3-D WORLD

News For The CADKEY User

Summer 1992
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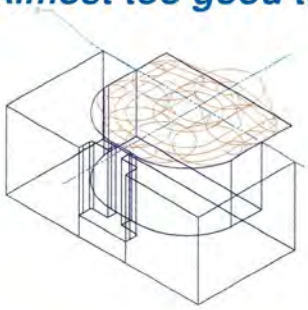
Almost too good to be true, but it is true!



Upper left: CUTTING EDGE model of welding jig for manufacturing drive-shaft supports with initial tool path. Right: Gilles Charron, Kerry Folkes and Brian Richards standing with the finished welding jig still mounted on ENSHU milling machine. Lower left: finished welding jig.

Cutting Steel with CUTTING EDGE only 3 Hours after Installation

Total Brake Industries of Dorval, Québec, Canada, designs and manufactures automotive brakes, thermostats and drive-shaft supports. They have been designing the components for their products in CADKEY® since 1990. They also use CADKEY to design the dies, molds, and welding fixtures in their manufacturing processes. Tuesday, May 12, 1992, marks the beginning of their use of CUTTING EDGE™ to machine their dies, molds, and welding jigs. Herein lies a remarkable story.

Gilles Charron, plant manager of Total Brake Industries' Stamping Division, and Brian Richards, a tool designer with 12 years of CNC programming experience, ordered CUTTING EDGE on May 8. Peter Barnett of Kemeny Automation, Inc., their CADKEY and CUTTING EDGE dealer in Montréal, delivered the software on May 12.

Total Brake had to make a welding jig for manufacturing drive-shaft supports. Brian Richards decided to use this production piece as the first project for CUTTING EDGE. "We had designed the drive-shaft support earlier, by hand," Brian said. "My assistant, Kerry Folkes, had already recreated the part in CADKEY in 3-D, and he had designed the welding jig for it, too." Brian planned to cut the fixture on the company's

(Continued on page 2)

Joint Announcement of American-Japanese Development

Fanuc, Cadkey, Kubota, and Sun Microsystems Form Major Technology and Business Alliance

On May 19, 1992, FANUC LTD., Cadkey, Inc., Kubota Corporation, and Sun Microsystems Computer Corporation announced that they have signed a new OEM agreement to produce the FANUC CAD DIE® workstation system. FANUC LTD. of Oshino-mura, Japan, the world's leading supplier of machine-tool controllers (See Editor's Note #1), will use exclusively CADKEY® 5, CADKEY® SURFACES, and CADKEY® Dynamic Extensions™,

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Cutting Steel

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ENSHU ACCU-MILL™ machine with a FANUC 6M™ controller.

Quick Start-up Time

"After I received CUTTING EDGE, I spent about a half hour reading the **Getting Started** manual," Brian said. "It took about 15 minutes to load the software. Then I followed the directions for the first two exercises of the tutorial in the manual. It was marvelous. There were no problems. About two hours had gone by. Now, I loaded the 3-D part file for the welding jig to be cut in steel. The fixture's overall dimensions are: 11.5 inches long, 5.8 inches wide, and 5 inches high. It needed to have a pocket cut into this block: 7.565 inches long, 4.528 inches wide, and 3.536 inches deep. Cutting steel with a three-inch, three-flute, carbide-insert mill, we can cut a maximum 32 thousandths of an inch with each pass."

"To program a part with CUTTING EDGE," Brian continued, "you do not need to read the manual. You just have to read the screen properly. Make sure that there are numbers where numbers are supposed to be. If you are not sure, put the cursor at the location on the screen, and click. Something will happen. And, if what you select does not work, you can always go back and select again."

"To do the pocket, I specified the starting point and the chain of entities on the part's surface. When it requested the *next entity*, CUTTING EDGE showed me that part of the jig's geometry was not complete. CUTTING EDGE created the tool path anyway, but I am fussy. I do not like to work with incomplete geometry. So, I corrected the geometry, and redid the tool path. CUTTING EDGE calculated the speeds and feeds beautifully."

Quick Move into Production

After minor modifications of output code, Brian verified the tool path on the screen. Based on his visual verification of the tool path, Brian decided to eliminate the usual step of proving-out the tool path by cutting a test part in wax. "We did not need to have a wax test," Brian said. "Perhaps it was not prudent, but I was not at all afraid to start cutting immediately in steel."

"I sent the post processor's output file to the FANUC 6M controller on our ENSHU milling machine, using Crosstalk™ communication software, and we were ready to cut steel." Approximately three hours had passed since Peter Barnett had delivered CUTTING EDGE earlier that day, May 12.

"We began cutting steel the next morning," Brian said. "I find that CUTTING EDGE is the way it should be. I got on the system and made a program right away. You can see what you are doing. You see what the machine is going to do, and it does it." Cutting the pocket in the welding jig took 20 hours.

Editor's Note #1: Because CUTTING EDGE is a brand-new product, some readers may find it difficult to believe that Total Brake Industries got their new CUTTING EDGE system into manufacturing production so speedily. Any reader may contact Gilles Charron or Brian Richards to verify the accuracy of this article. You can contact Gilles or Brian at Total Brake Industries, 1949 55th Avenue, Dorval, Québec H9P 1G9, Canada. Telephone: (514) 631-5758. Fax: (514) 631-9197. Or, you may contact Peter Barnett at Kemeny Automation, 2453 Guenette Street, Montréal, Québec H4R 2E9, Canada. Tel: (514) 745-0535. Fax: (514) 745-0542.

Editor's Note #2: ACCU-MILL is a trademark of ENSHU LTD, Hamamatsu, Japan. FANUC 6M is a trademark of FANUC LTD, Oshino-mura, Japan. Crosstalk is a registered trademark of Digital Communications Associates, Inc., Alpharetta, Georgia.

Fanuc

(Continued from page 1)

with FANUC's own CAM software, in the FANUC CAD DIE. This system is FANUC's latest-generation, advanced CAD/CAM system, for the design and manufacture of dies and molds with sculpted surfaces. The FANUC CAD DIE will run exclusively on Sun Microsystems' SPARCStation™ hardware with the UNIX-based Solaris® operating system.

This agreement follows four years of collaborative development by FANUC, Cadkey, and Kubota, Cadkey's Japanese distributor, with strong technical support from Sun Microsystems Computer Corporation (SMCC), a subsidiary of Sun Microsystems, Inc. of Mountain View, California. Kubota Corporation of Osaka, Japan, is a century-old manufacturing company with recognized expertise in customizing technology to new applications. SMCC is a world leader in the development of client-server, networked, workstation-based computing systems for commercial and technical applications.

A First

This marks the first time that FANUC has chosen hardware and software technologies other than its own for integration into a product.

FANUC selected CADKEY 5 and CADKEY SURFACES because of their high-level 3-D modeling and surface capabilities, award-winning interface, ease of use, and the CADKEY Dynamic Extensions (CDE). FANUC chose the

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SPARCStation for its open architecture, speed, power and conformance with international standards. FANUC, Cadkey and Kubota engineers have concentrated their efforts on developing customized tools and extensions specific to the tool-and-die industry, especially manufacturing companies that supply the automotive and aerospace industries. They used Cadkey's CDE technology throughout their work to create a modular integrated system.

"The product and the relationships that we are announcing represent the best of international cooperation," said Livingston Davies, President of Cadkey. "Besides allowing a group of engineers to work on a project simultaneously, it lets one engineer work on various aspects of a project — CAD, surfaces, and CAM — without getting out of his chair."

The FANUC CAD DIE made its first public appearance in Osaka, Japan, in May 1992. The system will become available internationally during the third quarter of 1992.

Editor's Note #1: The Investment Report published by Schroder Securities (Japan) Limited, dated November 5, 1991, states that FANUC LTD. has a market share of approximately 70% in Japan and 50% worldwide.

Editor's Note #2: FANUC CAD DIE is a registered trademark of FANUC, LTD., Oshino-mura, Japan. SPARCStation is a registered trademark of SPARC International, Inc., Menlo Park, California, licensed exclusively to Sun Microsystems, Inc., Mountain View, California. Solaris is a registered trademark of SunSoft, Inc., Mountain View, California. UNIX is a registered trademark of UNIX Systems Laboratories, Inc., Summit, New Jersey.

