

# Silent Partners

*Soon to be your sidekicks, smart software agents will do much more than offer jazzy help. They may even take over the whole job.*

BY STEVE DITLEA

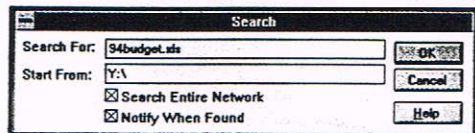
IT'S 3:00 P.M. and you have to get your hands on the '94 budget numbers. Oh, and you need them in time for tomorrow morning's management meeting. Are you sweating it? No way: You have the world's most reliable assistant, who will relentlessly scour the network for the spreadsheet you need. You won't even have to pay overtime. It's all in the line of duty for your average software agent.

Just turn to your PC and instruct your agent what to search for and where by setting parameters with a click or two of the mouse. While you finish up the day's business, your

agent will scour online databases, gathering the information you need and returning it to your PC.

Welcome to the new PC software order. After nearly a decade of nonstop feature wars—the escalation of

*“How can I get that file from Operations when Joe's out sick?”*



Search	
Search For:	94budget.xls
Start From:	Y:\
<input checked="" type="checkbox"/> Search Entire Network	
<input checked="" type="checkbox"/> Notify When Found	
	OK
	Cancel
	Help

Automate search: No need to waste time searching for a file. Have an agent do the dirty work.

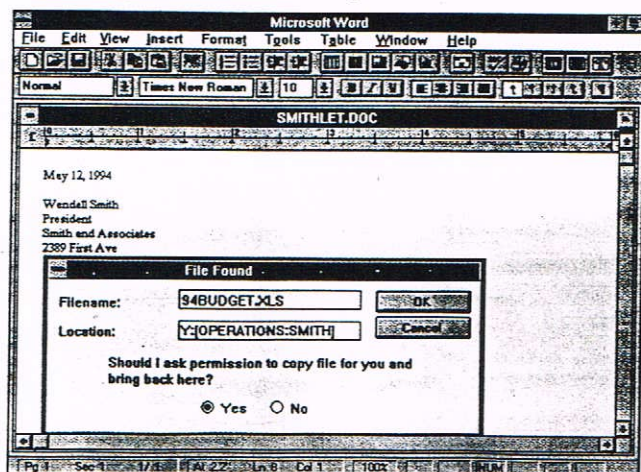


Assign task: After you click OK, the agent is off and running.



Agent working:  
Bingo! The agent has  
found the file and  
brought it back to  
your desktop.

ever-mightier program functions for ever-more-rarefied tasks—software developers are getting back to the original vision of personal computing. What most PC users have always wanted is a way to turn their PCs into electronic brains that can take over tedious business procedures and simplify their complex tasks. So it should come as no surprise that in place of



Background operation: While you're writing a letter, your agent searches the network for the file.

94BUDGET.XLS					
Houston, TX					
20	Saleries	4-1002	20000	20000	20000
21	Supplies	4-2310	5000	5000	5000
22	Equipment	4-2543	9500	9500	9500
23	Lease Pmts	4-7862	17000	17000	17000
24	Advertising	4-8752	3000	3000	3000
Boise, ID					
27	Saleries	3-1002	7700	7700	7700
28	Supplies	3-2310	2100	2350	2350
29	Equipment	3-2543	6500	6500	6500
30	Lease Pmts	3-7862	8500	8500	8500
31	Advertising	3-8752	2200	2200	2200

Task complete: Thanks to your agent, you  
can now get to work on crunching some  
budget numbers in your spreadsheet.

yesterday's buzzwords—*power* and *productivity*—today's software vocabulary is brimming with the likes of *intelligence* and *smarts*.

Mainstream business applications now offer incarnations of intellect with names like Assistants, Coaches, Experts, and Wizards. The major vendors are already devising next-generation solutions that move core applications closer to anticipating users' needs. In the pages that follow, we'll look first at the current approaches to software automation from companies like Borland International, Lotus Development, Microsoft, and WordPerfect. Then we'll focus on what these vendors, and other major players, have in store for years to come.

