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Release of V5.40 TNT products

Introduction

MicroImages is pleased to distribute **V5.40** of the **TNT** products and the 39th quarterly release of the Map and Image Processing System (**TNTmips**).

Different Features.

It has been an anomalous, unusual, and "off-schedule" quarter for MicroImages. The shipment of **V5.30** was delayed six weeks by releasing so many new useful additions and extensions which could be completed within the shortened period. This required the alteration of almost every software development objective scheduled for the quarter and set forth in the MicroImages **MEMO** shipped with **V5.30**. As a result, a totally unannounced set of surprise features are being released as **V5.40**.

Unfortunately the switch in objectives did not work, and **V5.40** is still late. **V5.30** used a dual partition Mac and Windows format for the "A" disk and repeated the sample data, illustrations, etc. in each partition. **V5.40** uses a new "A" hybrid disk format covering Windows and Mac (and **UNIX** if ever needed) on the same **CD**. This is the format which records common data only once on the **CD** and is used in those few advanced games and commercial software whose single **CD** can be used on Windows or Mac platforms. It is the format needed if most of the **CD** is to be used for data which is too large to be repeated (such as with a **TNTatlas**).

Finally, at the last minute, two workstation **UNIX** platforms had to be completely set up from scratch to be used to build **V5.40** of the **TNT** products: the **HP-UX** platform, whose system hard drive was lost, and the **DEC Alpha UNIX** version, where a replacement computer was finally delivered.

Upon the completion of **V5.40**, Microlimages' software engineers have resumed working on the master plan. Most of those features previously outlined for release in **V5.40** are now underway for release in **V5.50** in September and are reiterated below.

Status of Client Base?

General comments.

Based upon key exchanges, registrations of new systems, and other related information, 80 to 90% of clients actively using the **TNT** products have now switched from **W31** to **W95**. Those professionals and students sending in registrations cards for **TNTlite** are using **W95** over **W31** in a ratio of 15 to 1! Those who have not switched should do so as soon as possible.

1. **TNTmips** and the other **TNT** products run significantly faster via **W95** than with **W31**.
2. **W95**, and therefore the **TNT** products, operate better than **W31** if you are still running with 8 mb of real memory and slower 486 machines.
3. **W95** is a lot easier to learn and operate than **W31**. **W95** costs very little. It markedly increases your productivity and system reliability. It is thus difficult for Microlimages to understand why the remaining users have not moved to it.

On 1 May 1996 each client was sent a Microlimages **MEMO** entitled Securing TNT Keys. Since that time, Microlimages has continued to receive almost all keys returned for exchange by regular mail. Furthermore, these keys are still being sealed loosely in an envelope. It is your decision to return your valuable product in such an insecure fashion, however **if you lose your Microlimages hardware authorization key at your location or while in transit to Microlimages, the cost of its replacement will be the cost of the original TNT product you purchased.**

Software Support.

TNTtalk. Clients using the **TNT** professional products as well as others using the **TNTlite** products are encouraged to join the moderated **TNTtalk** listserver. You can join **TNTtalk** by visiting our web site and selecting the appropriate option. The registration page will then query you for your name and email address and add you to this mail list server.

TNTtalk is provided by Microlimages to assist students and our clients in communicating with each other, requesting help, discussing applications of mutual interest, seeking staff, and so on. **TNTtalk** does not replace Microlimages' direct Software Support for the **TNT** professional products. However, it can be of assistance to **TNTlite** users in getting help and as a means for everyone to access the experience of others in spatial data analysis.

Clients using the **TNT** professional products should continue to address technical and business questions directly to Microlimages' Software Support by the most convenient means of communication.

TNTpatch. **TNTpatch** is our **FTP** site where you can get the latest expanded or corrected processes. If they are of particular immediate value to you, please request them via Software Support, or you can download the respective process from ftp.microimages.com. The files at this location are located in /pub/outgoing/tntpatch and are updated frequently. They are further organized by operating system (platform) subdirectories.

When Microlimages' Software Support provides via a call, **FAX**, or email message, the name of the file to be downloaded, there is always one additional file which must be downloaded with the correction. This file is called **NEEDED.ZIP** and contains necessary reference files. For example, if it has been recommended that you download the latest copy of the [vector combinations](#) process, the files that you will need are: **VECTANLY.ZIP** and **NEEDED.ZIP**. It is important to remember that all downloads must be in **BINARY** mode rather than the default **ASCII** mode. If a file such as a **TNTmips** executable is downloaded in **ASCII** mode it will not work in **TNTmips**!

NOTE: All files in the Win31, Win32, **NT_alpha**, 68K, and **PPC** directories are compressed with PKZIP (BINHEX for the Mac and PMac platforms). This is done to assist clients who have reported difficulties in downloading large files from our **FTP** site. Therefore, it will be necessary to use the appropriate routine to decompress and actually use the extended or corrected process. Files placed on this **FTP** site for workstations are not compressed.

Summary of New Features.

- The following is a brief summary of highlights of the new features and processes which are being released in **V5.40**.
- **TNTview** now provides a tool bar with which to access a variety of new features added to it from **TNTmips**. The most important addition is access to all the vector, **CAD**, raster, and database import and linking processes formerly provided only by **TNTmips**.
- Large icons also provide access to other support processes for project file maintenance, project file recovery, text editor (2-byte international), map calculator, scientific calculator, setup preferences, and setup fonts (including 2-byte international).
- **ESRI's** shapefiles (*.**SHP**) can now be exported as well as imported into **CAD** files. A hot-link can also be made so that the shapefile can be used directly in the **TNT** products as a **CAD** object.
- The Atlas**GIS** external file format (*.**BNA**) can now be exported as well as imported into a **CAD** object. A hotlink can also be made so that the *.**AGF** files can be used directly in the **TNT** products as a **CAD** object.
- The Atlas**GIS** internal file format (*.**AGF**) can now be exported as well as imported into a **CAD** or vector object. A hotlink can also be made so that the *.**AGF** files can be used directly in the **TNT** products as a **CAD** object.
- The georeference information needed by MapInfo as a *.**TAB** file can be exported with rasters.
- Users of **TNTlite** and **TNTmips** can now subset a window from any large foreign **CAD** file format during import (e.g. *.**DXF**, *.**DGN**, *.**SHP**, *.**AGF**, *.**MIF/MID**, ...).
- Users of **TNTlite** and **TNTmips** can now subset a window from more, but not all, types of large foreign raster file formats during import. The most important addition to this is the windowing of small areas from all **TIFF** formats while importing from them.
- A new option is available in display for managing automatic map projection conversion computations when overlaying **CAD** or vector objects on rasters. Formerly the choices were affine (approximate) and Exact. The default is now Automatic, which will automatically use the fast affine method of transformation when it produces no detectable displacement (extents of the display are small). It will automatically switch to Exact computation when the displacement would be greater than 1.5 pixel (extents of the display are large).
- A new color balance gadget is available for use in fine tuning in the display process. The measurement tools now contain a tool bar for selecting each tool.
- When pin-mapping, the label angle and position relative to the label point can be selected.
- A new interactive process is provided to assist in the **color binarization** of map scans.
- Warping now provides the optional selection of bilinear and cubic convolution resampling methods for all distortion models. Also, the map projection of the output object being created can now be specified, avoiding the separate reprojection process.
- A new process is available to create a raster object whose cell values are the minimum distance to the "0" and/or "1" values in a binary raster object. Contours of the minimum **distance raster** which result are setbacks or buffer zones.
- Computed or virtual fields can now be created from the real fields attached and related to any graphical element. A computed field appears and acts in processes as if it were a real data field in the database table. However, it is defined and created everywhere it is needed by an expression which combines several other real and/or computed fields in one or more related tables. Thus the expression defining a computed field can be edited and altered at any time to redefine the field's values.
- The display process can use a computed field. Defining and using a computed field in display permits the combination of several variables in a single theme mapping operation.
- The georeferencing process has numerous improvements and additions. Two different images (or any raster objects) can now be overlaid in color (red and green, green and blue, ...). With the addition of three or more tie points, one of the images can be altered to match the scale, location,

and geometry of the reference image (e.g. an airslide versus another reference airslide, orthophoto, or a scan of a map). Automatic correlation of a new tie point to the corresponding point in the reference image is provided. Warping by any model is now in this process, so that at any point during the addition of tie points, a redraw will show the current match between the two images, and additional tie points can be added.

- A new **directional analysis process** is provided to inspect, analyze, and use the orientation of the lines in a vector object. Its initial application is to study the orientation of geologic lineaments in visually interpreted or filtered images. A new surface extraction process has been added to the **DEM/ortho** process. This option in Step 2 provides a new approach to cross-correlating the two images called "**TIN densification**". While currently slower, it creates an elevation raster with much more of the surface detail. It also allows the derivation of a reasonable **DEM** from some marginal quality stereo images such as underwater video or uniform, semi-arid areas of low relief. A new process is available to partition existing vector polygons with squares, triangles, rectangles, hexagons, or parallel lines and then save all the partitions as new polygons in a new vector object.
- A totally new process is provided to combine vector objects by an extract, inverse extract, extract and clip, extract adding border, subtract, add, logical OR, logical AND, and logical XOR. It replaces the previous vector intersection process. It combines features from two overlapping vector objects, one operating on the other. The two objects may be in different map projections. The graphical elements to be combined can be selected from both objects by query or by attributes. Elements can also be interactively selected from the source and operator objects and in a View window.

Probably Available Now.