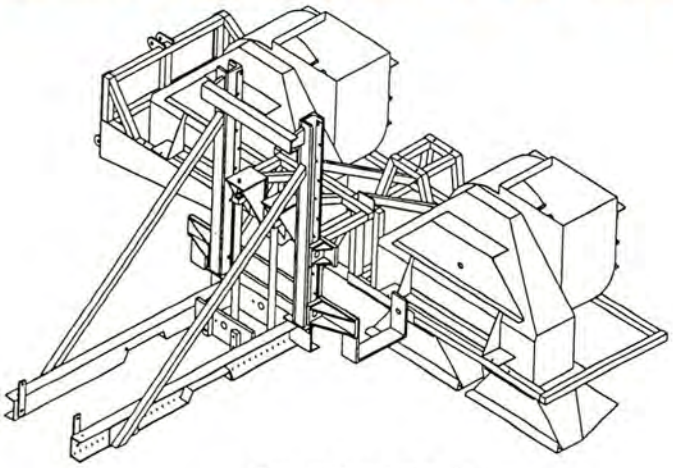
"Great companies use CADKEY."
Al Cowen
President and CADKEY user
Alton Boring Company
Livonia, Michigan

MACHINE DESIGN Honors Cadkey, Inc. with CAD/CAM Leader Award

The May 21, 1992 issue of ***MACHINE DESIGN*** awarded its 1992 CAD/CAM LEADER AWARD to Cadkey, Inc. "for improving the vision of design engineers," with a system in which "design, analysis, and manufacturing software are combined into one neat package, producing a compact version of concurrent engineering."

MACHINE DESIGN honored Cadkey and 20 other companies in the CAD and CAM industries. ***MACHINE DESIGN*** is published by Penton Publishing, Inc., a subsidiary of Pittway Corporation, 1100 Superior Avenue, Cleveland, Ohio 44114-2543.

Industrial Fan Manufacturer Creates Agricultural Vacuum Cleaner with CADKEY



Two-fan Bug-Buster II™

What can you do, if you are a farmer who needs to control insects in your food crops, but you don't want to use insecticides because of their potentially harmful effects on the people and animals that consume the food you grow? One answer is the Bug-Buster™, designed and manufactured by IAP, Inc. of Phillips, Wisconsin. The letters IAP stand for Industrial Air Products. IAP has manufactured custom-designed industrial fans for 16 years, and they have been using CADKEY® to design their fans ever since Version 1.5. In 1989, one of their customers, a lettuce farmer, led IAP into an entirely new application of their technology: using the intake suction of fans, mounted on a frame attached to a tractor, to remove harmful insects from plants, so that they can do no more harm to the plants. The idea of the Bug-Buster had arrived.

IAP's Bug-Buster operates on the principle of a vacuum cleaner. As the fan hoods pass over the plants, the insects in and around the foliage are sucked into the fan. The centrifugal force of the fans kills the insects instantly and discharges them into the atmosphere. The Bug-Buster provides an environmentally safe alternative to chemical insecticides for agricultural and

(Continued on page 4)

Agricultural Vacuum

(Continued from page 3)

horticultural applications. Since the first Bug-Buster's success with lettuce crops, IAP's agricultural customers from California to England have applied the Bug-Buster to strawberries, potatoes, alfalfa, bell peppers, yellow squash, grapes, snap beans, carrots, asparagus, cauliflower, cabbage, celery, tomatoes, onions, broccoli, and flowers (particularly mums and azaleas).

Custom Design

"Different plants have different characteristics, and they also have different types of insects that cause problems," said Ralph Mallwitz, Engineering Manager at IAP. "So, to an extent, we have to custom design fans and hoods for different crop types. For example, strawberries are delicate and grow close to the ground, and the problem insects are lightly attached to outer layers of foliage. We had to customize our hood design and the suction of the fan so that the farmer could pick off the bugs without picking the strawberries. On the other hand, potato plants have an entirely different foliage canopy, with larger, more dense insects that require much greater suction capacity to capture."

"We designed our first Bug-Buster on CADKEY from scratch, fans, frame, hoods, everything," Ralph said. "The ability to model the frame and fans in 3-D and to define our own 3-D views of the model was critical because the clearances were critical. We had to look down the frame from very particular views to see whether the fans would overlap the frame anywhere. Shortly thereafter, we designed another model of Bug-Buster, as a self-propelled crop vacuum, with a wide wheelbase to support the weight and the vibration of its two fans."

"We like the ability to change colors in CADKEY, and to mask geometries by color," Ralph said. "We now have written standards at IAP so that different parts are designed in specific colors. For example, housings are green, and bearing pedestals are blue. Dimensions are light purple, and notes are light blue. That way, more than one engineer can work on a design. Also, by masking on color, we can copy an existing design for a particular part of a fan into a new file so that it can be customized into a new design rapidly. We also use the snap and grid function a lot, especially for placing dimensions a specified distance from the geometry. It keeps the geometry clean and readable. IAP's drawings impress our customers very strongly. We are one of the few fan manufacturers that give customers customized drawings instead of standard data sheets."

"Getting back to the Bug-Buster," Ralph said, "each fan on a typical Bug-Buster can remove the insects from two rows of plants. Now, we make units ranging from one to four fans depending upon the customer's need. We make the Bug-Buster's frame to fit, as a front-mounted accessory unit to the customer's tractor, any type of tractor."

Parametric Design with CADKEY

Although the Bug-Buster has become a very successful product, industrial fans remain IAP's primary business. IAP manufactures a wide variety of industrial exhausters: backward incline, airfoil, radial bladed, high pressure, forward curve, and vane axial fans, in heavy-duty and extra-heavy-duty models, with varying discharges. In January 1991, Robert Theis, President of IAP, sought to increase the company's speed of generating engineering drawings in response to the needs of its customers and its shop floor. Ralph Mallwitz took up the challenge and wrote a program in QUICK BASIC® that includes a data file containing all of the specifications for IAP's twenty, most popular, design configurations for radial-tip (P) and open-radial-blade (ORB) fans.

The program asks the customer six essential questions: (1) What size fan? (2) What type of fan: paddle blade or open-radial blade? (3) Heavy duty or extra heavy duty? (4) What is the discharge of your fan: up blast, top horizontal, bottom horizontal, top angular up, or bottom angular up? (5) What is the rotation of your fan: clockwise or counterclockwise? (6) Would you like to input your own dimension height for dimensions in the drawing? The answers to these six questions define one of 1,600 possible design configurations of IAP's 20 most popular P and ORB fans.

After these questions have been answered, the program creates a CADL file in CADKEY's CDL subdirectory, with the default name HOUSE, which is a two-dimensional, fully dimensioned drawing, with all entities in the colors and placed on the levels corresponding to IAP's written standards. To display the CADL file, all anyone has to do is to enter CADKEY, perform the sequence FILES-CDL-EXECUTE, and enter the name HOUSE. The file is then ready for printing or plotting.

IAP uses this program now to generate almost all of its drawings. "This program has made engineering obsolete for custom fans with standard parameters," Ralph said. "It allows us to focus our engineering efforts on designing complex, specialized custom fans. We use CADKEY for everything in designing our products."

Technical Support Hours

Monday-Thursday: 8 a.m.-8 p.m.
Friday: 8 a.m.-5 p.m.

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Fadal Designs Vertical Machining Centers Using CADKEY !

"The reports of my death are greatly exaggerated," Mark Twain cabled from London to the Associated Press in 1897. Some 10,023 machine-tool manufacturers in the United States (small, medium-sized and large) are echoing Twain's sentiment in 1992. If they have their way, the 1980's gloom and doom over the impending demise of the American machine-tool industry, due to foreign competition, will have been exaggerated, too. One of these optimistic machine-tool manufacturers is Fadal Engineering Company, Inc. of North Hollywood, California. And, CADKEY® is part of Fadal's optimism. All of Fadal's vertical machining centers are now designed and maintained using CADKEY.

