market in the late 1970s must be almost without parallel, the convenience and power of the pocket calculator was so completely overwhelming – I would be intrigued to see some figures if anyone can oblige. Subsequently, of course, the PC has swept all before it and there is previously unimaginable power within a hand's reach on your desk.

But the undeniable power and convenience of the computer is not without its hazards. GIGO: Garbage In – Garbage Out, of course, but there are more subtle, 'psychological' hazards. There is perhaps less tendency to question the result generated by a computer (a very necessary step in slide rule calculations!) – it somehow appears authoritative. But this appearance may be completely spurious; remember, the thing was programmed by a human being and the 'precision' of 10 decimal places is usually completely illusory.

At first thought it is amazing that any human could beat a chess computer that is analysing gazillions of positions every second, but the computer still has to make an evaluation of the relative merits of each position examined. If the analysis does not reveal a forced checkmate or overwhelming gain of material, this evaluation must be on the basis of 'positional judgement' that has been programmed by human beings. The number of possible positions tends to explode astronomically with the number of future moves, so even this 'brute force' calculation has limited range. No Grandmaster can 'out calculate' a chess computer, but they may well display superior judgement of position that has developed intuitively and been honed by experience.

PROGRAMMING RULES

Generic assessment tools will typically be programmed with a degree of conservatism that may be completely inappropriate in particular circumstances. The program may well lack an 'Is this sensible?' algorithm. Computers may be clever, but they often lack wisdom.

Computer tools may allow optimal design that trims the superfluous fat from your solutions, but perhaps their use detracts from the development of an intuition about what 'looks/feels right'? If used appropriately they may actually speed the development of such intuition by allowing the rapid assessment of alternatives by 'what if' games. But if this philosophical point is not appreciated there is the



danger that flawed designs might remain unchallenged by sound instincts based on experience.

This is where 'rules of thumb' come in handy as a reality check on the computer result; if there is a significant discrepancy it may represent a useful refinement in the design, but you need to be sure you understand from what this arises.

Isambard Kingdom Brunel said in 1854: "Let me give you one general piece of advice... Consider all structures, and all bodies, and all materials of foundations to be made of very elastic india-rubber, and proportion them so that they will stand up and keep their shape; you will by those means diminish greatly the required thickness. Then add 50%."

There is a lot to be said for having designers actually go into the field to commission their designs. Anyone with any experience will testify that what looks good 'on paper' doesn't always translate into corresponding operational experience. Even when the thing actually does what it was supposed to, there can be all sorts of headaches for the builder that has to construct it, or the operator that has to use it, or whoever has to maintain it. Field commissioning will certainly hone your instincts for what works and what looks and feels right. ■