While your word processor and spreadsheet get smart, scripting languages such as General Magic's Telescript will soon cull information from corporate databases and screen your e-mail. It's only the tip of the iceberg. Programs with embedded intelligence will make suggestions to improve your productivity. At the same time, a secret agent may be telling your supervisor when you play Solitaire. It's a brave new world, filled with problems as well as promise.

"I WANTED AN agent to be responsible for getting something done while I was busy with a research problem," says Oliver Selfridge. It was this vision that prompted the former Massachusetts Institute of Technology researcher to dream up *software agents*. For Selfridge, an agent should resemble a valued assistant with which one can communicate in a kind of shorthand and rely on its sense of responsibility to get the job done.

So far, Selfridge's dream hasn't been fully realized. The virtues that Selfridge thought an agent should have—super intelligence, self-motivation, and loyalty—are not yet found in software agents.

Nonetheless, through a combination of wishful thinking and marketing cunning, the term agent is being applied to a broad range of manifestations: from simple adaptable interfaces to sophisticated self-modifying program objects that can do your shopping.

"Lately, the word agent is used any time PC users think some personality in their computer is doing something for them," explains Ted Selker, a lecturer at Stanford University who teaches the course "Proactive and Reactive Agents in User Interfaces."

Selker's interest in agents dates back to graduate school when he created his first agent—Coach, shorthand for *cognitive adaptive help*—for his PhD thesis. In the mid-1980s, he contributed to Atari's research effort into intelligent encyclopedias and video games, the precursors of today's multimedia software.

How smart are these so-called agents? Selker rates agent intelligence on a continuum from preprogrammed macros to human-faced personalities on screen (see "New Faces in Interfaces" on page 170). You'll find clever programming and lots of human ingenuity in each agent, but currently there isn't enough problem-solving intelligence. A truly intelligent agent should be capable of original thinking, giving it the ability to solve problems independently.

For example, it should adapt to changing circumstances by coming up with an alternate plan of attack.

The leading software vendors boast of "artificial intelligence" for largely cosmetic features, like menu bars, icons, smart help, and even tutorial videos. Still, when learning to use a program costs more in lost productivity than the software price itself, it's hard to resist even the illusory promise of PC intelligence.

## IS TODAY'S SOFTWARE SMART?

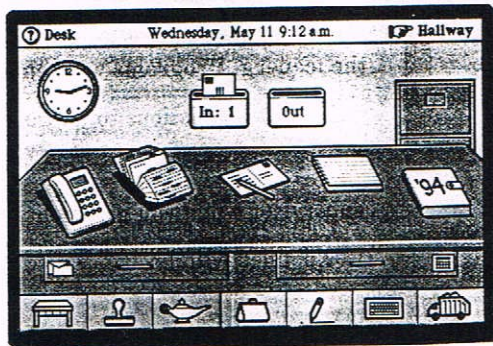
Consider this: Lotus successfully packages its combined applications (1-2-3 for Windows, Ami Pro, Freelance Graphics, Lotus Organizer, and Approach) as its SmartSuite. But don't look for breakthrough artificial intelligence here. All of the programs include SmartIcons, which are really no more intelligent than icons that launch Windows applications via macros. Their smartness refers to the fact that they are consistent across Lotus applications.

By the next version of SmartSuite, each program will include the ScreenCam screen-recorder utility, which debuted last November in Lotus 1-2-3 Release 4 for Windows. About as smart as a camcorder, ScreenCam records program screens, mouse and cursor movements, menu selections, and audio. These live-action screen captures can be used to create quick custom tutorials to train users how to do something correctly—how to generate an invoice in Approach, for example. In the absence of built-in or third-party tutorials, ScreenCam is a savvy feature only if a systems manager or network administrator has the smarts to create onscreen lessons.