Entrepreneurial Spirit

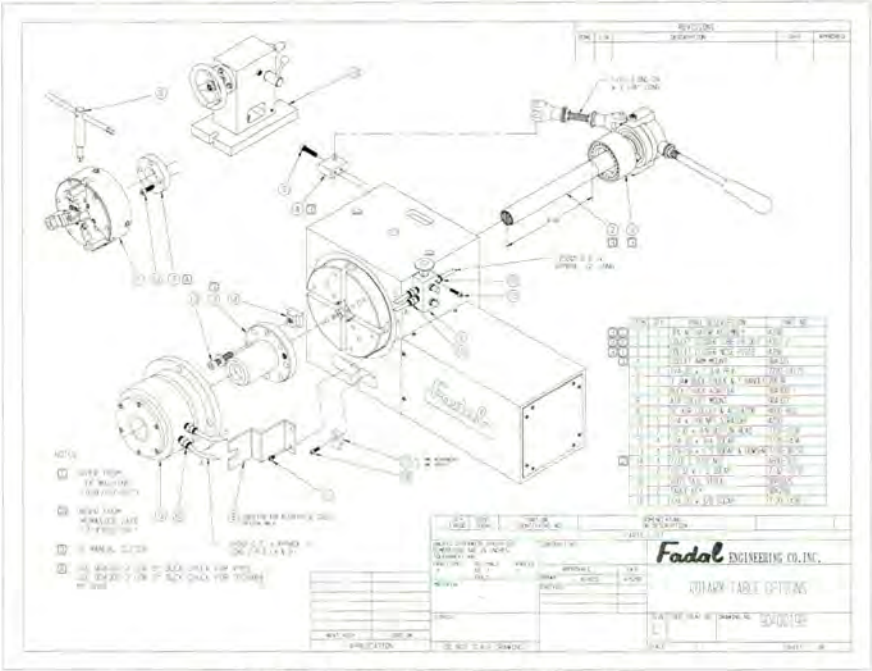
Francis de Caussin began a machine shop/job shop in his garage, in 1953, after he had transplanted himself and his family from Detroit, Michigan, to Southern California. The 1950's and the 1960's were the heyday of American manufacturing of machine tools. Fadal Engineering Company began building machine tools in the late 1960's. Francis de Caussin's three sons all participated actively in their father's business. Now, almost 40 years later, the founder has retired. His sons, Adrian, David and Larry, are President, Vice President and General Manager respectively. Indeed, the founder's grandchildren have also taken on significant roles in the family business. The name Fadal is an acromym that represents the initials of the first names of Francis, Adrian, David, and Larry de Caussin.

When Francis de Caussin started Fadal Engineering Company, Southern California was not a place famous for building machine tools. Almost all of the major machine-tool manufacturers in the United States were clustered east of the Mississippi River and north of the Ohio River. True, there was another family-run machine-tool company in Gardena, California, ten miles south of Los Angeles: Burgmaster Corporation, founded by Fred Burg, in 1944. But, that was just about it. Fred Burg pioneered the building of machine tools in Southern California, and he inspired Fadal to enter the field. "We are doing our best to avoid the mistakes that brought Burgmaster to an untimely end," said Adrian de Caussin.

Fadal and CADKEY

In 1989, Fadal Engineering Company bought its first CADKEY system. Now the company has seven CADKEY systems, all on stand-alone, 80386, IBM-compatible personal computers. "Settling on CADKEY was not easy for us," said Dean de Caussin, a Mechanical Engineer at Fadal. "We had tried other PC-based CAD software, and we had not been satisfied. After so many years in business, we had an enormous number of drawings to update. The system's dimensioning capabilities and ease of use were two critical factors. It finally came down to a choice between AutoCAD™ and CADKEY. We bought CADKEY, and we're glad we did. It makes a wonderful replacement for drafting by hand. CADKEY and our draftsmen seem to think the same way. There was a very short learning curve."

Of its seven CADKEY systems, Fadal has dedicated one specifically for 3-D design — to see how a finished part will look and fit into a machine. "CADKEY gives you confidence that what you design will work," Dean said, "you can assemble the machine on the screen." Another CADKEY system is devoted totally to dimensioning part files. A third system serves for creating prototype part files and hardcopy prints for use in Fadal's machine shop. Fadal uses the fourth system for remanufacturing replacement parts for existing machines, to upgrade very old equipment into



Exploded assembly drawing of rotary table.

(Continued on page 7)

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Fadal

(Continued from page 5)

CNC machines. "We use these refurbished machines only for our own internal use," Dean said. A fifth system serves the Engineering Department for developing new designs and special projects. The last two are systems that David de Caussin, Fadal's Chief Engineer, uses himself, one at work and one at home.

Safety Symbols Included in the Design

Even the safety symbols that appear on Fadal vertical machining centers are incorporated into the original part files using a combination of CorelDRAW!™ and CADKEY. The safety symbols are scanned into digital files in PCX format. An operator loads the PCX files into CorelDRAW!, traces over the symbols free hand, and creates output files in DXF format. Using CADKEY's DXF translator, the symbol files are converted from DXF format into CADL™ (CADKEY Advanced Design Language) format. The operator then reads the CADL file for the appropriate safety symbol into the original part file so that it will automatically appear in the hardcopy plot or blueprint of the part.

Fadal Engineering deliberately chooses to use American-made parts, as much as possible, in building its vertical machining centers. "We want to be loyal to our fellow manufacturers," Dean said, "and we want to help in keeping a base of machine-tool technology in the United States." According to articles published in **California Business** (February 1990), in **Business Week** (October 22, 1990), and in **American Machinist** (August 1991) magazines, Fadal Engineering Company appears to be succeeding in its effort.

Customer Enthusiasm

Fadal's customers also appear to appreciate what Fadal is doing. Fadal users speak passionately about the equipment that the company produces. (Editor's Note: "Passionately" is the most appropriate word to use here.) For example, Dean Alt of Alt's Tool and Machine, Inc., Santee, California, and Philip Durand of Connecticut Tool Company, Inc., Putnam, Connecticut, are both CADKEY users and Fadal users. Both extol Fadal's vertical machining centers.

"I have owned Fadals for six years," Dean Alt said, "they are very good machine tools. Dollar for dollar, they are the best you can get. I have done things with my Fadal machines that I could not do on other machines. They fit the job-shop market very well."

In a totally separate and unrelated conversation, Philip Durand agreed with Dean Alt. "When we got our Fadal, we were surprised," Philip Durand said. "The first time that I saw the name Fadal, I thought that it was a foreign product. I wanted to buy an American-made machine if possible. Later, I looked at Fadal again and found that it had features that I had not expected for the money. I would buy another Fadal in a minute if I had the work for it. In fact, I may buy another one anyway."

Editor's Notes: The 10,023 indicated in the first paragraph as the number of machine-tool manufacturers currently in the United States comes from the Thomas Register of American Manufacturers, 1992.

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DRAWING LAYOUT ENHANCEMENT

3D-2D COMPRESSION removes duplicate entities, trims overlapping entities, projects arcs-on-edge to lines; **AUTOMATIC HORIZON LINE AND CENTER LINE** enables edits to drawings in layout mode, expedites the creation of layouts from a 3D wireframe; **ARCHIVE/FREEZE REVISIONS** maintains compact 2D form, transfers fully-compressed 2D drawings to other CAD systems; **BORDER/CHART SCRIPT FILES** records script files for standardized formats

USER-PROGRAMMABLE LIBRARIES

ICON LOADER automates building and retrieving libraries for symbols, pattern files, CADL® files, and macros; **FLUID POWER** hydraulic and pneumatic power diagrams; **ELECTRICAL** electrical and electronic schematic diagrams; **LOGIC** ladder logic, flowcharting; **PIPING** pipe fittings, valves; **SHEET METAL** technical drawings for structural metal work;

PRODUCTIVITY ROUTINES

DYNAMIC EXTERNAL FILE REFERENCING pattern files placed in assemblies by references, pattern-to-part-file associativity triggers automatic updates to all geometry when pattern files are changed; **ATTRIBUTE TAGGING** Builds user-definable script files to tag text data to geometry, exports to database or ASCII files, adapts data to complex database tasks; **FILE MANAGER** icon-based, CDE-windows interface provides file management from inside CADKEY 5, browse part file descriptor data for drawing file organization and tracking; **TRANSFORM OFFSET FUNCTION** creates draft angles or offset geometry for entities selected with MOVE, COPY, and JOIN options in CADKEY®; **POP-UP CALCULATOR** provides a list box for variables definition and editing, stores and retrieves part file variables, evaluates expressions;

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Small Job Shop Does Big Work

In 1986, Dean Alt of Alt's Tool and Machine, Inc., in Santee, California, saw the need to invest in computer-aided design and manufacturing equipment for his 17-person company. Alt's Tool and Machine manufactures dies, molds, and tooling — products much in demand in the San Diego area. However, Dean Alt's company could not seriously compete for the specialty die-making work generated by aerospace companies in the area, without computerization. Drafting boards and knee-milling machines no longer gave his company the production strength that it needed.