- The following features which did not make **V5.40** should be completed by the time you read this **MEMO**. If they are of particular immediate value to you, they can be obtained for use with **V5.40**. Please see the section above entitled **TNTpatch** for information on how to go about obtaining these additional features. Remember, these are weekly or daily additions and alterations and are error prone.
- The Wallis filter for local contrast enhancement is being implemented.
- Support for devices interfaced by **GPIB** boards (e.g. scanners) is being implemented for use under **W95** (already available in **W31** and **NT**).
- Stereo viewing support is available for the CrystalEyes and SimulEyes devices manufactured by StereoGraphics. Additional information on the current stereo devices supported by all the **TNT** products occurs below. It should be emphasized that viewing is all that can be done at present with these stereo viewers.
- The import, export, and linking of the Geo**TIFF** format is now available. Note that the use of this import process required changes in the **RVC** functions. Thus, your pre **V5.50** release of this feature will require the Internet downloading of most of the current post **V5.40** system (call it **V5.50** alpha).
- Improved procedures have been established at MicroImages' web site for those newcomers who will be directly downloading and installing the FREE **TNTlite 5.4** during this quarter. For those with fast modem communications (28.8 Kb), a piece-by-piece downloading is now provided. Modem-oriented phone communications are occasionally interrupted. Under these circumstances, the probability of completing the download of a file is inversely related to its size. The improved approach for this quarter downloads the **TNT** systems in component pieces. If interruptions occur, access can be reinitiated and downloading resumed to obtain the missing pieces. A more advanced installation process is also downloaded as the first step. It will assemble the required pieces on the local system and identify any missing pieces based upon a reference file.

Planned Features.

- Some of the priorities for **V5.40** have been carried over without change as priorities for **V5.50**. Others have been adjusted to meet changing requirements of MicroImages and our clients.
- The **3D** display process is to be completely rewritten and integrated into a consolidated display

process. The result will probably then be referred to as the viewing or visualization process. The objective of this rewrite is to modernize the **3D** activity, increase its ease of use, incorporate new features, support stereo perspective viewing, prepare a framework for "fly-by" viewing, and so on. Extension of stereo viewing to view stereo renderings of **3D CAD**, vector, and **TIN** objects will also be incorporated. Creating stereo views from single images and their associated **DEM** will also be added.

- A suite of indicator and selection tools will be created for use in stereo views. They will be incorporated first into the **DEM**/ortho process to allow the stereo-aided selection of tie and control points, drawing of ridge and drainage lines (break lines), and so on. These tools are also headed for the stereo view process to support the selection of object features (lines, cells, ...) while viewing in stereo. Ultimately, they will provide the basis for a stereo object editor.
- The surface fitting processes scattered around in various locations within **TNTmips** will be collected and integrated into a more intuitive single process.
- Development of the new [vector combination](#) process, [raster distance process](#), and grid process will be continued.
- An **ODBC** interface between **TNTmips** and Microsoft Access will be undertaken.
- A new, separate interactive menu process for directly editing attached and related database tables will be created.
- The current mosaic process will be refurbished, its interface modernized, and some new features added.
- The interactive, interobject selection and analysis procedures have been rescheduled for this quarter. These are the means by which questions about multiple objects can be answered interactively. For example, draw a circle on the display of an image, and ask for an overlay or pin map of the water wells from a vector object not currently displayed. The **X** server for use on **W95** and **NT** platforms is being modified further to enable each remote user of **TNTmips** to have their own individual reference files. This permits multiple users to share a **TNTmips** running under **NT** and yet still have their own defaults, preferences, etc. It will also subsequently lead to a multiple user license requirement for multiple, simultaneous users of **TNT** products on an **NT** server.

New Platform.

A version of the **TNT** products will be provided for the **IBM PowerPC** based workstation platform and **IBM's AIX V4.10** of **UNIX**.

MI/X (Microlimages' X Server)

for Microsoft Windows W95 and NT Platforms.

Minor alterations include "Switch Language" toggle methods. Changing to a different keyboard layout and language (e.g. English to German) in **W31** requires running a control panel function. **W95** and **NT4**, and now the **TNT** products, let you toggle between keyboard layouts and languages using an icon on the start bar icon. Previously the **TNT** products handled this for **W95** in the **MI/X** server.

The server also no longer covers up the task bar when started.

for MacOS platforms.

Problems associated with the concurrent installation of the **MI/X** server and **TCP/IP** network access have been eliminated.

Similar problems between the **MI/X** server and an active **PPP** (Point to Point Protocol) function have been eliminated. Starting **V5.30** of the **MI/X** would dial your modem unless the **PPP** desktop extension was shut off.

Stereo Viewers

The following is a summary of the stereo viewing devices which have now been supported for use in **TNTmips**. These devices will all be used in the new stereo applications which are being added, such as stereo measurements, editing, flyby, and so on. The support for anaglyph glasses, **3DMax**, mechanical stereo viewers, and cross-eyed stereo is incorporated into **TNTmips 5.4**. Support for the digital CrystalEyes and SimulEyes viewers manufactured by StereoGraphics has already been added, but post **V5.40**. MicroImages would be pleased to receive any technical information you can supply on similar equipment.

StereoGraphics CrystalEyes®

Platforms supported: **W31**, **W95**, and **NT** (Intel).

Supported Modes: 800 by 600 pixels at 8-, 16-, and 24-bit color depths.

Effective resolution: about 800 by 220 pixels.

Eyewear comfort: fair

Eyestrain: high

Connection: A small component box which sits on top of the monitor is plugged between the output of the computer video card and the computer monitor and transmits an infrared sync signal to a sensor in the glasses. No wire is required for the glasses, and thus multiple viewers are possible with multiple glasses.

Comments: This device is designed more for **UNIX** workstation use by customized software and is popular now on **SGI** platforms. The left image is displayed across the top of the screen and the right image across the bottom. This over/under stereo approach makes accurate positioning of the two windows awkward within separate windows. Eyestrain is increased and usability decreased due to overlap of windows where corresponding user interface elements don't appear in both eyes (e.g. tool bar icons).

Retail Price: \$500

StereoGraphics SimulEyes™ VR

Platforms supported: **W31**, **W95**, and **NT** (Intel).

Supported Modes: 1024 by 768 pixels at 8-bit color depth only.

800 by 600 at 8-bit color depth only.

The above are the only modes for which StereoGraphics has supplied a **DLL** for this device. They have promised to subsequently supply **DLLs**, which if ever delivered, would provide support for the following additional modes.

640 by 480 pixels at 8-bit color depth only.

1280 by 1024 pixels at 8-bit color depth only.

Effective resolution: 1024 by 384 pixels.

800 by 300 pixels.

Eyewear comfort: poor

Eyestrain: moderate

Connection: A special box is plugged between the output of the computer video card and the computer monitor. This connector has a thin cable which connects to a small component box. (4 AAA batteries required). Jacks allow for one to four sets of glasses to connect to this sync box by thin cables.

Comments: This device is designed more for a game user, but gives stereo as good as the more expensive CrystalEyes. The left and right images are spliced together into a single image with odd lines for the left image and even lines for the right. Icons and text in both images are readily decipherable with or without the glasses in this arrangement. The color depth is limited to 8-bit which is good enough for games. However, the color quantization which results may not match between left and right images, causing some interpretive problems. Limited color depth will also limit the use of color in identifying features by direct color, stereo photo-interpretation.

Retail Price: \$180, \$100 for extra glasses

Kasan Electronics 3DMax

Platforms supported: **W31**, **W95**, and **NT**.

Supported Modes: 1280 by 1024 pixels at 8-, 16-, and 24-bit color depths.

1024 by 768 pixels at 8-, 16-, and 24-bit color depths.

800 by 600 pixels at 8-, 16-, and 24-bit color depths.

(may even function at 1600 by 1280 pixels but not tested)

Effective resolution: 1280 by 512 pixels.

1024 by 384 pixels.

800 by 300 pixels.

Eyewear comfort: fair

Eyestrain: moderate

Connection: A small interface card goes into the **PC** bus. The output of the video card passes through this **I/O** card which syncs on it. The video output of this new card then goes to the monitor. The stereo effect can then be turned on and off via the keyboard. It is widely compatible with many video cards. A thin cable also connects the glasses to this card by a jack on the card. Splitters and extra sets of glasses can be added. A remote infrared unit may also be available.

Comments: This device is also designed for game users, but gives just as good stereo, if not the best stereo, of these devices. The left and right images are spliced together into a single image with odd lines for the left image and even lines for the right. Icons and text in both images are readily decipherable with or without the glasses in this arrangement. The color depth is limited only by the display board and Windows driver being used, so full color stereo is possible. This Korean made device would be Microlimages' recommended unit except that there is no U.S. source, and availability anywhere else is probably also a problem.

Retail Price: \$200, \$100 for extra glasses

Anaglyph Glasses.

Platforms supported: Every possible **TNT** platform.

Supported Modes: Every display mode available (24-bit recommended).

Effective resolution: Same as display resolution.

Eyewear comfort: good

Eyestrain: moderate

Connection: No connection of any kind.

Comments: This is simply a set of two color lens glasses which you can make as simple or as elaborate as desired. The advantage is that this viewing device is as simple as possible and free. The disadvantage is that the approach is limited to monochrome viewing.

Retail Price: free (A set will eventually be distributed free with every **TNT** product when more stereo tools are incorporated.)

Installation

for Mac and Power Mac.

Hybrid Format.

The "**A**"**CD** for **V5.40** has been prepared in a new hybrid format which shares data and other common files between Mac and Windows programs (and **UNIX** if needed). This is currently the most advanced "computer only" format. More advanced formats are appearing for the incorporation of sound, video, and other multimedia applications not needed to distribute the **TNT** products. Only two known **CD-R** software mastering programs are available for preparing such hybrid **CDs** (MicroImages has both), and using either of them is error prone and a big headache.