While ScreenCam sounds like something TV's David Letterman would skewer, it does demonstrate the need for more imaginative ways to teach people how to master their software. "Anything that makes computers less forbidding involves intelligence," insists Alex Morrow, general manager of systems architecture at Lotus. By accelerating the learning curve, even the dumbest tutorial can boost human intelligence. "Showing things as animated examples reassures

*"Agent, I can't afford to be bothered with junk mail. Get rid of it."*

Sort mail: The Desk in General Magic's Magic Cap software program is command central for all of your communications.

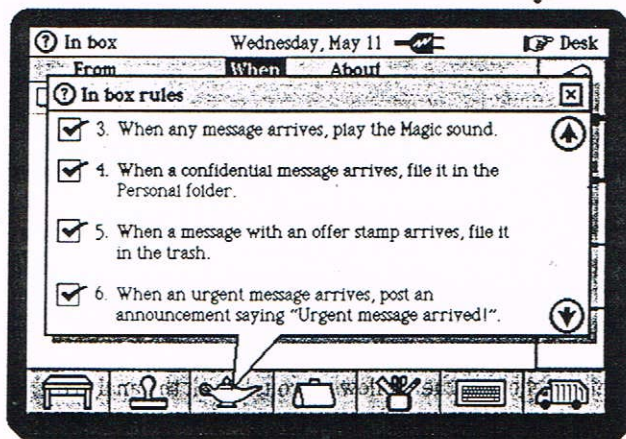


Assign task: Create an agent to keep your in-box from becoming clogged with junk mail.

new users that tasks can be accomplished," Morrow adds.

Another example of simple tutorials that save time, Coaches were introduced in WordPerfect 6.0 for DOS and Windows. "The idea is not to ask the computer to do things for you, but just to show you how," says Dave LeFevre, product manager for WordPerfect. Coaches are canned walk-throughs of multistep tasks such as mail merges. Although they don't adapt to the individual user's work habits or situation, Coaches provide an interactive experience that prompts users to input data, acts on the input, and walks the user to the next step.

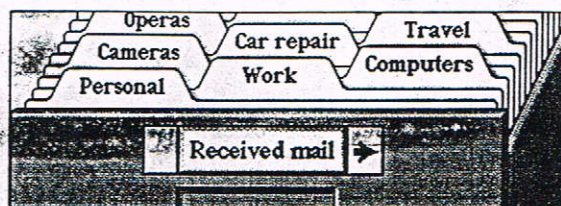
To call up a Coach in WordPerfect, you click on an icon with a cartoon profile of a football coach, then select from among 12 esoteric tasks, such as creating labels or footnotes. While LeFevre admits that today's Coaches are little more than well-designed macros, they won't always be this limited. "Within a year or two, you'll see active agents in WordPerfect, so tasks in software will be simplified."



Background operation: Set rules for the agent's behavior. Tell it to notify you with text and sounds if an urgent message arrives, or to throw a junk mail message in the trash.

The next version of WordPerfect will have what LeFevre refers to as *morphological capabilities*. This means it will be able to break down sentences and search for syntactical elements as you input text. For example, future agents will recognize incorrect verb forms and correct them in real time. "Your software will show you what you're doing that is grammatically incorrect and suggest corrections or automatically do them for you," says LeFevre. After this technology was in development for more than three years at WordPerfect, efforts were accelerated by the purchase of Reference Software International, a leader in dictionary and lexical software.

If LeFevre is right, by 1996 your word processor will be able to diagram a sentence about as well as any



Task complete: An e-mail message in your work folder might even contain voice annotation.



Agent working: The agent follows these rules, filing your urgent messages in the appropriate folders, and trashing the junk mail.

substitute teacher can, totally recasting the sentence order if necessary. Maybe substitute teachers won't diagram sentences anymore, since PCs will do it for them. Still, syntactical understanding doesn't include the common sense needed to properly interpret the various meanings words convey. Efforts are under way to impart common sense to PC software, but intelligence on a

par with a human personal assistant will probably have to wait until the next generation of PCs arrives (see "Computing Common Sense" on page 165).