Dean bought two Fadal™, three-axis, computer-numerical-controlled (CNC), vertical mills, manufactured by Fadal Corporation of North Hollywood, California, and went after new business. He soon found that to generate the code for the type of dies that he wanted to make required significantly complex programming. Dean experimented with getting the programming generated by independent contract programmers. Later, he decided to try doing the work in house. Dean bought a Dell™ 386 25MHz computer, with CADKEY® and a third-party CAM software package, and linked them to the Fadal three-axis mills.

Recently, Alt's Tool and Machine added more equipment, including a four-axis, wire electric-discharge machine (EDM). Dean also decided to divide the programming tasks. Alt's Tool and Machine does two-axis machine and four-axis EDM programming in house. The company obtains three-axis machine programming through a contract programming firm, Jef Falk Consulting, also a CADKEY user.

Dramatically Increased Productivity

Dean's customers now furnish most of their design data in digital form, as IGES files. Dean uses the CADKEY® IGES Translator to bring the design into CADKEY, particularly to verify the accuracy of data and dimensions. The IGES files coming from prime contractors frequently contain lines and surface data that need to be prepared for machine operations. "We use CADKEY to clean up the file and prepare it for machining," Dean said. Data supplied in the form of hard-copy drawings are digitized directly as 3-D models into CADKEY.

After verifying a part's design data in CADKEY, Dean and Jef save the part as a CADL® (CADKEY Advanced Design Language) file or as an IGES file, to serve as input to the CAM software for manufacturing the tool.

Accuracy = Productivity + Humor (Sometimes)

Upon delivery of the finished tool, the prime contractor inspects the die or mold using a coordinate measurement machine (CMM). In every case, the CMM has verified that Alt's Tool and Machine has produced a finished tool that conforms exactly to the database that the prime contractor had furnished. "Sometimes it's funny," Dean said. "When the CMM operator discovers what looks like an error, that same error also exists in the database that the prime contractor supplied. We have become so accurate that we even reproduce their errors faithfully."

Alt's Tool and Machine has become involved with more complex jobs. "Around San Diego," Dean said, "there are aerospace contractors who have had to look elsewhere for die manufacturers. We are proving that we can do the work. We haven't yet found a part, within the capacity of our equipment, that we can't make."

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THIRD-PARTY NEWS

InterFlux interfaces with CUTTING EDGE for Machining Free-form Artwork

InterFlux™, an interactive, graphical software product of Northwood Designs, Antwerp, New York, allows users to machine free-form artwork, such as lettering and company logos, through CUTTING EDGE. "InterFlux fills a hole that has existed between the artistic world and the manufacturing world," said Bill Elliot, President of Northwood Design. "In the past, it was nearly impossible or, at the very least, extremely time consuming, to incorporate artwork into the machining process. InterFlux makes machining artwork quick, easy and nearly trouble free."

InterFlux currently integrates with CUTTING EDGE through CADL® (CADKEY Advanced Design Language). However, Bill Elliott plans to use the technology of CADKEY® Dynamic Extension™ to integrate future versions of InterFlux into CUTTING EDGE.

InterFlux can accept computer-generated artwork files, as well as files created by scanning hardcopy drawings into a computer. These files are typically composed of many short line segments or bezier curves. Each of these files presents problems which make them difficult and time consuming to machine with computer-aided manufacturing software. Currently InterFlux can accept these files in EPS (Encapsulated PostScript) format, in AI88 (Adobe Illustrator 88) format, or in HPGL (Hewlett Packard Graphical Language) format. Within minutes, InterFlux converts the geometric data in an EPS, AI88 or HPGL file into an easily machinable file containing contiguous lines and arcs. An added benefit is a substantial reduction in the total number of entities contained in the file. The converted file usually contains more than 90% fewer entities than the original file. InterFlux also includes many other functions to help with specific problems which are encountered in these free-form files.

After creating the machinable file, InterFlux exports the file into CUTTING EDGE in CADL format. The InterFlux user can select to export the machinable file in CADL, DXF, or NCI formats, as well directly into machine code with the appropriate post processor.

Interflux does not perform any cutter compensation, but it produces a toolpath that follows the lines. Users can specify up to eight different depths and feedrates, and they can view a 3-D animation of the tool and its path prior to export.

For additional information about InterFlux, contact Northwood Designs, RD #1, Box 87E, Antwerp, New York. Telephone and Fax: (315) 287-2877.

Editor's Note: EPS and AI88 are file formats of Adobe Systems, Inc., Mountain View, CA. HPGL is a file format of Hewlett-Packard, Palo Alto, CA. DXF is a file format of Autodesk, Inc., Sausalito, CA. NCI is a file format of CNC Software, Tolland, CT.

New CADKEY User's Group Forming in San Joaquin Valley

CADKEY users in the San Joaquin Valley area of California will hold the second meeting of their new CADKEY User's Group at Pacific West Microsource, 7555 North Del Mar, Suite 106, Fresno, California 93706, on Wednesday, July 22, 1992, at 6:30 p.m. All CADKEY users, especially those in the San Joaquin Valley are welcome to attend. The agenda includes discussion of CADKEY 5 and third-party products.

Any CADKEY user in the area of the San Joaquin Valley who would like to participate in this new users' group, but who cannot attend this meeting, can obtain information from Mark Arnett at Pacific West Microsource. Telephone: (209) 432-8099.

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Cadkey Now Present on CompuServe CAD/CAM Vendor Forum

CADKEY users, DataCAD users and anyone seeking information about Cadkey's products have a new resource available: the CADD/CAM VENDOR FORUM on the CompuServe® Information Service. Cadkey's section in this electronic mall allows users of all of Cadkey's products (CADKEY®, DataCAD® CADDInspector™, CADKEY® ANALYSIS, CUTTING EDGE™, etc.) to converse electronically with Cadkey, Inc. and with one another: asking questions, finding answers, and exchanging free-of-charge software, especially utility files. *3-D WORLD* is also available now, in ASCII format, on CompuServe.

Booklets explaining Compuserve's services, including an introductory subscription to CompuServe, are included in every product shipped to a new Cadkey customer. CompuServe Information Service provides a variety of services, such as electronic mail, internal corporate information, application and database-management software, and packet-data, network services to more than 1,600 major U.S. corporations and government agencies. CompuServe's services also include information and communications services, including bulletin boards, news, weather, sports, travel, money matters, markets, computers, technology, home, health, education and electronic shopping to more than 400,000 owners of personal computers.

Compuserve is available internationally, 24 hours a day, 7 days a week, in most of the countries of the world. It is not necessary for Cadkey customers outside of the United States to contact the United States to access CompuServe's CAD/CAM VENDOR FORUM. Users can receive information about Cadkey at their convenience. In order to access the CADD/CAM VENDOR FORUM inside CompuServe, type:

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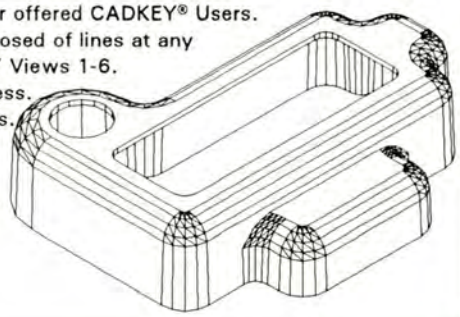

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HLB TECHNOLOGY

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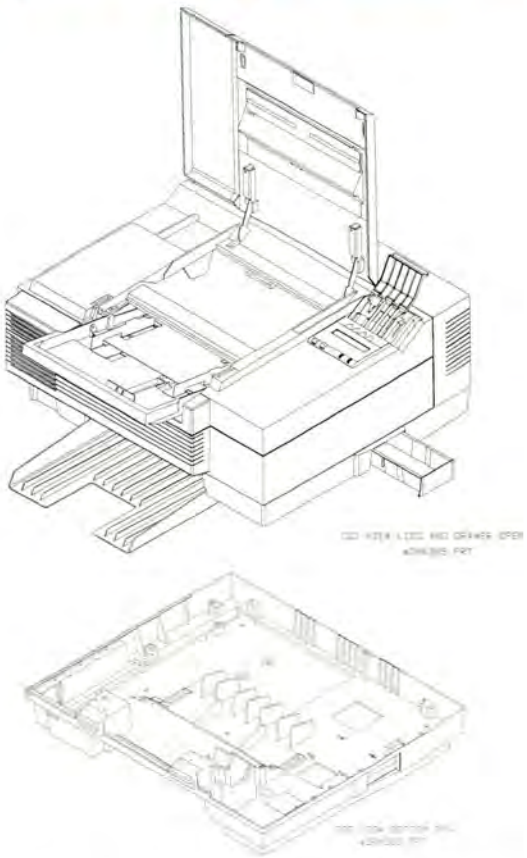
New Ink Technology Requires New Type of Printer

The Phaser™III PXi Color Printer, manufactured by Tektronix, Inc. of Wilsonville, Oregon, implements a new technology in printing with ink. Based on a phase-change technology, users can print on any media, including plain paper, vellum, or cover stock, on sizes up to 12x18 inches. With a printing resolution of 300 dots per inch, powered by a 24MHz RISC-based controller, and featuring Adobe PostScript Level 2, the Phaser III is well suited for printing CAD designs. To use this new ink technology required the development of a new type of printhead based on three-dimensional modeling in CADKEY.