MicroImages has purchased most of the types of commercial **CD-R** mastering software. **V5.20**, **V5.30**, and **V5.40** each used a different mastering software and successively more advanced means of integrating the Mac and **PC** releases on the single "**A**"**CD**. However, it is not anticipated that further delays will be experienced in producing the "**A**"**CD**, as all objectives of this integrated "**A**"**CD** have now been met.

Two very minor shortcomings appear in the "**A**"**CD** when viewed from a Mac or PMac, both due to flaws in the hybrid **CD** creation software. 1) A single **PC** file icon is shown which has nothing to do with **TNTmips** and is used by, and should be hidden by, the mastering software. 2) The MicroImages icon does not appear representing the **CD** on the desktop, as was the case for **V5.30**. The Apple generic **CD** icon is shown instead.

Running From **CD**.

The Mac and PMac versions of the **TNT** products can now be run directly off the "**A**"**CD** with only minor reference materials transferred to the hard drive. The installation process for the Mac and PMac provides the option for any or all **TNT** professional products and **TNTlite** products to be installed on the hard drive or to be set up to run directly from the **CD**. Operating directly from a fast **CD** (4X or greater) is a very useful option for those with limited hard drive space, such as students using **TNTlite**. It also allows those who move around a lot to be up and running on a new platform in less than one minute. Unfortunately, only the most recently produced Power Macs have incorporated the 4X and faster **CD-ROM** drives, which have been available for some time on Windows based platforms.

IMPORTANT: Most have not had success in using the serial or universal version of the **TNT** products hardware protection key on the serial port of the Mac and PMac. Apple has recently admitted in writing that a wide variety of variations and problems exist in the "so called" standard serial ports of their many, many models of Macs and PMacs. This is the direct cause of the highly varied results achieved by attaching an **RS232** rated device to an Apple serial port. This is also the reason that a Mac rated version of many products which use the **RS422** serial have been marketed, whereas serial devices from the "other" world may or may not work.

for W31, W95, and NT.

The process for entering an authorization code no longer distinguishes between upper and lower case letters.

On **W95** program. This is Microsoft's recommended standard procedure for installing under these systems. An Autoplay program can do anything any other legitimate **W95** or **NT** program might do. In the **TNT** products, it puts up a color window showing the capitol dome of the State of Nebraska, a common view in the downtown area of the MicroImages offices. It also provides three simple buttons to proceed: Setup, Browse, or Exit. When Setup is selected, it will find and use the proper installation process for the **W95** or **NT** platform (Pentium or Alpha). No more hunting around by the newcomer to find the correct Setup program.

for UNIX.

The installation procedures for **UNIX** based workstations remain the same as in **V5.30**. These scripts used to install on **UNIX** workstations already follow the standard installation procedures on these platforms and continue to require only incremental changes to improve them.

Installed Sizes.

Loading a full installation of **TNTmips 5.4** only onto your hard drive (exclusive of any other products, data sets, illustrations, Word files, etc.) requires the following storage space in megabytes.

PC using **W31** 73

PC using **W95** 100

PC using **NT** (Intel) 100

DEC using **NT** (Alpha) 100

Mac using **MacOS 7.1** (680xx) 61

Power Mac using **MacOS 7.5** (**PPC** 60x) 75

Hewlett Packard workstation using **HPUX** 86

SGI workstation via **IRIX** 110

Sun workstation via Solaris 1.x 80

Sun workstation via Solaris 2.x 75

IBM workstation via **AIX 3.x** (**RS/6000**) 148

DEC workstation via **UNIX=OSF/1** (Alpha) 122

V5.40 of the illustrations for the on-line documentation require an additional 23 megabytes. The sample data sets for Crow Butte and San Francisco require an additional 11 and 13 megabytes respectively.

V5.40 of the **TNT** products for the **DEC** Ultrix and the Data General Aviiion platforms are available upon special request for which a special **CD** will be produced.

Upgrading.

If you did not order an upgrade of your **TNT** professional product, and wish to do so now, please contact MicroImages by **FAX**, phone, or email to arrange to purchase your quarterly upgrade to **V5.40**. Upon receipt of your order and processing, MicroImages will supply you with an authorization code by return **FAX** only. Entering this code when running the installation process allows you to complete the installation and immediately start to use **TNTmips 5.4** and the other **TNT** professional products.

If you do not have an annual subscription to **TNTmips**, you can purchase **V5.40** under the elective upgrade plan at the cost in the tables below. Please remember that new features have been added to **TNTmips** each quarter. Thus, the more quarters you are behind **V5.40**, the higher your upgrade cost, up to a fixed limit. Upgrades from all previous versions of **MIPS** and **TNTmips 4.9** or earlier are the same, fixed cost shown below. As usual, there is no additional charge for the upgrade of your special peripheral support features, **TNTlink**, or **TNTsdk** which you may have added to your basic **TNTmips** system.

Within the **NAFTA** point-of-use area (Canada, U.S., and Mexico):

TNTmips Product Code Price to upgrade from TNTmips: V4.80

V5.30 V5.20 V5.10 V5.00 V4.90 or earlier

D30 to D60 (CDs) \$250 450 600 700 750 750

D80 \$375 675 900 1050 1125 1125

M50 \$250 450 600 700 750 750

U100 \$450 800 1000 1200 1300

U200 \$780 1400 1875 2200 2350

U300 \$1030 1850 2475 2900 3100

For a point-of-use in all other nations:

TNTmips Product Code Price to upgrade from

TNTmips: V4.80

V5.30 V5.20 V5.10 V5.00 V4.90 or earlier

D30 to D60 (CDs) \$300 560 750 875 940 940

D80 \$425 800 1050 1225 1300 1300

M50 \$300 560 750 875 940 940

U100 \$500 850 1050 1250 1350

U200 \$830 1450 1925 2250 2400

U300 \$1080 1900 2525 2950 3150

***TNTview*® 5.4**

Tool Bar.

Additional functionality has been transferred into **TNTview** from **TNTmips**. As a result, the installed size of **TNTview** has almost doubled. In order to continue to provide for simple access, these Within the **NAFTA** point-of-use area (Canada, U.S., and Mexico):

TNTview Product Price to upgrade from TNTview:

V5.30 V5.20 V5.10 V5.00 V4.90 V4.80 or earlier

W31, W95, and NT \$95 170 225 265 280 280

Mac and PMac \$95 170 225 265 280 280

DEC/Alpha via NT \$125 225 300 350 375 375

UNIX single user \$155 280 375 440 470 470

For a point-of-use in all other nations:

TNTview Product Price to upgrade from TNTview: V4.80 V5.30 V5.20 V5.10 V5.00 V4.90 or earlier

W31, W95, and NT \$115 205 270 320 335 335

Mac and PMac \$115 205 270 320 335 335

DEC/Alpha via NT \$150 270 360 420 450 450

UNIX single user \$185 335 450 530 565 565

***TNTatlas*™ 5.4**

A "home" icon has been added to the tool bar to automatically return the view back to the first screen in the atlas.

Upgrades.

For a point-of-use in all other nations:

TNTatlas Product Price to upgrade from TNTatlas:

V5.30 V5.20 V5.10 V5.00 V4.90 V4.80 or earlier

W31, W95, and NT \$80 135 180 210 230 230

Mac and PMac \$80 135 180 210 230 230

DEC/Alpha via **NT** \$95 170 225 265 280 280

UNIX single user \$115 205 270 320 335 335

TNTatlas™ sampler of San Francisco

A *Prototype3* **TNTatlas** of San Francisco is being actively prepared now that the procedures have been mastered for producing a single hybrid Mac, Windows, and **UNIX CD** which shares one set of Project Files. Since the procedures for running the **TNTatlas** software directly from a **CD** on a Mac and Power Mac are now available, this option will be included in *Prototype3*.

TNTlite™ 5.4

Unexpected Demand.

Demand for the **TNTlite** products via the "**A**"**CD** ramped up far faster than expected by MicroImages. As a result, three additional quantity reprintings had to be made for **V5.30** of the "**A**"**CD** after the initial preplanned, extra stock produced with the release of **V5.30** was exhausted. The original extra supply of the "**B**"disk for **UNIX** platforms was exhausted half-way through the quarter, and subsequent orders for the "**B**"**UNIX CD** were delayed and are now being filled with **V5.40**.

MicroImages had anticipated a gradual and cautious introduction of this **TNTlite** concept with **V5.30** and **V5.40** as its beta releases with time for feedback. Fortunately, others of you had other ideas. Most of the MicroImages Authorized Dealers immediately ordered stocks of the **CD** kits to distribute as part of their training, marketing, and promotion programs. Several have ordered hundreds. Academic types who are not currently clients have ordered in units of 10 to 25. MicroImages has also provided **TNTlite** to those who visited MicroImages' booth at a couple of meeting/shows. The mess with Atlas**GIS** (see **V5.30** of the Grapevine **MEMO**) has also generated interest in using **TNTlite** as a FREE replacement for Atlas**GIS**.

Network Access.

Over the quarter MicroImages has focused upon getting the **TNTlite** information up on our web site, and this is beginning to generate totally independent interest. You will now find summary information about the **TNTlite** product is easily accessible to anyone who visits <http://www.microimages.com>. This includes a promotional description, the explanatory **MEMO**, a list of dealers, and other descriptive material such as the two page "press release" enclosed on its use in Precision Farming. A very simple **TNTlite CD** ordering procedure is also available to order via email or to generate a form for **FAXing**. Toward the end of the quarter, **V5.30** was also made available for all platforms for direct downloading via Netscape in compressed form (if you had the network capacity needed). We now have had successful downloads and installations of **TNTlite** in Japan, the U.S., and elsewhere despite the large file size. An alternative means of downloading **TNTlite** in a sequence of smaller pieces is currently being added to the <http://www.microimages.com> site.