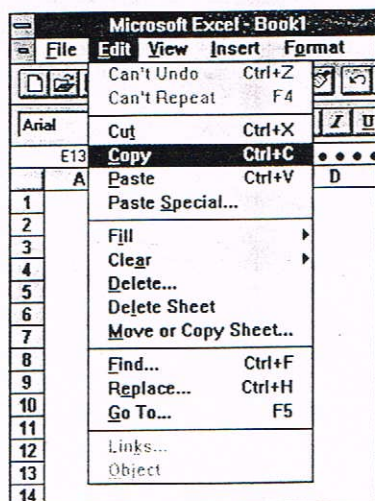
## HELP! SMART HELP!

A peek into the future of automated help came last October at a big bash in New York, when Microsoft Chairman and CEO Bill Gates unveiled Microsoft Office Version 4 for Windows, an application suite that includes Excel 5.0, Power Point 4.0, and Word 6.0. Gates also announced Microsoft's new IntelliSense technology. IntelliSense is a grab bag of Microsoft's automated tutorials (Wizards), context-sensitive help, automated formatting, and spelling correction. But with agents sure to become a major battleground for competing software developers, Microsoft is giving itself a migration path from Wizards to more powerful agents.

Chris Peters, vice president of Microsoft's Office Business Unit, is credited with coining the term IntelliSense. He explains, "IntelliSense is everything from simple artificial intelligence [AI] to powerful AI that delegates tasks to your computer. It can turn 100 steps into 5 steps." Or automatically correct errors.

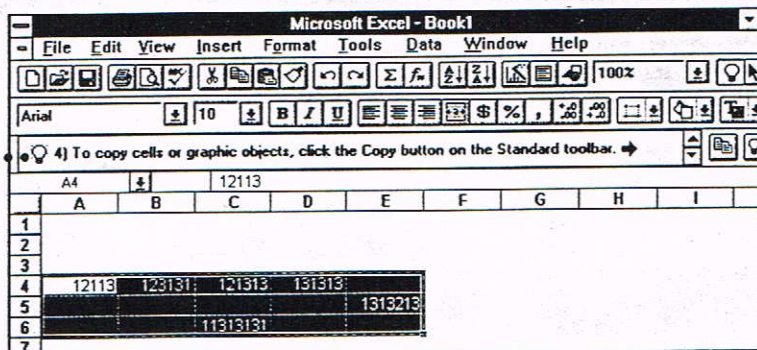
In its product launch for Office Version 4, Microsoft stressed that each of the 100 most common tasks users perform with Office can now be accomplished in a single step. In some cases, IntelliSense means automatic execution of common correction and formatting functions, while in others, IntelliSense guides the user through complicated tasks such as programming with macro languages.

More often than not, Office's IntelliSense involves a Wizard. "A Wizard actually does a task for the user," says Peters. Wizards first appeared in Excel 4.0 as dialog boxes that walked you through the steps required



Keep working: Copy and paste your data as you would normally do.

*“Sometimes I don’t know when I need help.”*



The wizard speaks: Excel’s TipWizard continually monitors your actions and offers a new tip to help you copy or paste your data more efficiently.

to perform a task, much like WordPerfect’s Coaches. In Excel 5.0, the FunctionWizard alone provides help for 200 worksheet functions. Activated whenever you load a text file, the Text Import Wizard offers counsel on formatting. Most of these Wizards are easily summoned by clicking on an icon bearing a Wizard’s wand.