"This printer is a mechancially intensive product that required designing at least 300 individual parts," said Ace Van Horne, design engineer. "Some of the parts were simple; some were complex. We started with two design engineers working together with CADKEY. By the time we reached the manufacturing stage, we had 15 engineers working as a team with CADKEY, plus people in the manufacturing-support organizations."

"We have used CADKEY for four years," Ace added. "We designed every part in the Phaser III in 3-D with CADKEY. The advantage of 3-D modeling is that one engineer can make sure that the part which he/she is designing mates properly with a corresponding part that someone else is designing."



Isometric views of the Phaser III™ PXi Color Printer

Critical Element

The critical element in the Phaser III project was the new type of printhead needed to take advantage of the advance in ink technology: *hot-melt* or *phase-change* ink. Tektronix' previous printer models had used water-based ink. However, water-based ink can evaporate while it is in the printer's reservoir and in the printhead, plugging the holes. Water-based ink also absorbs into the paper, and this can create a fuzzy image while diluting the colors so that they are no longer brilliant.

Hot-melt or phase-change ink solves the problems associated with water-based ink. "It looks like a crayon when you insert it into the printhead," Ace Van Horne said. "As soon as it is dropped into the machine, 140-degree heat liquefies the ink. The now liquid ink shoots through a line of nozzles in the printhead onto the paper. The holes in these nozzles are 2-to-3 thousandths of an inch in diameter. However, because liquefied phase-change ink does not evaporate, as water-based ink does, it does not dry and clog the holes in the printhead's nozzles. The temperature of the paper going through the printer is much less than 140 degrees centigrade. The paper sucks the heat out of the ink so that the ink very rapidly goes below its melting point. The ink resolidifies on the paper as plastic, before it has a chance to bleed into the paper. After the complete image is on the page, the printer rolls the paper through two rollers to flatten the drops of plastic ink onto the paper by pressure fusing."

Database Management

As the number of people in engineering and manufacturing involved in the Phaser III project increased, there was a serious need to control the database of CADKEY files shared among so many individuals. The CADKEY part files had rapidly grown to 10 megabytes. All of the personal computers of the project-team members were linked in a network with a VAX™ 8650 as a file server, running both DOS-based and UNIX-based versions of Sun Microsystems' Network File System™. "We did not share original CADKEY part files," Ace said. "We shared CADKEY pattern files over the network."

Ace purchased a CADKEY-

related, third-party database-management software, ACTVIEW™, produced by ALLAN CAD TOOLS of Portland, Oregon. ACTVIEW integrates with CADKEY through CADL® (CADKEY Advanced Design Language). "You can access ACTVIEW while you are working in CADKEY, and it displays an indented parts list," Ace said. "You use the ARROW keys to navigate through the parts list to find individual files. To select a particular file, you press the space bar. You can select more than one file at a time. Pressing the ENTER key causes ACTVIEW to transfer all the tagged pattern files into your CADKEY worksession. The system displays all of the geometry in your part file in its correct location and orientation, and you resume your work exactly where you had been."

"ACTVIEW has many useful features," Ace added. "One of the most useful is the ability to archive all previous revisions of a part, along with a log file describing the changes, into a single compressed file. ACTVIEW allows you to extract any one of the old revisions and to bring it back into CADKEY."

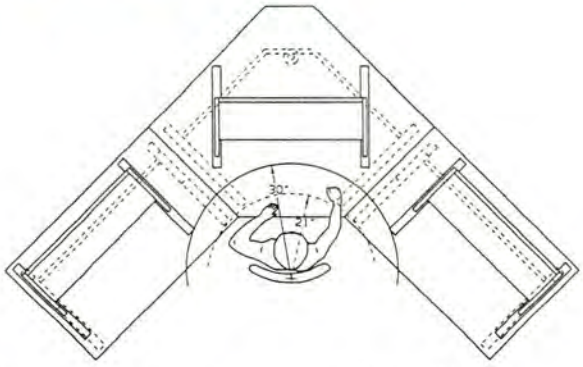
Manufacturing the Phaser III Color Printer required a considerable amount of tooling, molds for plastic parts. "Our suppliers made a number of the molds by taking IGES files from us and transferring them into their CAM systems," Ace said. "They were able to machine the molds directly from our design data. The largest and most complex molds were done without paper drawings."

Editor's Note: Phaser is a trademark of Tektronix, Inc., Wilsonville, Oregon. VAX is a trademark of Digital Equipment Corporation, Maynard, Massachusetts. Network File System is a trademark of Sun Microsystems, Inc., Mountain View, California. ACTVIEW is a trademark of ALLAN CAD, Portland, Oregon.

For additional information about the Phaser III PXi, contact Tektronix, Inc., 2660 S.W. Parkway, P.O. Box 1000, Wilsonville, Oregon 97070-1000. Telephone: (800) 835-6100.

For additional information about ACTVIEW, contact ALLAN CAD TOOLS, 6450 SE Aldercrest Court, Portland, OR 97267. Telephone and fax: (503) 659-9935.

CADKEY Users Design Workstation Furniture and Start New Company



The work area, chair and leg clearance of EMW's CAD workstation furniture. The dashed lines represent the clearances in competing products.

Ronald Ernst, George Moore, and Arlyn Wiesman experienced the restructuring taking place in the American furniture-manufacturing industry first hand. Their initial dismay turned into a resolute decision to put their experience to work in producing high-quality, CAD-workstation furniture that can be adapted easily to meet the real needs of its users. They founded EMW, Inc. in Two Rivers, Wisconsin, in August 1991, during the depths of a recession. EMW uses CADKEY® to design their wood and laminate furniture.

Ease of assembly and disassembly at the customer's site is a major feature of EMW's furniture. Ease of assembly, requiring only a screwdriver (HONESTLY!), is a by-product of tight design and manufacturing control. EMW even includes a flat-head and Phillips-head right-angle screwdriver in the assembly kit for their furniture.

EMW manufactures its furniture from structural panels of wood and high-pressure laminate cut to specific size. The laminate serves particularly well for making resilient top surfaces. A computer-numerical-control manufacturing system does routing, grooving, and point-to-point boring for holes into which metal-to-metal joinery is inserted and fastened. "The insertion of the steel-to-steel fasteners into the wood and laminate pieces requires extreme accuracy so that the components fit into a useful and ergonomic piece of furniture," said Arlyn Wiesman, one of the principals of EMW. "This is one place where we find CADKEY especially useful."

"CADKEY allows us to incorporate user-specific needs for work-surface space and, very importantly, for foot space," Arlyn said. "We can include specific needs for the user's line of sight, optimal keyboard height, and angle of viewing the monitor. CADKEY also gives us flexibility in customizing the legs and panels of tables to make them convenient for the customer to use."

"So far," Arlyn added, "the most popular colors for our furniture are natural wood grains, almond, and gray with black trim. However, we can customize our furniture and our colors to match any office decor."

Note from Technical Support: CADUTIL and CADKEY 5

If you have experienced difficulty using CADUTIL with CADKEY 5, there is an updated version of CADUTIL on the Cadkey Bulletin Board Service. Dial (203) 298-6405 through your computer. After you reach the Cadkey Bulletin Board, enter the command: DOWNLOAD CADUTIL.ZIP. You will need PKUNZIP to unzip the program. If you do not have PKUNZIP, download PKUNZIP.EXE from the Cadkey Bulletin Board.