Promotion.

Departments in various universities have indicated that they are adopting **TNTlite** for use in their **GIS** and/or Remote Sensing courses. This is encouraging, as these universities are not currently using the **TNT** professional products. It is also interesting to note that this has happened somewhat spontaneously via dealers and "verbal/email grapevine" promotion. Concurrent with the release of **V5.40**, MicroImages has begun a promotional campaign to inform academicians about the availability of the **TNTlite** products for instructional purposes. However, as a counter-point, the **TNTlite** registration cards returned to date indicate that most of those trying it are professionals, and not students.

Sample Data = TNTlite Cells.

MicrolImages hopes that the expanding academic and professional use of **TNTlite** will result in the creation of many interesting **TNTlite** sample geodata sets. It is also hoped that all of you who create **TNTlite** geodata cells will share them with others. The easiest way to do this would be via Internet. The first user-contributed **TNTlite** geodata cell is being posted for downloading on <http://www.microimages.com> at this time. If you have sample cells of **TNTlite** geodata you wish to share to promote your capabilities, please send them to MicrolImages via Internet or on physical media. Please also include any descriptive materials you have prepared. MicrolImages will then place this material in a collection of sample data sets on the web site for easy access and use by all. Or, if you are maintaining a home page of your own, simply inform MicrolImages of the specific page you would like a link to where interested parties can find a description and access to what you have to offer in **TNTlite** cells, as well as other promotional information.

Upgrades.

A copy of the standard **V5.40** of the "A" or "B" **CD** will be shipped to each party who has registered their copy of the **V5.30 CD**. These copies will be shipped when all materials have been shipped to professional clients.

TNTdemo™

The full scale introduction of the **TNTlite** program has removed most of the need for trial use of the **TNTdemo** program. Effective with this release, the promotion and availability of the **TNTdemo** program is canceled.

On-Line Documentation

The size of the documentation has expanded this quarter to 2135 pages. A lot of new pages were added, but the extensive subsections in the Prepare volume on Edit Vector and Edit **CAD** were deleted along with the processes. The corresponding subsections on the object editor have not yet expanded to such a level of detail.

Last minute supplemental sections which do not occur in the on-line documentation were created for new processes and features. These sections were completed for **V5.40** after the master **CDs** were created for the reproduction process. These 79 additional pages are included in supplemental, printed form as follows.

Georeference (13 pages)

Distances (5 pages)

Directional Analysis (10 pages)

Vector Combinations (8 pages)

Generate Grid (11 pages)

Stereoscopic Modeling (11 pages)

Color Binarization (21 pages)

NOTE: MicrolImages has excess copies of the printed documentation for **V5.30** which are available on a first come, first served basis for \$50 plus the cost of shipping by the method of your choice. The shipping weight is 12 pounds.

New TNTmips Application Features

* Paragraphs or main sections preceded by this symbol "*" introduce significant new processes, or features in existing processes, which are released for the first time in **TNTmips 5.4**.

> Paragraphs or main sections preceded by this symbol ">" introduce modifications in the **TNT** professional products which have additional, special significance to the users of the **TNTlite** products.

System.

* New Hot Links

TNT project files can now have links to the **ESRI** shapefile format and to the Atlas**GIS** internal **AGF** format. It is not necessary to import these file types (along with **DXF**, **MIF/MID**, and many rasters including **TIFF**) to use them in the **TNT** products. Both these newly hot-linked file types have no topology and thus fall into the category of **CAD** objects from the viewpoint of their direct use in **TNT** processes.

> Lite Switches.

Objects created or modified by **TNTlite** can be used only in **TNTlite**. Each user of **TNTlite** is warned of this each time the student version of **TNTmips** (i.e. **TNTlite** version of **TNTmips**) or the student version of **TNTview** is started. Any object (but not the whole Project File) created by the professional version of **TNTmips** can be made inoperable in the professional version of **TNTmips** by its subsequent modification in the student version of **TNTmips**.

You may be making your professional Project Files available to students (e.g. an instructor's professional **TNTmips** system operating on a network with student versions of **TNTmips**). Thus, system preferences can now be set up in each student version of **TNTmips** or **TNTview** to control its use of objects created by the professional versions of **TNTmips**. One of the following warning options can be set via Support / Setup / Preferences using the General System Preferences window.

Full Access.

No warning is provided (i.e. just as in **TNTlite 5.3**). The student version of **TNTmips** can access any object of the allowable size or smaller in any Project File regardless of who created it. Correspondingly, any new object or modifications to existing objects can be saved by the student version in any Project File. Objects so modified or created can then only be used in **TNTlite**.

Warn When Attempted (default setting in **V5.40**).

A warning is exposed, and then you can proceed. With this choice, the student version of **TNTmips** has read and write access to a "lite sized" object created by the professional version of **TNTmips**. However, the warning alerts you that the object was created in the professional version of **TNTmips** and may be confined (i.e. captured) by **TNTlite** should you choose to proceed.

Access Denied.

Write access is denied, and you cannot modify or create objects in a Project File previously prepared in the professional version of **TNTmips**. This provides absolute protection for your professional files. Note carefully that it does not prevent read access for a "lite sized" object from a professional Project File. It merely forces the user of student version of **TNTmips** to save to a new "lite" object which will be captured for all future use in the student version.

Miscellaneous.

The minimum displayed elapsed time for a process will now be one second. This eliminates the "Time to

XXX, 0 seconds" messages.

A preference can now be set to control the initial state in which attributes will be displayed--in single record form or in tabular form. If the attribute view method is subsequently changed in the process, then its viewed parameters will be saved and reused the next time. Use the General System Preferences window accessed via Support / Setup / Preferences to set this initial kind of attribute display to be used.

Project File Maintenance.

> Any time any object is selected in the Project File Maintenance window, a message automatically appears that: "Object usable in **TNTlite**" or "Object is NOT usable in **TNTlite**". This allows **TNT** professional users to determine which objects can be immediately used by students or others using **TNTlite** without starting up **TNTlite** and trying them or by careful checking of each of the object's size parameters.

The cell size for raster objects and scale for vector, **CAD**, **TIN**, and database objects can be changed by selecting any one of the object's associated georeference subobjects. Use the Edit Object Information subwindow, and select the button Set From Georeference.

Measurement Tools.

Icon buttons are now available for selecting each available tool: caliper, protractor, planimeter, rectangle, circle, ellipse, solid trace, and boundary trace. Additional icons are also shown for displaying a profile and updating a histogram for the area of those measurement tools which define a closed shape.

The currently selected measurement tool will be retained as the default for the next time the measurement tools are opened.

Display.

Color Balance.

There is a new Color Balance gadget window available for use in display via Enhance / Color Balance. This is the same gadget window as has previously been provided in printer setup, but here it allows you to control the color balance on the screen as well as for the printer. The tools it contains can be used to directly change contrast and saturation and to shift selected components of the hue. The Apply button provides for direct application of the tuning of the color balance to the image being displayed. If you also subsequently make additional color balance changes in the printer setup dialog, the effects are cumulative.

Automated Projection Management.

A new "Positional Accuracy" option of "Automatic" has been added via Options / Positional Accuracy / Auto-Select. This is now the initial default and will automatically choose between the "affine" and "exact" positioning for each layer based on the estimated distortion. If the distortion exceeds 1.5 screen pixels, the "exact" method will be automatically used.

This new default will reduce the common misconception of inaccuracy in relative positioning of objects if they are in different projections. This confusion has been frequently reported when you have zoomed into a composite display and forgotten to switch from the fast affine approximate method of converting a layer's projection to the slower exact method.

This smarter method now uses the affine conversion for fast display where the composite display scale is large and the displacement is not evident. It then switches to the exact method of conversion between projections as you zoom in, and thus continues to display good registration. Since the areas of the objects involved are also drastically reduced when zoomed in, fewer of the complex computations are

required and there is no apparent loss in the responsiveness of the display process.

Theme Mapping.

* **V5.30** added the capability to interactively design theme maps of individual attributes similarly to less expensive desktop mapping systems. But, the single field to be mapped had to exist in the attribute table. **V5.40** significantly expands the utility of theme mapping. Now a computed field (defined in detail below) can be selected wherever a real field can be selected, including in theme mapping. Simply write an expression to mathematically or logically combine the fields for the polygons or other elements. Then select and use this new field in the interactive theme mapping operation.

Pin Mapping.

It is now possible to set the label angle and position relative to the label point. The angle is set by specifying a value for "LabelAngle" in the query. Values are in degrees counter-clockwise around the label point. The position is set by specifying a value for "LabelPosn" from 1 to 9. The LabelPosn values arranged around the point (5 is the center) are:

1 2 3

4 5 6

7 8 9

Thus to draw the label below the label point set LabelPosn = 8. By choosing multiple layers and positions, a single point can have several different labels or values positioned about it. The default is to draw the label to the right of the point as before.

Video Capture.

Video capture is now available for those using **W95** and an auxiliary **TARGA** video capture board. Previously the **W31** version of **TNTmips** was the only version supporting the **TARGA** boards. This required keeping a portion of **TNTmips** for **W31** installed on a **W95** based platform to capture video images with these boards.

Color Merge.

A transparency coefficient may now be specified for each layer. This allows a display blending multiple rasters into a single color result by picking a transparency value for each.

Miscellaneous.

There is now a toggle-button for the "Examine Raster" tool on the tool bar in the View window. This makes it easier to switch between this tool and the "Select" tool for examining attributes.

