



Internet to enable patients themselves to make the most of their appointments? Do barriers to making appointments accomplish anything other than increased anxiety? Conversely, how often might patient-doctor-patient e-mail accomplish the work of an appointment in less time? How might individual physicians or modules use the Internet in their practices? Is everyone familiar with Internet Grateful Med, the remarkably rapid and simple access service of the National Library of Medicine? Should we develop a questionnaire for use on the Internet to collect a standardized medical history on each member nationwide? If so, how frequently should we collect this information? Current technology certainly provides the confidentiality to gather that information safely, but what additional skills would we need to use the information productively? And perhaps the most basic question of all is also posed by Gates: Does it make sense to invest huge sums in developing custom software, or should we build on the enormous R&D investments of the software industry and customize their applications to meet our needs? The promise of the electronic medi-

cal record has led to its own mystique. To date, its effect often has been to provide an excuse for deferring action on current problems because they'll disappear once we get the EMR.

The closing lines of *Business @ the Speed of Thought* resonate with the choice we have: "If we sit back and wait for the digital age to come to us on terms defined by others [we will lose] ... Digital tools magnify the abilities that make us unique in the world: the ability to think, the ability to articulate our thoughts, the ability to work together on those thoughts." (p 415)

This straightforward book is written by a man who identified the unmet needs of people who were trying to work collaboratively, and then built the world's largest fortune by successfully fulfilling many of those needs. The book will be useful reading for physicians who want to participate actively in making Kaiser Permanente the organization that it has the potential to be. ♦

Business @ the Speed of Thought: Using a Digital Nervous System. Bill Gates, Collins Heminway. New York: Warner Books. 1999. 470 pages. \$30. ISBN 0-446-52568-5

"Dragon NaturallySpeaking, Medical Suite"

Separate reviews by Eric P. Daniels, MD; and Robert Hogan, MD

In 1993, Dragon Systems of Newton, Massachusetts received a \$47,500 Phase I Small Business award from the US Army Space and Missile Defense Command to study automated speech transcription—technology that enables a computer to transcribe recorded speech into written text. This funding helped Dragon Systems to secure two other contracts from the Defense Advanced Research Projects Agency to continue its R&D efforts. In 1997, the company produced Dragon Systems NaturallySpeaking software, a commercial software package that accurately transcribes dictation into printed words. Various versions of this product are described on the Dragon Systems Web site (www.dragonsys.com).

Because of the unusual nature of this technology and its powerful implications for medical practice, two reviewers from different fields of practice assess the latest medical version of this product.

Dragon Systems NaturallySpeaking Software: Use in a Radiology Department

Is there a benefit in being an early user of voice-recognition technology? Clearly, voice recognition software has the potential to lower labor costs and

to remove a clerical aspect of the physician's job, transforming transcriptionists into editors and quality-control professionals. Voice recognition software also provides the benefit of immediacy: reports are available at the moment the x-ray films are read. But how well does the software currently do this?

The CEO of Applied Voice Recognition recently stated, "Voice recognition technology is not perfect and is unlikely to be that way for 10 to 15 years at best." Perhaps understandably, Claudier Tessier, Executive Director of the American Association for Medical Transcription, stated that he "would not hire a transcriptionist whose first pass looked like what is being produced as final from voice-recognition software." By contrast, my own findings are of 95% accuracy under ideal conditions, and better than 80% accuracy in actual practice, and are quite in line with findings of others. As a result, at least six radiologists in my department are eager to pilot the technology. After a more formal cost/benefit analysis, the idea may be worth a trial. The basis for my conclusions is as follows: two different versions of Dragon Systems NaturallySpeaking software, Professional Suite, were tested on two computers with



different microprocessor speeds. Both variables—version of software and speed of microprocessor—produced important effects.

Methods

I first tested Dragon Systems NaturallySpeaking software, Professional Suite, v2.02, in the hospital on a 166-MHz Pentium II system equipped with 96 MB of RAM. After 45 minutes of being trained to the nuances of my voice, the system was able to identify approximately 85% to 90% of the words dictated. However, the software performed too slowly for clinical use and was very sensitive to pauses. In addition, breath sounds were detected and shown on the screen. (I have been told that this aspect of the software can be corrected by further training.)

I next tested the same version (v2.02) of the software at home on a 500-MHz Pentium III system equipped with 256 MB of RAM. After a similar 45-minute training period, the system successfully identified 85% to 90% of the words dictated. Speed of response was no longer unsatisfactory.