Intel's RapidCAD Chip Supports CADKEY and DataCAD

The Intel RapidCAD™ Engineering CoProcessor improves the performance of mathematically intensive applications such as computer-aided design, three-dimensional modeling, rendering, and analysis up to 70% according to tests reported by Intel Corporation. The RapidCAD Engineering CoProcessor is really a combination of two chips. RapidCAD-1 combines the functionalities of the Intel386 DX microprocessor (CPU) and the Intel387 DX Math CoProcessor (MCP) into a single device. RapidCAD-2 contains the interface logic to manage mathematical exceptions, such as dividing by zero on PC-compatible systems. RapidCAD-2 fits into the socket formerly occupied by the mathematical coprocessor.

Both Intel Corporation and Cadkey, Inc. performed benchmark tests comparing the performance speed of the RapidCAD Engineering CoProcessor with that of the Intel386 DX CPU and Intel387 DX MCP. Intel performed five tests using CADKEY® 386 Version 4. Cadkey performed four tests using CADKEY Version 4 and one test using DataCAD® 4.0. CADKEY 386 Version 4 may use the Intel387 Math CoProcessor as an option. However, DataCAD 4.0 and CADKEY 5 require the Intel 387 MCP. Although the tests were limited in scope, RapidCAD demonstrated an overall improvement in performance in speed of processing and graphical display.

The method used to calculate the results presented in this article is: (a) Measure in seconds the time it takes the Intel386+Intel387 and the RapidCAD chip sets to perform each test. (b) Subtract RapidCAD's time from the Intel386+Intel387's time. (c) Divide the difference by the Intel386+Intel387's performance time to determine the percentage of performance improvement of RapidCAD in comparison to the Intel386+Intel387.

Intel's Tests

Tests performed using a Compaq DESKPRO 386, 33 MHz system.

(1) Drawing ellipses:

Time in seconds with Intel386+Intel387:	19.16
Time in seconds with Intel RapidCAD:	13.79
Time difference in seconds:	5.37
Percentage Performance Improvement:	28.02%

(2) Deleting ALL entities:

Time in seconds with Intel386+Intel387:	14.84
Time in seconds with Intel RapidCAD:	11.33
Time difference in seconds:	3.51
Percentage Performance Improvement:	23.65%

(3) Solid boolean operations (solid subtraction and plane sectioning) with mass properties:

Time in seconds with Intel386+Intel387:	88.00
Time in seconds with Intel RapidCAD:	58.09
Time difference in seconds:	29.91
Percentage Performance Improvement:	33.98%

(4) Phong shading:

Time in seconds with Intel386+Intel387:	85.00
Time in seconds with Intel RapidCAD:	59.86
Time difference in seconds:	25.14
Percentage Performance Improvement:	29.57%

(5) Smooth shading display:

Time in seconds with Intel386+Intel387:	64.00
Time in seconds with Intel RapidCAD:	39.87
Time difference in seconds:	24.13
Percentage Performance Improvement:	37.70%

Cadkey's Tests

Test performed using a Compaq DESKPRO 386, 20 MHz system.

(1) Creating one line; performing X-FORM: (a) to rotate copy that line 1,200 times; (b) join/copy these 1,201 lines, and (c) join all of these lines by creating 1,201 additional lines, pdoucing a total of 3,603 lines. create and joining all these lines:

Time in seconds with Intel386+Intel387:	65.16
Time in seconds with Intel RapidCAD:	59.58
Time difference in seconds:	5.58
Percentage Performance Improvement:	8.56%

(2) Loading a 1.4MB CADKEY part file, and performing four redraws:

Time in seconds with Intel386+Intel387:	83.39
Time in seconds with Intel RapidCAD:	63.61
Time difference in seconds:	19.78
Percentage Performance Improvement:	23.71%

(3) Loading 1.4MB CADKEY part file, and performing AUTOSCALE, HALF SCALE, AUTOSCALE, DOUBLE SCALE, AUTOSCALE:

Time in seconds with Intel386+Intel387:	103.20
Time in seconds with Intel RapidCAD:	70.84
Time difference in seconds:	32.36
Percentage Performance Improvement:	31.35%

Test performed using a Toshiba® 5200, 20 MHz system.

(4) Redrawing a 262306-byte CADKEY part file four times:

Time in seconds with Intel386+Intel387:	15.00
Time in seconds with Intel RapidCAD:	11.50
Time difference in seconds:	3.50
Percentage Performance Improvement:	23.33%

(5) Performing hidden-line removal on perspective view of DataCAD architectural file:

Time in seconds with Intel386+Intel387:	159.00
Time in seconds with Intel RapidCAD:	138.00
Time difference in seconds:	21.00
Percentage Performance Improvement:	13.20%

For additional information about the RapidCAD Engineering CoProcessor, contact Intel Corporation, End User Components Division, FM2-01, 1900 Prairie City Road, Folsom, CA 95630. Telephone: (800) 538-3373. Fax: (800) 525-3019.

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Third-party Development for Third-party Developers

CAD/CAM Developer's Kit Makes Creating CDE Programs Easier

The CAD/CAM Developer's Kit™ can reduce the time required to develop programs implementing CADKEY® Dynamic Extensions™, in CADKEY® and in CUTTING EDGE™, by as much as ten times or more, according to John Keklak, President of Building Block Software. The CAD/CAM Developer's Kit is a library of C-language functions produced by Building Block Software of Waltham, Massachusetts, to support mathematical computations and derivations encountered in writing software for CAD/CAM applications, such as, parametric design, engraving, piping layout, electronic CAD, mapping/geographical information systems (GIS), robotics, and motion control.

"The CDE environment in CADKEY 5 provides third-party application developers with a powerful and easy-to-use tool for creating these types of add-on products for CADKEY," John said. "The key advantages of CDE are: (1) incremental linking, which allows program changes to be made in a matter of seconds; (2) graphical user-interface devices which make CDE programs very simple to learn and to use, and (3) megabytes of memory for program and data storage via the Phar Lap™ 386 DOS Extender."

"Our customers have told us that by using our CCDK for CAD/CAM applications, they get their software products to market in much less time than if they created the programs from scratch," John said. "By eliminating the need to write code for core mathematics, the CCDK allows you to spend time on features that you would have otherwise skipped."

One User's Success

Baystate Technologies of Worcester, Massachusetts, is one Cadkey third-party developer who is using the CAD/CAM Developer's Kit (CCDK) to implement Cadkey's CDE technology in their product, DRAFT-PAK™. According to John Pentecost, a software engineer at Baystate Technologies, CCDK functions are written at an intermediate level that is high enough to separate the developer from the details, yet low enough to allow building custom functions. The kit allows the developer to forget about mathematical details involved in obtaining a solution to a particular piece of a puzzle, and to focus on the puzzle as a whole. "If you can write pseudo-code to create the mathematical steps necessary to solve your problem," John said, "then you

(Continued on page 18)

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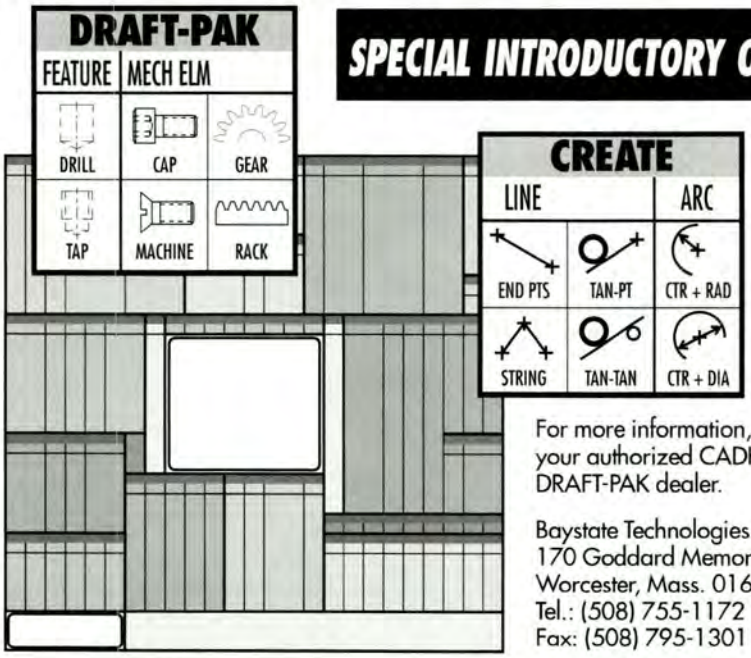

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CAD/CAM Developer's Kit

(Continued from page 17)

have just about written the program using the CCDK."