An option and icon push-button has been added to the tool bar in the Display / 2-D window to draw the currently selected layer. Some of you were toggling the hide option on and off to accomplish this.

The Enhance / Contrast dialog now allows previously saved contrast tables to be opened. Tables may even be read and used from other rasters of the same type and depth.

The Examine / Raster Correlation view now allows the correlation histogram to be saved as a raster. This raster can then be used as a layer in a layout for later viewing and/or printing.

Raster Color Conversion.

Grayscale rasters may now be used for this process. For example, an 8-bit grayscale raster object can be converted to a 16-bit color composite raster (still grayscale). The inverse is also useful where a grayscale image stored in a 16-bit color composite can be converted to an 8-bit raster object.

Remap Raster Null Cells.

A new process is available to "remap" all null cells in the selected raster(s) to a new value. This is not only useful within **TNTmips** but also to convert the default 255 null value in **TNTmips** to the 0 value in preparation for exporting to other less flexible systems which often fix the null value at 0.

* Color Binarization. (*prototype process*)

What Is It?

A new Input the Proper Scans!

V5.30 introduced a new color interactive line following process into the object editor to be used for semi-automatic map digitization. An integral part of this process is an automatic neural network color compression step. This step automatically reduces any 16-bit or 24-bit **RGB** color composite raster object selected for tracing to the selected number of important colors. It learns and presents the distinct colors making up the map. It weights the selected number of colors toward their separation in a color sense or model (e.g. color distinctness), but not necessarily toward the map area that the color or very similar colors occupy. It tries to find and group each distinct color together. For example, when used for reducing a 24-bit color raster for presentation on an 8-bit display board, it would preserve a sharper transition between the red cells representing a road and their white background.

Color Binarization color plate

The standard 8-bit color compression method used everywhere else in **TNTmips** (in the scanning program, **RGB** to 8-bit color compression, **RGB** display on 8-bit color display boards, etc.) optimizes image appearance (map or photo) based upon the cell area that the colors occupy. It is designed specifically to reduce the color quantization or color banding in a continuous tone image viewed on a 256 color display board. Used on a map with distinct colors, it will tend to present a good looking display of the map for similar reasons. These 8-bit color compressed raster objects can be selected for use in the color separation process and the color interactive line following process. If this process is started by selecting an existing 8-bit color composite, the power of the "front-end" neural network analysis is aborted, and all you are doing is selecting colors from the existing color palette. For best results do not do this. Use these two processes on 16-bit and 24-bit color raster objects so that the automatic neural network compression method designed for them is applied.

The How Does It Work?

The interface for the process is very similar to that provided in **V5.30** for the similar operation used in smart line following. A Color Binarization window is opened. Select an 8-, 16-, or 24-bit color composite raster object to be processed. If you select an 8-bit raster, (see caveats above) the process immediately continues on to display it and initialize the graphical contents of the Color Binarization window.

If you choose a 16- or 24-bit color composite raster, the process provides an auxiliary Separation window where you can select the number of color separations to be produced (2 to 256) and the sampling rate for the training of the neural network color classifier. The default for this window uses every 8 by 8 pixel to train this color separation process and is usually adequate unless the input objects are small rasters or represent unusual source materials. The higher the sample rate selected and the greater the number of colors, the longer it will require to prepare this color separation raster. Select the Apply button to continue and specify the destination of the source object to contain the color separated result. When the new 8-bit color object has been created, you are returned to the Color Binarization control window where it is automatically used.

Within the Color Binarization control window is a small binary test window showing a zoomed sample of any selected area of the color separated map. At any time, you can interactively select or unselect colors from this color palette or directly from the feature of interest in the display of the color separated map in the View window. The objective is to select and test a final set of color selections from the display and/or palette which will best map the color features of interest with the best internal continuity and without adding in background features of some other color.

Choose Show As Binary at any time to see in another test window how the currently selected colors actually map into a distinct binary feature for possible overlay or as the continuous lines needed for its automatic raster to vector conversion. A number of other useful control buttons are provided to Reset, Invert, select a Range, Replace, Merge, and Restore the current color selections. Toggle between a histogram or pie diagram to automatically show the number of cells in the map which match the current selection of colors.

Warping Objects.

A comprehensive expansion of the georeferencing process occurred as outlined in detail below. A number of features were added into the object warp process to support these important georeferencing changes as well as for direct application.

* The bilinear and cubic convolution resampling methods are now available for all warping models. This has been requested by many of you for some time!

* The "Piecewise Affine" model is now available for warping vectors and **CAD** objects. This is important as it allows distorted **CAD** and vector objects to be warped to fit the geometry and projection of scanned maps and orthoimages. This is particularly useful with **CAD** objects which were sketched in the field (e. g. via **CAD** sketching in **TNTview**) over uncorrected airphotos. Or alternately, with **TIGER** vector objects crudely georeferenced at a scale of 1:100,000 which does not fit your new, accurate orthophoto.

* The output projection may now be set for all warping models. This eliminates the need for the special "change projection" model.

Minimum Distance Raster. (prototype process)

What is it?

A new process is available to compute a raster whose cell values each contain the minimum distance to a particular kind of feature. It is located at Interpret / Raster / Distances. A typical application might be to compute a minimum distance raster for drainage lines and lakes represented in a "hydrology" binary raster. The contours subsequently computed for this minimum distance raster would be a series of buffer zones around the hydrologic features. These buffer zones would be similar to those produced by the previously available buffer zone process which operates on line elements in **CAD** or vector objects. A monochrome illustration is attached entitled **Distance Rasters** which will assist you in understanding this new process and a sample application. A printed section of supplemental documentation for this new process entitled Distance Rasters is enclosed.

A distance raster can be used to create a "distance to" field for a large collection of field sample points in a **CAD** or vector object. First compute the minimum distance raster for the other element(s) of interest (e.g. the drainage lines). Then use the transfer attributes process to create a new attribute field for the field sample points which contains the distance value in the raster object for each point. You now have a distance to the drainage field to use in pin-mapping, theme-mapping, and other appropriate **TNT** processes.

The minimum distance raster can be used directly in combination with other rasters. For example, a raster of the minimum distance to hundreds of **GPS** located sample points and polygons recording the occurrence of some surface material or geochemical value could be coregistered with a georeferenced

color-infrared **SPOT** satellite image. The four bands could then be used in a classification process to map selected surface materials only when they are close to a sample point. Alternatively, the same four bands could be used in the feature mapping process to interactively explore for the distribution of a single "three color" surface material relative to its distance from the known occurrence of the sample points and polygons.

How Does It Work?

This new process calculates the minimum distance to the white or black pixels in a selected binary raster object for every cell in a new raster object. The minimum distance is computed as the smallest Euclidean distance between each new cell and the nearest white or black binary cell. The new raster object produced has the same cell size, projection, and other reference characteristics as the input binary raster object.

You may choose the data type for the new raster object from one of the following types:

16-bit or 32-bit unsigned integer,

16-bit or 32-bit signed integer, or

32-bit or 64-bit floating point.

The minimum distance might be calculated for each binary cell four different ways:

only to white pixels,

only to black pixels,

to both pixels with a positive sign for distance value, or

to both pixels with opposite sign (positive distance to white and negative to black pixels).

A great deal of computation and data buffering occurs in this new process where every cell in the new raster requires computing the distance to many cells in the binary raster. As a result, the current prototype implementation requires computation time. If this new process becomes widely used, more programming effort can be expended to speed it up.

Sample Application.

The following is a test application of the process using data in the sample data set CB_DATA and which produces the buffer zone results in the attached black and white plate entitled Distance Rasters. Use Prepare / Convert / Vector to Raster / Flat to convert the hydrology vector object from the **DLG** data in CB_DATA to a binary raster object where the ponds and drainage lines are "1" and all other cells are "0". Select the **SPOT** image in the CB_DATA set as a reference to establish the cell size and other spatial properties of the new minimum distance raster object. Select 16-bit integer as the data type for the new minimum distance raster. When the process is complete, display the new minimum distance raster produced as a gray scale image.

Use the contouring process at Prepare / Convert / Raster to Vector / Contours. Contour the new 16-bit minimum distance raster [omit the "0" value contours] and select to create the 100 unit contour [buffer zone] from the minimum distance object in a new vector object. This will produce a vector object containing a buffer zone for the drainage.

* Dynamically Computed Database Fields.

What are They?

It is now possible to create a "computed" field in a new or existing database table. The values for the computed field are not actually stored in the table. Instead, you enter an expression that is evaluated to generate the values for the field in each record. The expression can be constructed of the real and/or other computed fields in the same table and/or fields in other relational tables.

A computed field is recomputed each time the table is used in a display, selection, theme map, pin map, vector analysis, and so on. In other words, a computed field acts identically to a real field in all operations where a database or attribute table is used. However, the text which appears in the field label button for a computed field is blue, whereas that for a real field is black. This blue text indicates that the specific field is computed and that its current values can be altered at any time by editing the controlling expression. For example, an expression might provide a computed field which is a linear combination of other real and computed fields. At any time the coefficients of the expression of the linear combination can be altered to create new values in the computed field.

Using Computed Fields.

To create a computed field in an existing table, select "Edit Definition" for that table and click on "Add". Change the field type to "Computed", then click on "Edit Expression ..." and create the expression used to compute the field's values. To create a computed field in a new table, follow the same steps.

The values of a computed field can be viewed by opening the table in Examine Attributes. A computed field can be used anywhere a normal numeric field can be used except Style by Attribute. The reason it can't be used there is that Style by Attribute requires the field to be a Primary Key and to have an index. Since computed fields don't actually exist, they cannot be made primary keys. Correspondingly, the individual values for a specific record of a computed field cannot be edited since they do not exist and are controlled directly by the expression.