“You have a sense of accomplishment when you get a Wizard to complete a task by pushing its Finish button,” Peters points out. In Excel 5.0, that might be the new PivotTable Wizard, walking you through the steps for pivoting chart data to create alternate data. In Word 6.0, the AutoFormat Wizard scans a document and makes it look nicer by automatically replacing common eyesores. For example, asterisks used for bullet points are replaced by dingbats, and straight quotation marks are replaced by curly ones. PowerPoint’s AutoContent Wizard prompts you through your choice of six generic business presentation types, which are meant to inspire creativity while you’re producing your own presentation.

Microsoft has taken Wizards a step further with IntelliSense Wizards. Lurking in the background of your Office Version 4 applications, TipWizards are activated when they notice a task that could be performed more efficiently. When this happens, the lightbulb on the TipWizard icon bar turns yellow. Click on the icon and the shortcut comes up. As intelligent as they sound, TipWizards are essentially just clever built-in macro commands. With more than 1,000 of these in Excel 5.0 alone, you get a feeling of security from being watched over by an army of software magicians.

Since Microsoft is the industry leader in suites and office applications, its commitment to IntelliSense provides a big target for competing software publishers. “Our spreadsheet is smarter,” Daniel Rosenberg, user

interface architect for Borland, says about Quattro Pro 5.0 for Windows. “We have simple learning algorithms built in to the program, like the Intelligent Graph feature.” Depending on the amount of data to be displayed, this subroutine tries to pick out an appropriate chart style for you without requiring your input.

Quattro Pro 5.0 also features Borland’s answer to Microsoft Wizards: Experts. Like Wizards, Experts guide you through complex tasks. For example, the Analysis Expert offers you lists of spreadsheet analysis choices, then follows through with the analysis once you have entered the selected data. The term Experts brings to mind the expert systems in artificial intelligence research, such as sophisticated programs that consistently provide medical diagnoses—based on interviews with medical experts—that are better than the diagnoses by attending physicians. But Borland’s Experts are far less intelligent. Rosenberg admits that “Experts and Wizards don’t do real, intelligent processing. Neither really works for you or advises you on better results.”

In the pending release of Lotus Approach 3.0 for Windows, Lotus also responds to Microsoft’s Wizards with its own software helpers, called Assistants. These will eventually show up in all Lotus SmartSuite programs. A Lotus product manager explains, “With our Assistants, you can go back and change parameters if you’re not happy with the results. With Wizards, once you push the Finish button, you can’t backtrack.”

With the availability of adaptable scripting languages, we can begin to create “the electronic assistant for the rest of us.” Smart software can be programmed to incorporate

## SMART SOFTWARE

truly autonomous agents to interact with data and events on other systems—to access external databases, exchange correspondence, and route documents for review.

### THE BUTLER DID IT

"To have software agents, at the very least you need the ability to schedule events, either by time or by a triggering action, and to script actions for the agent," explains Leon Navickas, general manager for the Lotus Notes research and development effort. "It's no secret that Lotus is working on this for the next version of Lotus Notes, Release 4."

For anyone who has ever dabbled with a macro language to access and search a remote information service or to monitor e-mail, the prospect of using a scripting language shouldn't be daunting. "We'll make things a lot easier for end users," Navickas says. For starters, Notes will finally support the full functionality of the rules in Lotus' own e-mail package, cc:Mail. "There's little opportunity for mistakes because the scripting is very context-driven. It's very easy to write a script to filter out junk e-mail messages."

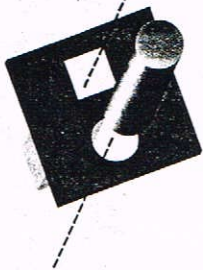
The e-mail or fax butler—hip to the difference between junk communications and career-essential data, fastidious about cleaning out your telecommunications files without being asked—is today's recurring office fantasy for smart software. Is it just a dream? Or is e-mail screening the killer app that will make smart PC software a necessity?

### COMPUTING COMMON SENSE

Faster microprocessors, more main memory, and larger hard disks are being used to impart computers with the basic real-world knowledge that most people acquire during childhood.

