

of the future, and lists potential breakthroughs, including a translating telephone, an intelligent assistant, an intelligent telephone-answering machine, a cybernetic chauffeur, invisible credit cards and artificial people! Allen Newell, one of the founders of the field of AI has a short piece on *Fairy Tales*, where he says: '... the aim of technology, when properly applied is to build a land of Faerie' (p. 421), and further that 'computer science and technology are the stuff out of which the future fairy land can be built' (p. 423).

The last chapter discusses the impact of AI on employment and the economy, education, communications, etc. This is followed by a piece by Margaret Boden on the *Social Impact of AI*, where she looks at both the positive and negative implications of AI.

Extensive notes, a good bibliography, a glossary and an index round off the book.

The only complaint I have about the book is that, in spite of the large size and the excellent printing, the publishers have chosen to use a dark typeface that is hard on the eyes.

Summary

To many of us, AI is about bettering the quality of life, using what have been termed 'intellectual steam-hammers', just as the steam-hammers of the first industrial revolution eased the physical burden of people.

AI is an amalgam of sciences and of technology. AI involves cross-disciplinary work covering a myriad of disciplines, understanding human processes, and human thought, and applying this knowledge to make more 'intelligent' systems. Clearly, AI is not a discipline insulated by *Keep Away* signs.

AI involves learning from humans, who have evolved over several millennia, about how to do things, what to do, and even how not to do things, and what not to do, and using this knowledge to create useful intelligent artifacts.

There have been many expectations of AI, some bordering on the absurd. But AI is not about replicating a poet's ability with words, or a mischievous child's smile.

There is a lot to be said about AI, and about the ideas and the technologies

that are used in AI. It takes considerable skill to communicate this effectively and Raymond Kurzweil's book seems to have done just this, in a very comprehensible and attractive fashion.

I would recommend this book to anyone who wants a good introduction to Artificial Intelligence and related technologies. This is a book to be gently savoured and relished, much like an old friendship, or a mellow after-dinner liqueur.

1. Boden, M. A., *Artificial Intelligence and Natural Man*, Basic Books, New York, 1977.
2. Boden, M. A., *Artificial Intelligence and Natural Man*, 2nd Edition, MIT Press, 1987.
3. Turing, A., *Computing Machinery and Intelligence*, *Mind*, 1950, vol. 59.

Videotape review

The Age of Intelligent Machines: Machines That Think. Written and narrated by Raymond Kurzweil, Videotape, MIT Press, Duration: 28:50 min., \$39.95.

The book *The Age of Intelligent Machines* has a (companion) videotape associated with it. The blurb on the tape describes this videotape as 'a survey of Artificial Intelligence (AI) showing AI at work and under development'. The videotape, written and narrated by Raymond Kurzweil, has several nice features.

First of all, it is well put-together. It is a good mixture of basic AI ideas with interesting examples of practical systems in the lab and in regular use. The multidisciplinary nature of AI is clearly brought out. It gives a balanced view of AI achievements and potential, without hyperbole or exaggeration. A newcomer to the area would probably get interested in this area with just one viewing of this videotape.

As in the book, prominent AI researchers feature in the videotape, talking about the 'paradoxes, promise and challenges of AI', making the field come alive.

One underlying theme in the tape is that technology in general, and intelligent machines in particular, can help people reach beyond their limits and overcome barriers of disabilities.

There are two applications that catch the viewer's attention. Stevie Wonder, the blind musician describes how speech synthesizers help him use a music synthesizer, manipulating the myriads of controls on such equipment. He also demonstrates how Optical Character Recognition (OCR) equipment using Pattern Recognition technology helps in reading out books for him. 'With technology', he says, 'I can do things. Technology is like a brother, mother ... a friend ... It is another sunshine in my life ...'

The other application is a robotic aid for the disabled, being developed at Stanford University by Stephen Michelowski. He is trying to integrate several technologies (such as robot motion, machine vision, speech recognition etc) in a mobile robot which can respond to spoken commands. The videotape shows clips of how a quadriplegic, paralysed by a fall on concrete, is able to instruct the robot to open a microwave oven, pick up a mug from the oven, and bring it to him, so that he can sip from the mug. When you first hear him talk of his dependence on people for everyday activities—'just to scratch my nose'—you realize what this technology means to him; it gives him the ability to do things for himself.

Roger Schank (then at Yale University) talks about what he likes best—cooking and eating—and about a program called CHEF, which learns how to cook new dishes, using a library of recipes. He talks of figuring out how we do things—composing a sentence, understanding what someone is saying—and about the need to understand a task in such a way that we can 'tell' computers how to do it. Marvin Minsky of MIT, one of the founding fathers of AI, describes how tasks that are (relatively) simple for humans to do, such as tying shoelaces, are quite complex for machines. He later describes his notion of a *Society of Minds*, a set of distributed intelligent agents working together to achieve intelligent behaviour. A machine architecture to test such ideas, the Connection Machine, is briefly discussed. Edward Feigenbaum of Stanford University, the messiah of Expert Systems, talks of using expert systems to simulate biochemistry. You then see the AARON program which creates art. Harold Cohen, of the University of California at San Diego, who

created AARON, jokes about how he is likely to be 'the only artist who can have a posthumous exhibition of recent works!' Raj Reddy, the Director of the Robotics Institute at Carnegie Mellon University, talks of current work in AI that is 'far more complicated than putting a man on the moon', and of the need for more people to work in the field, if we are to create intelligent robotic agents like R2D2 and C3P0 of *Star Wars*.

Some of the other applications in the videotape include natural language interfaces to databases of art objects, and of the use of AI in newspaper layout. Digital Equipment Corporation's expert system for computer system configuration, XCON, is featured, as are factories of the future. The implications of the use of AI in education and training are stressed. There is a brief mention of the strategic importance of AI in defence applications and of the potential of AI in commercial aviation

and in architectural design, especially in visualization.

There is a brief mention of the likely social impact of AI. With the industrial revolution, where physical power was amplified by machines, there was a fear that jobs would be lost because of these machines. In this 'second industrial revolution', which emphasizes knowledge power, there is again the fear of the displacement of people; the hope and prediction is that this revolution is likely to create more jobs at a variety of levels.

The videotape ends with Minsky wondering what would happen if machines went beyond the intellectual capabilities of humans.

The tape seems to be available only in the American NTSC format. This is a pity, for a PAL version would be of interest to India, Europe and other countries where PAL equipment is common. It would also have been useful to display names and affiliations of

people whom Kurzweil interviews. But these are minor complaints, and there is much more to appreciate in the videotape.

Too often, scientists and technologists are unable to adequately communicate to laypeople the excitement and the potential of the fields that they work in. Ray Kurzweil has gone beyond this barrier, and has done an excellent job of producing an educative and captivating introduction to AI technology. I have no hesitation in recommending this tape to all those interested in AI and related technologies. And at \$39.95, it is one of the cheapest and one of the most interesting introductions you can get to AI.

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