More than one computed field can be created for a table. Computed fields can use fields as input which are in separate relational tables attached to the same object. However, in **V5.40** an expression cannot be formed which would use fields from separate tables which are not related through a primary key and thus are not relational. This unfortunately prevents a field from a standard attribute table (e.g. polygon area) from being used in an expression with a field from another table (e.g. demographics) attached directly to that key. For example, an expression for a computed field containing population density using the area from the standard polygon attributes table could not be formed. As a work-around, a standard attributes table could be exported, reimported, and then attached to the other tables in a relational sense. It is anticipated that this limitation for computed fields will be removed in **V5.50**.

Sample Applications.

An attached color plate entitled [California County Theme Map](#) illustrates a sample use of a very simple computed field. It provides a theme map of California counties where only counties with a population density of more than 40 persons per square kilometer are color coded by increasing population density. The last field in the attribute table shown is a computed field containing population density. (Note that this illustration was printed before the "blue" field label feature was added to distinguish computed from real fields.) This population density field is computed by the expression $(CA_CENT.pop / CA_CENT.SQKM)$ where the real field for county population is divided by the real field for county area. Once the new field was defined for population density, it was a simple matter to choose it in display as the field to be theme mapped. In this illustration the population density theme map was layered over an available **AVHRR** mosaic of the southwest United States.

While rather simple in concept, the computed field represents the addition of a powerful new **GIS** capability into **TNTmips** and **TNTview**. Complex expressions can be designed to model results which can immediately be visualized via theme mapping, queries, element labels and other activities. For example, the new Vector Combination process also released in **V5.40** can be used to combine a soil map vector object and a current crop map vector object of a county. The resulting vector object would have attribute fields from which the Universal Soil Loss Equation (**USLE**) could be modeled as a computed field. The rainfall factor can be introduced as a coefficient in the **USLE** expression and could

be changed at any time. This vector object and computed field can then be immediately theme mapped.

Larger Overview.

MicroImages is currently actively working toward connection to, and use of, other external databases, such as Access and Oracle. Once this is complete, the use of computed fields becomes even more powerful. Suppose that all attributes for each crop area (farmer's "field") are stored externally in Access relational tables linked to the crop area polygons in a vector object. Suppose further that all the records and fields in the Access tables were set up at the beginning of the growing season for each crop area and remain fixed while their contents are updated daily in some fashion (manually, via sensors, via image processing, etc.). Within **TNTmips**, internal tables can be set up consisting only of computed fields which use these "external fields" to model growth parameters. Since a computed field is always re-evaluated at the time of use, these internal tables, and any **TNTmips** use of them, will continually adjust to reflect these dynamic conditions changing during the growing season. One can even expand these operations a little further where an "alarm" scenario is constructed. Within this type of application, an alert map is displayed where the tabular conditions in a dynamically updated external database combine with the geographic information within a **TNTmips** to automatically identify problem areas. This might be an automatic display of where immediate irrigation water is required in all or part of a crop area.

* Georeferencing.

Advanced Concepts.

Important modifications and Sample Uses.

- 1) An accurate database of section corners or other survey points collected by a **GPS** unit could be selected as a reference layer and displayed as labeled points. A vector object containing section lines is selected for georeferencing and each corner co-located with the survey points. Then the new vector object is saved by the process which is warped with the selected model to match the survey points in the database object.
- 2) Another example relates directly to photointerpretation. A vector object is available with accurate geometry and georeferencing from a orthophoto interpretation prepared by someone else (i.e. the orthophoto is not readily available as a reference layer). Choose this vector object as the reference layer and a new airphoto raster object to be georeferenced. Add control points, redrawing periodically to warp the portion of the airphoto being worked on to check its current fit to the vectors. When a satisfactory fit has been achieved, save the airphoto and these control points, but without warping to save time and get on to the next airphoto. Later, warp all the airphotos prepared in this fashion in a batch process.

Operational Details.

A "Reference Layer Controls" dialog has been added which allows for the selection of multiple reference layers. Layers may be added, removed, reordered, enhanced, etc. via this dialog. In addition, map grid and database pinmap layers may be used for reference. All these features are useful when you have a group of nicely matching layers and wish to georeference one new layer to them using all available information. For example, an orthophoto, section corners, street map, and other survey data can all be composited as reference layers to use in georeferencing a new airslide or additional **CAD** or vector layer.

The object being georeferenced may now be "warped" by a redraw at any time to the currently selected control point model. This allows immediate evaluation of the currently selected set of control points.

As noted above, a distorted and reference image may be overlaid in two user-selectable primary colors (red and green recommended). This allows highly accurate visual checking of the current match of two images (or more in a sequential fashion), as well as scanned reference maps. An option to overlay images in full color is also available with the assumption that the reference raster(s) have transparent cells based on null values and/or masks. This is particularly useful when an image is being warped to match a map which has a lot of white area that can be made transparent. If the map contains large

areas of color, such as a geologic map or green forest overprint in a topographic map, then the new **Object Editor**.

The layer control display icons have been added to match those used in the display process. Other minor improvements were added to existing features.

Raster Object Editing

The separate raster editing process which was available in **DOS MIPS** and **TNTmips 4.0 to 5.3** is no longer provided. From now on, please use the new raster editing subprocess located in the object editor process. The features missing from the **V5.30** prototype release of this new embedded raster editor have been added. Please bring to our attention any raster editing features which previously existed in **DOS MIPS** or **TNTmips** that have been overlooked and are not provided by this new editing subprocess.

Tabular View Layouts

Tabular view layouts now show the new computed fields described in detail above. A computed field can be distinguished by its blue column label from a real field with a black column label.

*** Grid Design. (prototype process)**

What is It?

Clients in a variety of disciplines have requested that a flexible means be added to **TNTmips** to partition polygons. In general these needs have been articulated by those who use, or wish to use, sampling procedures in agriculture, ecology, forestry, biology, and related renewable resources. The uses of partitioning are many, but can be initially summarized as providing a means to subdivide larger existing polygon area(s) into smaller regular sample polygon cells. These smaller cells can then be used as a graphical structure (i.e. polygons) to which attribute tables can be attached to represent discrete geo-samples collected at many points within the larger polygons. This new process will also eventually provide a logical means of distributing points over the larger polygons into the new cells to define points at which **GPS** controlled field measurements should be collected.

A sample use of this partitioning process would be where a table of the location and biological characteristics of each tree can be collected by field sampling for large polygons representing meadows. A partitioned vector object can be created in this grid process for the meadows and all the trees attached or transferred by location to the new grid of polygons. These smaller polygons can then be used to display and analyze the spatial distribution patterns of the trees (e.g. their density).

A first step in this direction is released in **V5.40** and can be found at Prepare / Vector / Generate Grid. It creates a new vector object which contains the regular partitioning of all the polygons in an existing vector object. For the time being, you will need to use other **TNTmips** processes (e.g. copy vector) to transfer all the polygons to be partitioned into a single vector object to use as input, as none of the normal polygon selection tools have yet been provided in the new process.

How does it work?

The process exposes a new Grid Analysis control window. Select the vector object to be gridded. A raster object can also be selected to be used as a reference object. Both will be displayed in a View window. Choose the type of shape to be used for the partition of the polygons: triangle, rectangle, square, hexagons, parallel strips. A dialog panel will be exposed for the shape selected and can be used to define its size. For example, if square partitioning is selected, then the cell can be defined by the length of its side or by its area in the units of choice. Similarly, a triangular partitioning is defined by the length of its edge or its area, and so on. A sample square and hexagonal grid for agricultural fields appear in the lower right corner of the attached color plate entitled Palmyra Northwest.

The next step is to define the origin and orientation of the partitions relative to the polygons. For

example, you want the square grid you have created to start at one corner, and be parallel in orientation to one edge of an agricultural field defined by a polygon. A small Orientation icon is located in the tool bar of the View window. Select it, and an orientation tool will appear which functions just like caliper tool in measurements. The orientation of this tool will define the edge and orthographic orientation of the partitions, and the "+" end of the tool will define the origin. To select the actual corners of the polygons (such as an agricultural field), modes are available to snap the origin or both ends of the tool to the nearest nodes in the polygon being partitioned (e.g. the corners of a field).

The Apply button creates a temporary vector object containing the partition polygons. This temporary vector is automatically displayed over the source vector object and reference raster. If the grid design is unsuitable (too large, too small, improper orientation, etc.), simply choose new parameters. Iterate until the desired partitioning is achieved, and then save the vector object.

The outer boundaries of your source polygons will automatically become the outer boundaries of the appropriate partition polygons. The new vector object created has correct topology and can be immediately used elsewhere. Typically the next **TNT** processes applied to this new object would be:

to Attach attributes: this would attach a geo-table (one with latitude and longitude fields) to this vector object with one or more records attached to each partition polygon and

to Transfer attributes: the attributes of points in some other vector object would be transferred to the partition polygons accomplishing the same as Attach. Supplemental documentation expanding upon the operation of this new process is enclosed and is entitled Generate Grid.

***Directional Analysis.** *(prototype process)*

What is it?

This is a new process primarily intended for analysis, interpretation, and extraction of the line elements in a vector object based upon their orientation. Its initial use will be in the study of geologic lineaments or faults. Lineament maps can be derived in **TNTmips** in various ways, including direct digitizing from images (**CAD** sketching or the object editor) or applying spatial filters to an image and then converting the resulting raster into a vector object. Contour maps are also made up of lines which can be interactively tested to detect their orientation properties.

The process is located at Interpret / Vector / Directional Analysis. A black and white plate entitled **Directional Analysis** is attached to show some of the general concepts of this process. A printed supplemental documentation section entitled Directional Analysis is also enclosed to assist you in operating it.