Since 1984, Douglas Lenat, principal scientist and director of Microelectronics and Computer Technology, has led the Cyc Project, organizing the 4 million assertions (such as "a child can't be older than its parents") needed to understand entries in an encyclopedia. By 1995, Lenat expects to have a "knowledge base able to support common sense" that occupies 200MB.

Meanwhile, since 1991, Microsoft's Natural Language Processing Group has been building relationships between the definitions and phrases of the 75,000 words in *The Langman Dictionary of Contemporary English*. Consider similar sentences with different meanings: "I saw the pelican with a telescope," and "I saw the pelican with a feather missing." In this case, Microsoft's software finds a relationship between *telescope* and the act of seeing, and discovers that *feather* applies to the pelican. "It takes about a half-second to do such an analysis with a 486-based computer," says Chris Peters, vice president of Microsoft's Office Business Unit. Peters predicts that a 128MB Microsoft knowledge base will be ready by 1996, and that next-generation PCs will perform sentence analysis in less than a tenth of a second—fast enough for use in common applications.



In the wake of software giants Microsoft and Lotus, which combined sell the vast majority of e-mail software, at least one company has staked its future on claims of a smarter scripting language. Beyond Inc., a firm specializing in e-mail software, is tied to the success of its core product, BeyondMail—which it calls "a next-generation rule-based electronic mail system." More than a clever hack, BeyondMail was inspired by research at the M.I.T. Sloan School of Management on the Information Lens, a way of sorting online data so managers won't be flooded by an information glut. According to Eugene Lee, Beyond's vice president for product planning, BeyondMail offers custom forms and a rule engine so that you can write applications relating the real world to a script.

BeyondMail is not quite an e-mail butler, but its sophisticated scripting language gives you the tools you need to create the butler. Users can program agents to perform desired actions in background mode. With add-on products like the Beyond Notes Connection for enhanced access to Lotus Notes, WinRules for links to Microsoft Mail, and PowerRules for Macintosh applications, Beyond has a window of opportunity to convince users that e-mail is more than just messaging.

Other companies have also settled on the Notes desktop as the platform from which to launch agents with more than their share of smarts. SandPoint's Hoover is one example. Says Mike Kinkead, SandPoint president and CEO, "A software agent retrieving information on the Internet for you can already act as intelligently as an office clerk, although certainly a lot less intelligently than a good executive secretary."

By many accounts, Hoover is the best agent-based software to be offered commercially for PCs. SandPoint describes its leading-edge product as an active information agent that can search, retrieve, and integrate information from multiple external sources. Hoover, like the vacuum cleaner or the FBI's J. Edgar, knows how to dig out dirt. Hoover queries online data services, parses the information it finds there, and delivers it in a neatly formatted briefing document to the Notes desktop.

SandPoint's stock-in-trade, it turns out, isn't its impressive software, but an information republishing business. "Hoover redistributes data from 40 online publishers," says Kinkead. Among its popular real-time computerized publishing services: NewsAlert, which monitors trends and topics on the leading news wires, and *The Wall Street Journal*, which provides full-text electronic

delivery of the daily national business newspaper into a Notes database which Hoover then parses.

At a monthly fee of \$233 per user, Hoover can be a high-priced luxury for enterprises trying to scale down expenses. SandPoint's Kinkead argues that the service pays for itself by saving time and effort in gathering current information for business planning. Still, he warns, "Agents are at a new, very early stage of development." As with other burgeoning institutions on the Information Superhighway, let the user beware.

While Hoover concentrates on gathering data from external sources, Trinzic's Forest & Trees software for Lotus Notes specializes in agent-based gathering of information from internal company databases. Product Manager Brad Haigis calls Forest & Trees "desktop decision support or executive system-analysis software." Among its powers, Forest & Trees can gather information from 25 mainframe and PC database formats on a regular basis, applying alarms and triggers if the data falls outside a preprogrammed range.