John Pentecost mentioned a section of DRAFT-PAK's code which he was upgrading to run in CDE. "This was an uncommented function that was written a long time ago," John said. "Although it still worked well, it needed some minor enhancements. We spent many many hours trying to convert this code into something more easily maintainable, but progress was frustratingly slow. Using the CCDK to set up the same module, going from specification to working program took all of two days! The new code for this function is about one half the size of the original code; it works in more cases, and it is easier to read and maintain."

Building Block Software also has a library of C-language functions for numerical-control programming, the NC Programming Engine™, which supports 2.5-axis toolpath computations for milling, turning, punching, wire EDM, and other machining operations.

For additional information about the CAD/CAM Developer's Kit, or about the NC Programming Engine, contact Building Block Software, 371 Moody Street, Waltham, MA 02154. Telephone and Fax: (617) 899-4350.

For additional information about the Phar Lap 386 DOS Extender, contact Phar Lap Software, Inc., 60 Aberdeen Avenue, Cambridge, MA 02138. Tel.: (617) 661-1510. Fax: (617) 876-2972.

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Cadkey customers who are readers of ***APPLIANCE MANUFACTURER*** have again voted Cadkey, Inc. **1992 Supplier of the Year** in the category of CAD/CAM/CAE/CIM software. This is the third year in a row that Cadkey has been voted this distinction.

APPLIANCE MANUFACTURER is a magazine devoted to the interests of the consumer, commercial, and business appliance industry. Each year, the magazine honors manufacturers in 83 categories who supply products to the appliance-manufacturing industry, ranging from *Adhesives* to *Wire & Cable Ties*. ***APPLIANCE MANUFACTURER*** is published by Corcoran Communications, Inc., 29100 Aurora Road, Solon, Ohio 44139.

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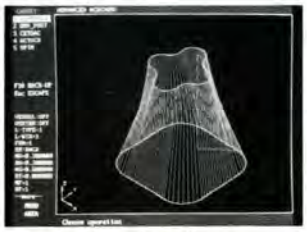

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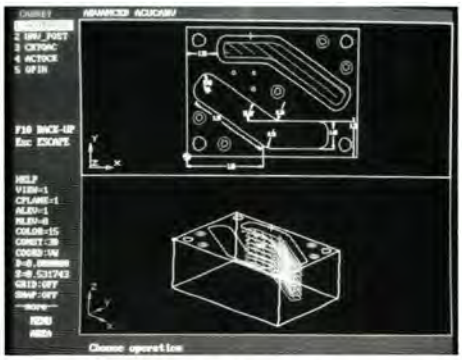

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THIRD-PARTY NEWS

Phar Lap 32-Bit Power Package Now Available for CADKEY/CUTTING EDGE Users and Third-party Developers

Cadkey, Inc. uses Phar Lap Software's 386 | DOS-Extender™ Software Development Kit (SDK) and MetaWare's High C(R) compiler to develop and incorporate CADKEY(R) Dynamic Extensions™ (CDE) into CADKEY(R) 5 and CUTTING EDGE™. Through a special offer arranged between Cadkey, Inc. and Phar Lap Software, Inc., CADKEY users, CUTTING EDGE users and third-party software developers can take advantage of this same 32-Bit Power Package to build their own CDE programs, for a special bundle price.

Phar Lap's 386 | DOS-Extender SDK and MetaWare's High C compiler provide everything that CADKEY and CUTTING EDGE users and developers need to build multi-megabyte 32-bit applications. 386 | DOS-Extender enables DOS-based programs to go beyond the DOS 640K memory limit to access all of the memory available in a 386 or 486 computer. 386 | DOS-Extender runs programs in protected mode, and it provides a transparent interface to DOS in real mode. This means that your programs can make DOS and BIOS calls just like any other DOS application. However, because your program is running in protected mode, unlike other DOS applications, it can take full advantage of the 32-bit speed and power of the 386 and 486 microprocessors. 386 | DOS-Extender supports the DPMI, VCPI and XMS industry standards. Therefore, Extended-DOS programs can operate in DESQview™ and Windows™, as well as in DOS. In addition, 386 | DOS-Extender is fully compatible with Building Block Software's CAD/CAM Developer's Kit.

According to Phar Lap, CAD programs which make use of 386 | DOS-Extender typically run 2-to-10 times faster than their standard DOS counterparts.

This special Cadkey-Phar Lap offer includes the 386 | DOS-Extender SDK, Version 3.0, composed of the 386 | DOS-Extender, the 386 | ASM Assembler, the 386 | LINK Linker, the 386 | LIB Librarian, and the 386 | DEBUG Debugger. The offer also includes the MetaWare 80386 High C Compiler, Version 3.0, composed of High C for Extended DOS 386/486 and the 32-bit Source-Level Debugger.

For additional information about this special offer, contact: Sales Department, Phar Lap Software, Inc., 60 Aberdeen Avenue, Cambridge, Massachusetts 02138. Telephone: (617) 661-1510. Fax: (617) 876-2972.

Or, contact Jeff Hall at Cadkey, Inc., 4 Griffin Road North, Windsor, CT 06095-1511. Telephone: (203) 298-6494. Fax: (203) 298-6401. International Fax: (203) 298-6402.

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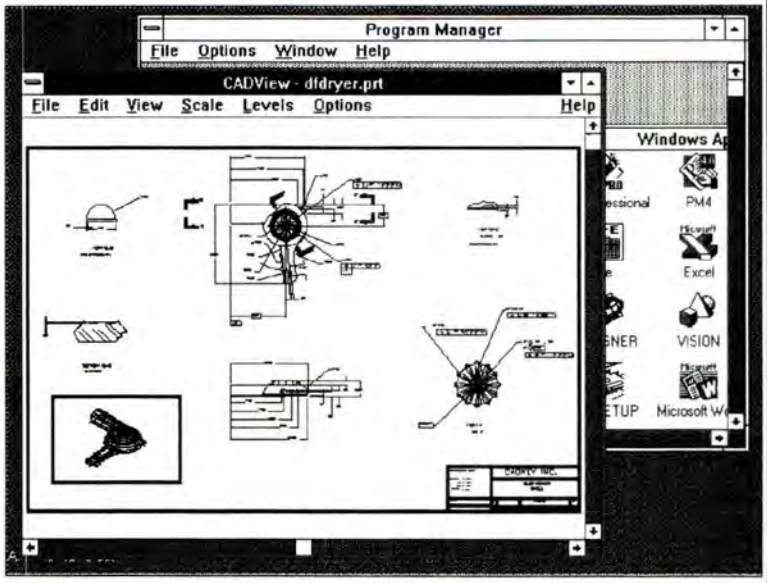

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Elizabeth High School, CADKEY and DataCAD Lead TSA Competition in Colorado

Students from Elizabeth High School and Elizabeth Middle School, using CADKEY and DataCAD, dominated the state-wide CADD competition sponsored by the Colorado Technology Student Association on May 8-9, 1992.

Some 500 students from 35 schools gathered at Regis University in Denver for the two-day program. The competition involved finished design projects that the students had developed, on their own, both during school time and at home.

Mechanical Design

The competition in Mechanical Design required that the students invent a product or improve the design of an already existing product. Using CADKEY Version 4, Shane Chevalier, Eli Moyle, and Mike Cogswell took first, second and third prizes respectively. Shane Chevalier, a Junior at Elizabeth High School, won first place honors by inventing an automatic adjustor for venetian blinds that opens and closes the blinds, without human intervention, depending upon the amount of light coming through the window.

Eli Moyle, a Senior at Elizabeth High School, won the second prize with his invention of an adaptive device to make it possible for a mechanic, whose hand has been amputated, to use a wrench. Mike Cogswell, another Junior at Elizabeth High School, won third place. Mike designed an adaptive device for a quadriplegic fellow student at the high school who enjoys using computers, but who cannot operate a three-button mouse. The device that Mike designed will allow this student to use a mouse with his chin.

Architectural Design

The competition in Architectural Design required the students to design a one-story, two-bedroom home with some form of solar-assisted heating or cooling. The students had to submit finished drawings of floor plans, elevations and sections. Cory Jackson, a freshman at Elizabeth High School, won first prize. Travis Chillemi, also a freshman at Eliza-beth High School, won second place. Both of them used DataCAD 4.06.

Jeremiah Shaw, an eighth-grader at the Elizabeth Middle School, submitted an architectural project on which he had worked at home with an old version of CADKEY (Version 1.41). His parents use CADKEY in their business. Jeremiah won first place in the Architectural Design competition among Middle School students.