How does it operate?

Directional analysis can be applied in flexible ways to the irregular lines in the vector object selected. The specific lines to be used can be selected from the vector object by a query. The angular and other properties are displayed for straight-line approximations to the irregular lines selected in the object. These straight line segments can be defined to represent the irregular lines in a number of ways detailed below. The straight line segments included in the analysis can be displayed in color over the original irregular.

The rose diagram allows the users to examine values and directions and choose the directions of interest. There are controls available for choosing level of detail presented in the rose diagram. A "test" mode is provided to highlight lines or segments that lie within a certain direction plus or minus a specified deviation tolerance. The lines selected by the analysis can also be saved into a new vector object as the original irregular lines or their straight line approximations.

Input Line Approximation Methods.

The following methods are available for computing the properties of the lines selected from the source vector object. The rose diagram will display these properties. The color overlay on the source vector will be these line properties for the conditions specified: angle or other property selected on the rose diagram, bandwidth around this setting (e.g. + and - deviation of the angle), and the minimum line segment length specified.

Node to Node. The directional analysis uses the straight line that connects start and end nodes of the polyline (line between nodes).

Line Best Fit. The analysis uses the approximation line that is the least squares best fit line for the polyline between each pair of nodes.

Line Segments. The analysis uses every line segment between sequential pairs of vertices making up every selected polyline. Remember that there can be many line segments making up these polylines.

Weighted Segments. This uses every line segment between sequential pairs of vertices making up every selected polyline. However, the lengths of these line segments are multiplied by the length of the segment. Thus, the longer the line segment, the greater the directly proportional impact of its direction in the analysis.

Average Length. This uses the average of the length of every line segment between sequential pairs of vertices making up every selected polyline.

Angle Deviation. The value used in the analysis is the average deviation of the polyline between two nodes from the best fit line between the two nodes. The deviation is computed for every line segment between sequential pairs of vertices making up every selected polyline. These deviations are then averaged, weighted by the length of the line between the vertices.

Fixed Length Contours. A length along the original, irregular line is entered as a variable. This divides the original irregular lines into links. The direction of the straight lines connecting the ends of these lengths is the value used in the directional analysis. The short, left-over lengths are ignored, so the length selected should be short compared to the average polyline length between nodes.

Output Line Specifications.

After analysis of the input lines is complete, the selected lines can be transferred into a new vector object. This new object can optionally contain the original vector lines or the new approximate lines derived. The direction of the lines to be saved can be that specified by the last rose diagram setting or by a specific number. The deviation and length of the saved lines from these set conditions can also be specified.

Which kind of approximate lines to save can also be controlled? Any of the four line types listed above can be transferred to the new vector object. These include Node to Node, Line Best Fit, Line Segments, and Fixed Length Contours.

Possible Future Additions.

Based upon the level of multiple client interest in this process, some possible additional features could be added such as:

providing Hough Transform analysis procedures for the lines defined;

saving these orientation properties (e.g. deviation from best fit, angle deviation, etc.) as an optional fuzzy properties attribute table for the polylines between nodes for use in other processes;

select lines from a View Window with various interactive selection tools;

save the statistics from a rose diagram into a file;

"accumulate" multiple line selections in a single analysis (e.g. 45 and 68 degrees);

saving and reloading a rose diagram; and

opening more than one rose diagram at a time for comparing results from sequential and differing analysis.

Sample Use.

A sample geologic analysis might proceed as follows. A satellite image is subjected to a filtering process to extract edges. This resulting raster object is converted to a binary raster object and then thinned and converted to a vector object containing only lines. The lines are overlaid upon the original image or some other data source in the object editor and attributes added to some of the lines created. For example, these attributes might be a qualitative index of the probability of the line being a lineament, a width property, and so on. The transfer attributes process could also be used to add more attributes to these raw lines from a polygon map of geology, a buffer zone map from known faults, a minimum distance map to drainage, and so on.

The vector object containing the collection of raw lines and attributes can then be brought into the

Vector Extract.

The area to be extracted from a vector object can now be selected using the interactive polygon drawing/editing tool.

Vector Intersect.

The decrepit vector intersect process designed and written as part of **DOS MIPS** is no longer available in **TNTmips 5.4**. It has been replaced over the past several quarters by three new advanced processes: vector merge for integrating adjacent or overlapping vector objects, transfer attributes, and the new vector combine process released in **V5.40** for complex combination of coincident vector objects. None of us will be sorry to see vector intersect go. MicroImages is only sorry that vector intersect lived this long. You now need more powerful **GIS** tools for combining complex topological geodata. MicroImages has also learned a lot more about what is needed, and these requirements could only be implemented in a new, totally rewritten processes.

*** Vector Combinations.** *(prototype process)*

The ability to rapidly combine vector geodata including associated attributes/databases is the key to performing complex topological **GIS** analyses. It is one of the important components which makes up a modern vector based **GIS** system. A new process called

Standard Attributes.

The standard attribute table for **CAD** and vector objects now includes the coordinates of a point which is located on the bisection of line elements, including those making up the boundaries of polygons. This new point can be used to place a symbol or label at the middle of lines or the boundaries between polygons.

Import/Export.

* Shapefiles.

These **CAD**-like ***.SHP** files used by **ESRI**'s ArcView can now be imported, exported, and linked to for direct use as a **CAD** object.

Please note that shapefiles use a "loose" data structure and do not necessarily have any closed topological properties and may or may not contain a closed polygon structure. This is why their users and developers continually grumble about "inaccurate area measurements" and other related problems. Shapefiles are equivalent to, and imported into **TNTmips** and **TNTview** as **CAD** objects. If these **CAD** objects are converted in **TNTmips** into vector objects, rigorous topology will be created, and then other vector operations can be applied.

* AtlasGIS's Files.

The **CAD**-like ***.BNA** external or data exchange file formats used by the Atlas**GIS** product, now owned by **ESRI**, can be imported into a **CAD** or a vector object. Only a **CAD** object can be exported to a ***.BNA** file.

The **CAD**-like ***.AGF** internal file format used by the Atlas**GIS** product can be imported and exported to and from **CAD** or vector objects. An ***.AGF** file can also be linked to for direct use as a **CAD** object.

Please note that the ***.BNA** and ***.AGF** files use a "loose" data structure and do not necessarily have any closed topological properties and may or may not contain a closed polygon structure. This is why their users and developers continually grumble about "inaccurate area measurements" and other related problems. Rigorous topology will be created for the ***.BNA** and ***.AGF** files if they are imported into **TNTmips** and **TNTview** as vector objects. However, importing to a **CAD** object may make for easier editing and updating over an image. The **CAD** objects can then be converted into vector objects and rigorous topology created. Whether directly imported as vectors or converted from **CAD**, vector filters and editing can be applied when they are in the form of vector objects.

The documentation of the ***.AGF** internal format was obtained by MicroImages under a non-disclosure agreement signed with Strategic Mapping Inc. months before they sold out the product. For a complete chronological review of the strange odyssey of the migration of Atlas**GIS** to **ESRI**, see the appropriate section in the enclosed copy of the Grapevine **MEMO**.

> Subsetting CAD Files.>

Need. Many **CAD**, vector, and raster files are available for use in **TNTlite** in their original formats via Internet, purchase on **CDs**, professional associates or fellow students, and many other means. However, the extensive **CAD** data available from these sources for student or local projects always seems to be in somebody else's format that would create, upon import, a **CAD** object larger than allowed for use in **TNTlite**. **V5.30** required that a foreign **CAD** file be reduced in size until it could be successfully imported by **TNTlite**. This forced **TNTlite** users to find access to a working copy of that software which created the **CAD** file, learn to operate it, and then reduce the size of the foreign **CAD** file.

Change. It is now possible during import to subset areas from all external or foreign **CAD** file formats supported. This is particularly useful to immediately minimize the size of a **CAD** object to the area of interest when importing it. It also allows subsections of **CAD** files to be directly imported from other foreign formats into **CAD** objects suitable for use in **TNTlite**. If the foreign **CAD** file is georeferenced, then the subset can be selected by geographic coordinates. Otherwise, the subset boundaries can be entered in the coordinates of the external **CAD** file.

Complications. Individual elements in a foreign **CAD** file may be larger in geographic extent than the subset selected. **CAD** blocks and geometric shapes may also be bisected by the subset selected. These characteristics pose problems in subsetting out an area of a foreign **CAD** file during import or any subsequent subset or extraction operation in **TNTmips**. At present they are resolved during import, and anywhere else within **TNTmips**, as follows. Elements which cross the subset area boundaries (e.g. major highways) may be optionally set to be included or excluded from the object imported. You cannot

choose an option to cut elements at the boundary as a foreign **CAD** file as they may be complex block or geometric shape elements which intersect the subset's boundary. If the option is selected to include all large elements crossing the subset area, then the extent for the **CAD** object will be equal to the largest extent of the elements included.

The elements and blocks in a foreign **CAD** file are not geographically ordered, thus it is necessary to process the entire foreign **CAD** file to find out which elements fall within or without the desired subset area. The **V5.40 CAD** import process will now always allow importing from within **TNTlite** and create a **CAD** object. However, the **CAD** object created in **TNTlite** will be limited to the sizes allowed (500 elements and 5 blocks). If the subset selected requires more elements than allowed, the process will not write those additional elements which exceed the limits. It will still run to completion through the balance of the foreign file and write a log file. If any element count has been exceeded, you will be automatically alerted that the log file should be reviewed.