According to Haigis, a major Midwestern manufacturing company monitors its parts inventory with Forest & Trees, automatically placing reorders whenever inventory falls below preassigned limits: "We've shortened the reaction time for companies in fast-changing industries," asserts Haigis. The usefulness of this kind of data pump is limited only by the ease of its user interface.

The pedigree of two of General Magic's founders, Bill Atkinson and Andy Hertzfeld—who helped design the first Macintosh computer more than ten years ago—assured the company's January announcement of agent-based technology the widest press coverage to date of a still-esoteric area of computer science. The emphasis on agents that shop for your Mother's Day flowers via an AT&T network called PersonaLink made for jovial copy in the pages of *The Wall Street Journal* and *Business Week*, but General Magic is seeking a serious role as the standard programming medium for agents on the Internet.

"Our agents are not intelligent, but they are programmable," says George Fan, product manager for the Telescript language.

Telescript is at the heart of General Magic's Magic Cap interface for "the handheld desktop of tomorrow"—a technology that could turn out to be less important than Telescript itself. According to Fan, "One definition of an agent is a remote mobile program helping manage flow and routing of messages. Telescript provides the remote programming architecture to make this possible." Among the functions it defines for an agent: a unique security code used for authentication, authority to charge items to your account up to a specified amount, and even specification of an agent's life span and date of demise, so cyberspace won't become overpopulated with out-of-date agents.

"One person can have several agents, and an agent can create other agents," Fan observes. Telescript's authentication and life span limits for agents are essential to avoid the kind of mutation that could turn into a disastrous virus on the interlinked world of the

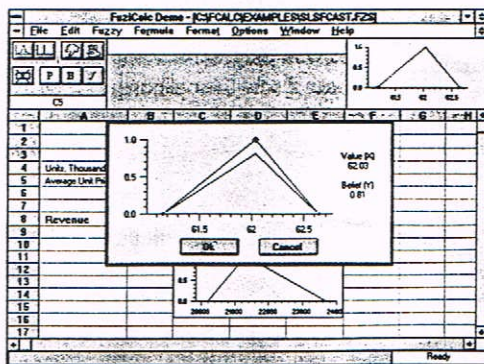
## FUZZY LOGIC

Applications generally embody black-or-white choices bound by rigid logic, not real-world, shades-of-gray problems. To get smarter, software has to accommodate fuzzy thinking, the adaptive reasoning that people use.

FuziWare proclaims its FuziCalc product "the world's first fuzzy spreadsheet." Instead of having you recalculate numerous what-if scenarios with precise values for estimates or forecasts, this innovative spreadsheet works with approximations. FuziCalc allows you to consider wide ranges of possibilities by specifying the numerical value for a cell with an absolute minimum, absolute maximum, and likely range—even with existing data files.

A verbal application of fuzzy logic can be found in Quattro Pro Presentation Advisor from Borland. Smart help screens offer slider bars with a range of choices for selection criteria instead of mutually exclusive either/or radio buttons. In the Slide Template Advisor, you can select ranges for five categories of effects, including Informal to Formal, and the Advisor will suggest an appropriate presentation style. Each slider bar embodies a continuum of seven possible values for easy adjustment.

When coupled with the media to be used and the presentation environment, sometimes these choices evoke too many contradictory needs and no solution is found—a sure indication of intelligence rather than canned responses. "You get the equivalent of a good graphic designer, but not a genius," says Daniel Rosenberg, user interface architect at Borland.



Message data: FuziWare's FuziCalc performs calculations with imprecise or "fuzzy" data.

Internet—a concern that's been raised by many critics.

The new scripting languages are enhanced versions of communications software and database scripts that automate recurring tasks. The future of agents really lies along the lines of software that learns from

observing a user's patterns. By developing a user profile, an agent can learn to anticipate the user's needs.