The 1992 Ohio Intercollegiate CADD Shootout!

Dave Marion, a student at Owens Technical College, Toledo, Ohio, used CADKEY and won the 1992 Ohio Intercollegiate CADD Shootout on Saturday, May 16. Hosted by the student chapter of the Society of Manufacturing Engineers at Shawnee State University, Portsmouth, Ohio, the CADD Shootout attracted representatives from 14 two-year and four-year colleges in Ohio. The competition was open to all post-secondary institutions in the State of Ohio. A full commercial package of CADKEY 386 Version 4.06 was one of the prizes awarded to Dave Marion.

Each participating school was allowed to send one, registered, full-time undergraduate student, as its representative, to participate in this one-hour skills-based competition. The rules of the competition allowed entrants to use any CADD software that runs on IBM 386/486-compatible hardware. The student had to use the software "right out of the box," just as it comes from the vendor, with a mouse-based user interface. Add-on third-party software products were not allowed. Two chose to use CADKEY®, while twelve chose to use AutoCAD™.

The competition involved creating two-dimensional, top, front, and right-side views of a housing, and the same views of a bracket. "We used 2-D drawings rather than 3-D models because we did not know how many schools in Ohio teach 3-D modeling," said Roger Diamond, computer-aided design and drafting instructor at Shawnee State University, and coordinator of the competition.

Dan Verbarg of the University of Cincinnati and Shyler Switzer of Shawnee State University placed second and third respectively in the competition. The other schools represented in the 1992 CADD Shootout were: Bowling Green State University, Clark State University, Kent State University (Main Campus), Kent State University (Salem Campus), Kent State University (Tuscarawas Campus), Lima Technical College, Lorain Community College, Marion Technical College, Ohio University, Rio Grande University, Southern State University.

"This is the first time that Shawnee has organized anything like this," Roger Diamond said. "We hope to make it an annual event."

For information about the 1993 Ohio Intercollegiate CADD Shootout, contact Roger Diamond, Shawnee State University, CADD Department, 940 Second Street, Portsmouth, OH 45662. Telephone: (614) 355-2374. Fax: (614) 355-2416.

Look for the next installment of the

ABCs of CDE

in the next issue of *3-D WORLD*

CADKEY and DataCAD Instructional Materials Available

The CADKEY Videos 4.0 Update Tape, a 46 minute VHS tape which demonstrates the features found in the newest version of the CADKEY software is now available. This tape, together with the earlier set of 12 CADKEY video tapes and an accompanying Study Guide, provides a complete instructional package for introducing new users to the CADKEY software. A similar set of video tapes is available for CADKEY Light.

New DataCAD users will benefit from **The DataCAD Videos,** a series of 10 instructional video tapes which provide an introduction to the most frequently used DataCAD features. The tapes are correlated with the projects found in the book "Beginning DataCAD".

"Beginning DataCAD" by Dr. Leonard O. Nasman, is a 165 page book which introduces new users to DataCAD through a series of carefully crafted drawing projects. These are designed to help beginners make useful drawings as quickly as possible by introducing concepts in the context of completing architectural drawing exercises.

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A Little Seed Money and Lots of Care Nourish a Big Garden of Ideas at Anoka-Ramsey Community College!

by Mark Plenke and Sandi Hitch

Editor's Note: This article is an abridgement and an integration of two, separate yet complementary articles written by people not associated with **3-D WORLD**. One article, written by Mark Plenke, appeared in the September 1990 issue of ***The Correspondent***, a monthly newsletter published by Minnesota Community Colleges, St. Paul, Minnesota. The second article, written by Sandi Hitch, was published by Anoka Ramsey Community College in November 1991.

A 12-sided box with blue and green edges takes shape on a computer screen in the high-tech lab at Anoka-Ramsey Community College, Coon Rapids, Minnesota. Math instructor George Heron leans over his student's shoulder and chooses menu options that spin the box across the black field and bring it back through a half dozen phases to its original position. As it twirls, one of the green sides begins to drift away across the blackness, and the box suddenly looks like what it is: a collection of lines on a computer monitor, instead of an object with height, and width, and depth.

"Intrapreneurship"

The spinning box wouldn't have been part of the student work in the computer lab at Anoka-Ramsey six years ago. The software, CADKEY, is part of the school's three-dimensional design curriculum started by Heron with an $840 "intrapreneurship" grant, seed money for improving classroom teaching and instructional techniques at the college. The program — its title is an amalgam of "entrepreneur" and "intra" for "inside the college" — got its start in 1986. Darby Nelson, a biology teacher and former Minnesota state legislator who was on special assignment for the education chancellor's office, suggested that the college should help people to find new ways to improve their classes.

"There was no money for things like that," explained Dorothy Warrick, a sociology instructor who has led the intrapreneurship committee since its inception. "We decided to take part of the instructional budget and set aside money. We started with $10,000, now it's $20,000." Faculty members and staff submit proposals. The committee (of four instructors and one administrator) debates their merits and then funds those with promise. Warrick said that part of the committee's task is to spot problems in the proposals, before they happen. "We have to anticipate what expense there will be in the future if a project is funded," she said. "We have to consider what problems we'll have if it fails, and what problems we'll have if it succeeds."

Successes

There have been some remarkable successes: specialized software for economics and business classes, research into tutoring programs for writing and mathematics. But, it's George Heron's 3-D design program that Warrick and others point to as the most exciting success story of the intrapreneurship program.

Heron had been teaching mathematics at Anoka-Ramsey since 1967, the year after the college was established. When the mechanical-engineering instructor retired in 1986, George Heron accepted the job. Two-dimensional computer-assisted design was already part of the curriculum. Heron knew that the equipment in the computer labs could help students go beyond it. "If we were to take full advantage of the equipment and help students in the latter half of the century, I knew we'd have to get involved in three-dimensional design," he explained.

Television commercials that represent a sporty car as a three-dimensional grid is an example of the technology that he's teaching, Heron said, though the graphics are more for show than for serious design. "We design more practical things — the pieces inside the car's doorknobs. CAD has been used to design classroom materials, to print multicolored transparencies, and maps for visitors," he said. One student used the technology to plot and lay out Anoka-Ramsey's new basketball court.

Experimentation

To develop teaching techniques and materials for the new technology, Heron applied for a grant from the intrapreneurship committee. The $840 award allowed him to hire a student worker who helped develop materials while serving as the subject of Heron's experiment with 3-D instruction. Heron taught the new design material as he learned it, introducing the computer graphics into the existing design course in the following quarter.

At about the same time, Cadkey, Inc. was looking for training centers around the country to train and keep computer-design professionals up-to-date on the technology. Using additional intrapreneurship grants, Anoka-Ramsey sent George Heron, and later Tom Loftus, a physics instructor, to the company's training center near the University of Connecticut. Anoka-Ramsey became a CADKEY center, attracting trainees from across the Upper Midwest. Students now come not only from Minnesota, but

also North Dakota, Iowa, Wisconsin, Michigan, and even from New York. George Heron and Tom Loftus have made the Coon Rapids Campus of Anoka-Ramsey Community College one of the largest CADKEY training centers in the Upper Midwest.

"At the time we introduced the program, Anoka-Ramsey was the only two-year or four-year college in Minnesota teaching three-dimensional design, in engineering graphics, at the sophomore level," Heron said. "That made us a nationwide leader in its development and teaching." Anoka-Ramsey now offers courses in mechanical design and solid modeling with CADKEY, as well courses in architectural design with DataCAD. "We now have one networked lab with twenty 486-generation computers and another lab with ten 386 computers that are not networked."

Growth

"Now we are able to do customized work with companies in the area, such as Mate Punch and Stevens Lee Company," said Tom Loftus. Anoka-Ramsey's Center for Business and Industry links George Heron's and Tom Loftus' CAD training program with area businesses. In their ongoing search to expand their program's applications, Heron and Loftus are investigating engineering analysis to study stress in structures and heat flow in solids, stereolithography, reverse engineering with coordinate measurement machines, and computer-aided manufacturing. "We need resources in these and other areas of computerized manufacturing to prepare us for the future," Heron said.

"We know that we'll need more equipment than we have. For us to get into these new fields, we need cooperation from the business community," said Loftus. "We need business partnerships. It's an exciting area to be working in, right now, because it's changing all the time. We invite you to come and take a look at what we're doing."

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