At home, I then tested the latest version of the software (v3.52) using each of the two Pentium systems. Before this software upgrade could be used, the speech files stored in the application had to be re-trained; however, v3.52 is faster and more accurate than the earlier version and includes many new features. (For instance, it readily accommodates completion of special forms and tables.) Using the Pentium III system—which provides many of the software's needs directly from the motherboard—I had the exhilarating experience of being unable to speak more rapidly than the system could transcribe my words. After only 30 minutes of training, the dictation accuracy was impressive. Between 90% and 95% of common as well as specialty-based words were transcribed correctly.

Discussion

My in-hospital, 166-MHz Pentium II proved too slow and unresponsive for radiologic dictation, so subsequent testing was done using a much faster machine in a quiet, peaceful environment. Accuracy may be decreased by factors unrelated to the software itself (eg, use of headphones, which can be distracting; the sounds made by handling film jackets; environmental disturbances; interruptions; and other extraneous noise); however, on the basis of my successful preliminary trial at home, an attempt will be made to upgrade the equipment in

the hospital (ie, by adding a faster processor) for further evaluation of the software.

Conclusion

I suspect that people who are already comfortable with using computer technology will be right at home with this software. Conversely, those who do not currently enjoy working with computers now are unlikely to find this program a satisfactory experience. The real question remains, what about most people, who are in-between?

By the way, in case you are wondering, this evaluation was “typed” using Dragon Dictate. ❖

Eric P. Daniels, MD

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If you have never used a voice recognition program, just imagine entering text by merely speaking to the computer! Voice recognition by computers has been around since about 1985, when Kurzweil began marketing “Voice Rad,” a product designed to be used by radiologists. Much has changed in the intervening 15 years. Better voice recognition programs are now at hand.

Dragon Systems NaturallySpeaking software provides continuous speech recognition: this package transcribes your words whether you speak in full or incomplete sentences, and you can speak rapidly. As you speak, you can watch the computer screen and witness the nearly instantaneous appearance of each word on the screen—as I am doing right now, writing this review.

Why would anyone wish to use continuous speech recognition instead of dictating into a recording device or typing directly into a word-processing program? Speed, of course, is one reason: Few of us can type 100 words per minute, and the opportunity to record our thoughts very rapidly is attractive in its own right. In addition, use of voice recognition software can eliminate several steps between initial recording of thoughts and final production of finished, “polished” text.

To use a conventional transcription service, thoughts must first be recorded and then transcribed; later, the transcribed results of the dictation must be inspected to identify errors in the dictation. Imagine if errors could instead be spotted and corrected immediately as the words were appearing on the screen, thereby allowing production of a perfectly



word-processed document the first time. Indeed, continuous speech recognition promises error-free text produced almost instantaneously the first time—movement to paper at nearly the speed of thought.

This review is being prepared using Dragon Systems NaturallySpeaking software installed on an IBM-compatible computer equipped with a 166-MHz processor and about 100 MB of RAM. Text appears on the screen as words are spoken. The occasional errors are quickly corrected using spoken correction features. Alternatively, the keyboard can be used for correction; however, as you become more practiced with this software, less and less use of the keyboard is required.

Essentially, the software learns the user's voice and pronunciation of much of the English language so that accuracy increases substantially with repeated use of the software. Ultimately, you can produce 100 words per minute with very few stops for correction. At the point at which recognition is flawless, the keyboard could even be discarded.

This review so far has consisted of nontechnical language. However, Dragon Systems NaturallySpeaking software can also recognize terms such as "flex," "hysterectomy," and "trigeminal neuralgia." Dragon Systems NaturallySpeaking software might entirely replace medi-

cal transcription. Thus, any one of us can equip our examination room or office with a fully functional, computerized transcription system capable of rapidly producing medical notes in finished form. The professional benefits of this capability are obvious and come readily to mind. Perhaps not so obvious is the possible and potentially life-enhancing use of the simpler, nonmedical version of the Dragon Systems software for written communication by quadriplegic patients.

For physicians who wish to replace their handwritten notes with typed entries, for physicians who wish to avoid the expense of hiring transcriptionists, and for anyone who yearns for immediate completion of keyboard-free word-processed documents, the future is sufficiently at hand to carefully consider using this product. ❖

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Dragon NaturallySpeaking, Medical Suite, v3.52 Dragon Systems, Newton, MA. Requires >133 Pentium processor, 64 MB RAM, 180 MB hard disk space, 16-bit sound card. Includes headset microphone. \$995.

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