It's easy to get paranoid about smart PC software that can learn about a user, discern patterns and tasks amidst the keystrokes, anticipate needs, and offer advice for productivity gains. Stanford's Ted Selker calls these entities *proactive agents* because they decide to do something without your asking for it. "Before you press a mouse button, proactive agents will tell you what you need by virtue of the relationship between user and agent."

## NEW FACES IN INTERFACES

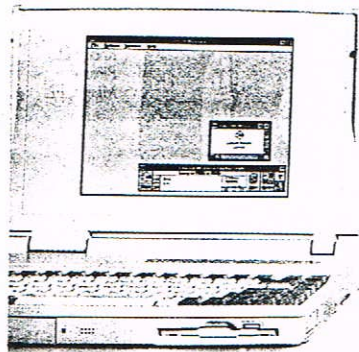
Software designers are about to launch megabytes of onscreen mugs so applications will appear wiser and friendlier. Help is already provided by half-human, half-animal characters in kids' programs such as Broderbund's "Arthur's Teacher Trouble" and "Just Grandma and Me" CD-ROM storybooks. And cartoonish human faces show up in icons for business applications like Borland's Quattro Pro spreadsheet.

With video-quality animated faces soon to appear on PCs, their implementation will be of critical importance. "It's uncanny how the human brain is designed for interacting with human faces and how emotional the response can be," says Chris Peters, vice president of Microsoft's Office Business Unit. For instance, Peters notes that "The more realistic the face, the more intelligent you expect it to be. . . . A face should avert its gaze after a while so the user won't feel uncomfortable." Computer-generated people should have manners, too.



One such proactive agent is Computer Associates' personal finance program, Kiplinger's CA-Simply Money for Windows. The software includes a background Advisor that monitors personal financial transactions and offers pointers when it discerns patterns in your bill paying and other fiscal activities.

Another proactive agent, Open Sesame from Charles River Analytics,



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is a more general-purpose program. Currently available for Macintosh computers only, it uses a neural network (a pattern of logic connections inspired by the structure of brain cells), and expert systems techniques from artificial intelligence. Open Sesame compares high-level events, like opening a file folder, with low-level events, like the keystrokes typical of the user's tasks. If it finds a pattern, it automatically proposes a way to automate the recurring series of keystrokes without the user having to create a macro manually. It will save time because users will be able to launch an elaborate string of actions with a simple command.

#### CENTRAL INTELLIGENCE AGENTS?

Agents are here to stay. Even if Assistants, Coaches, Experts, and Wizards don't catch on with current PC users, IBM is staking the future of its next-generation Power PC systems on "The Art of Intelligence" and "Technologies with a Human Touch." These strategies were announced in a November 1993 position paper by the IBM Power Personal Systems Division. Among its declarations, Big Blue is aligning its fate with software agents, 3-D sense-based user interfaces, and artificial intelligence that will go beyond today's most

sophisticated macros and enable the computer to understand natural language commands.

How smart will your PC software get? With all of this ongoing development activity, need anyone ask?

*Steve Ditlea is a freelance writer who has been covering the PC industry since 1978.*

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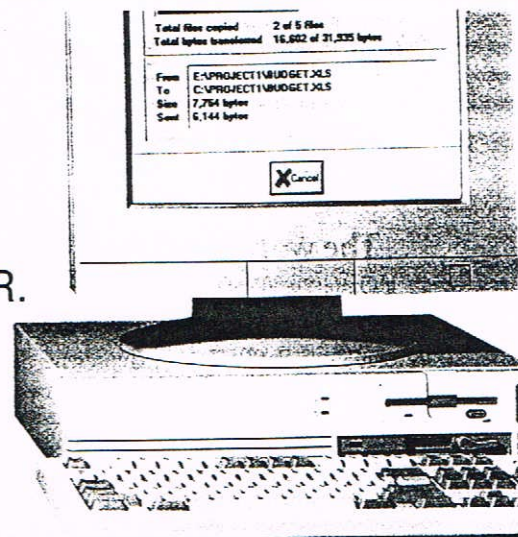
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