If you obtain a foreign **CAD** file from someone else such as from an Internet site, you may not know anything about it, its coordinate type, reference framework, etc. This data is often not provided within the data structure of the foreign **CAD** file. Thus, the **TNT** products usually have no automatic way of determining some of these descriptive parameters. For example, it may not be possible to determine if all the coordinates in the foreign **CAD** file are from an arbitrary rectilinear coordinate framework (as in a drawing) or in decimal latitude/longitude or a map projection (as in a map). When you wish to import all, and especially a subset, of a foreign **CAD** file, you will need to find and enter this kind of information. You can also experiment with the entry of "best guess" subset coordinates, map projection, and other parameters needed by the import process. After an import, you may be able to review the log files in an attempt to learn this kind of information for the foreign file while homing in on the area of your desired subset.

Log Files. The log file is useful to all clients for any **CAD** file imports. After an import, it contains descriptive information about the foreign **CAD** object and the new **CAD** object created by importing a subset. The information provided for the source or foreign file and the new **CAD** object includes total element count, extent or boundary, projection and coordinate framework, etc.

A **CAD** object will always be created for the subset area, even when **TNTlite** is being used. This **CAD** object may be complete, or it may be at "full" or maximum, and thus incomplete, where elements in excess of the **TNTlite CAD** object limits have not been imported. The log file can be used to determine how many additional elements above the **TNTlite** limits were needed to complete the import for the entire area of the subset. Based upon this information, the **TNTlite** user can immediately define a smaller subset area and try again to insure that the **CAD** object is complete. Even an incomplete **CAD** object can be displayed to assist in selecting a reduced subset area to import a complete **CAD** object fitting within the limits of **TNTlite**, but still centered on the ground area of interest.

MapInfo Files.

An option has been added to export georeference information available for an object as a MapInfo *.**TAB** file. This allows **TIFF** and other raster formats to be immediately used in MapInfo via its "Open Table" operation.

> Subsetting Raster Files.>

During importing, some external or foreign raster file formats can be subset for area by the row/col box. Most satellite image imports have always had this feature. Additional raster import processes have been modified to provide this feature, most notably for the import from **TIFF** files. These changes in raster import are useful to all clients to minimize object sizes needed during import. This subsetting feature is especially handy for users of **TNTlite** who can now extract many 512 by 512 pixel raster objects of many spectral bands from a wide variety of other formats without using the products which created the geodata.

These raster formats can be subset during import (for file size control or use in **TNTlite**).

- **ADRG**
- **ERDAS**
- Photo**CD**
- **TIFF**
- Arc **BIL/BIP**
- **IDIMS**
- Simple Array
- **TM-FAST**
- **AVHRR**
- **LVT**
- **SPANS**
- **TM-TIPS**
- **CCRS**
- MicroBrian
- **SPOT**
- User-Defined
- **ER-Mapper**
- **PCI**
- Terra-Mar

These raster formats cannot yet be subset during a direct import. Some of the more popular of these will be modified to move to the above list during the next quarter.

- **ALDEN**
- **EPPL-7**
- **GIF**
- **PCX**
- **ASCII**
- **GAC/LAC**
- **GRASS**
- Scan-**CAD** *.img
- **ASCII** -X/Y/Z
- Geosoft**GRD**
- Laserscan Scan-**CAD** *.rlc
- **DEM**
- Geosoft**GXF**
- Macpaint
- **TGA**
- **DTED**
- **GGR**
- **NITF**

It is now possible to set the map coordinate units for those foreign formats that provide georeference information without such units, such as **ESRI's** ArcInfo **BIL/BIP** format. Many foreign files are not map production oriented and do not provide the definition of their units or georeferencing. If the foreign file is georeferenced, it may have the definition of its units within the file, and they can be set during import.

DEM/ortho.

Status.

There have been good results reported from the users of the **V5.30** soft photogrammetry process. This has required patient clients and communications back and forth to MicroImages, as the process is complicated to properly apply. These processes have not been changed significantly in the way they are organized or must be run in **V5.40**. However, an internal change has been made in the **DEM** extraction process (Step 2) to produce a significantly improved **DEM**. A supplemental write-up entitled

Stereoscopic Modeling is included to present this in detail with illustrations. A separate black and white plate is attached to illustrate the improvement in the detail of the **DEM** which can be produced.

Detail in the **DEM** is not a critical element in the preparation of acceptable orthophotos, **3D** views, and flybys except for urban areas. However, accurate creation of detailed surface structure in an elevation raster is the key to its subsequent usefulness in applications in geomorphology (e.g. extracting drainage, watersheds. etc.), **GIS** (assigning **Z** coordinates, viewsheds, etc.), and engineering (cut and fill, gravity flow systems, etc.).

* New Correlation.

General Idea. The new **TIN** based cross-correlation option in Step 2 for **DEM** production creates significant improvement in the detail of the elevation raster. Both the **V5.30** area correlation and new **TIN** method may be selected as options as the older method is currently faster. The new **TIN** based correlation method iteratively creates completely new **TIN** surfaces estimating the real surface. The iterations occur differentially over the whole surface (not in successive overall iterations) and use the high speed **TIN** reforming processes added to **TNTmips** over the past 18 months. This differential "surface seeking" or **TIN** surface approximation eventually seeks out and uses the image parallax of subtle terrain features.

TIN Densification in DEM Extraction color plate

Think of the new approach in the terms that each finer, local **TIN** structure fits the surface better and provides a local definition of the local geometry of the image pair. As the local surface is progressively learned, it can be used to constrain the cross-correlation for that local area, improving the likelihood of the correlation identifying and pairing the correct image feature even at lower correlation coefficients.

Fewer Post and Holes. Once the dense **TIN** surface approximation is found, the **DEM** raster object is computed by using one of the available **TNTmips** surface fitting options. The quintic and the minimum curvature surface methods work best. The choice between them depends upon the geomorphology of the surface, so you may want to experiment with both. Creating a dense **TIN** object and the surface fitting significantly reduce the "post and hole" problem resulting from mis-correlated features. This in turn reduces the requirement for any additional surface smoothing, while retaining the terrain's geomorphological details.

Fewer Tie Points. As it proceeds, the iterative **TIN** densification process progressively produces its own tie points relating the geometry of the stereo pair. As it reduces the triangle sizes, the densification process will usually find the well defined (in image feature) tie points of matching geometry which you would have selected in the first place. Therefore, fewer tie points need to be entered at the onset if this new optional cross-correlation is to subsequently be selected.

There is also an option to "Save **TIN** nodes as Tie Points". This will stop the densification process at any specified number of nodes and save them. You can then restart the **DEM** process, select these points as tie points, and directly produce your **DEM** raster object. For example, you could start with 30 good tie points, run the **TIN** densification process to create and save 3000 nodes, and then use these as tie points with the faster area correlation option selected.

Special Areas. As the **TIN** densification process proceeds, it tends to ignore uniform areas such as lakes and uniform slopes because successive, new **TIN** vertex locations tested within such areas produce low correlation and are discarded. However, dense triangles tend to build up around the outside and define the edges of such areas as margins of a lake. Correspondingly, other well defined linear natural features (such as a drainage) also tend to become well defined in the **TIN**, as they contain good correlation points which eventually become closely spaced triangle vertices whose edges accurately define the break of the surface across the feature.

The area correlation method in **V5.30** has special functions to find, isolate, and deal with the actual

surface elevation of lakes and other uniform areas in the **DEM** raster object. These functions are not yet available in the **TIN** densification options, so lakes have good boundary definition, but also anomalous variations in elevation. The elevations of these areas in the raster can be subsequently corrected in the raster editor. Future releases will implement means of automatically controlling the elevation for such special areas as noted below.

Edge Effects. It follows that the **TIN** densification procedure can be improved even further to accept known edge and area information about the surface. For example, the **XYZ** location of a drainage or ridge line could be used as an edge in the **TIN** densification process, where it forms a fixed edge of progressively smaller triangles whose third vertices are not so constrained, and can be sharply up or down on both sides of the fixed edge. This can force in, or preserve the sharp edges and reversals in slope that are present in real terrain (ridges, drainage, cliff, peaks, etc.) that are required in the elevation.

This new approach to surface approximation enables work to begin to introduce known boundary control information into the **DEM** process. Concurrently, more work will be needed to provide the stereo viewing and drawing procedures needed to define the **XYZ** lines and boundaries of observable features.

Sample Application.

During the quarter, two clients submitted special case stereo airphotos which would not work well with the **V5.30** process. These were very marginal stereo situations which would be difficult to deal with by any photogrammetric means. One consisted of two black and white images of an area in the interior of Australia. The only significant topographic feature was a gradual slope from one side of the stereo model area to the other. A very subtle drainage also crossed the area. The area was semi-desert and covered with thousands of isolated large bushes or small trees. The isolated brush elements were dark and covered a total of perhaps 10% of the area with light exposed area of sand or dried grass in between. The slope, drainage, and shrubs could not be seen in stereo when viewing the digital images (original photos were not provided).

The **DEM** prepared in **V5.30** had a series of parallel ripples crossing the area approximately perpendicular to the slope. This artifact was the most prominent elevation feature produced. It resulted from the way the "nested grid cell" cross-correlation method started with large rectangular areas and then consistently focused as it zoomed in on the cross-correlation of the wrong brush elements, all of which look pretty much alike. The new **TIN** method learns the surface geometry as it proceeds from fine to coarse detail during densification and associated cross-correlation. It produced a much better **DEM** with these images dominated by the gradual slope which cannot be readily observed in direct digital stereo viewing.

SML.

You can now specify the type of subobjects to copy in CopySubObject. This is controlled by an additional, optional third parameter. For example, to copy only the colormap from Raster1 to Raster2:

```
CopySubObject(Raster1, Raster2, "Colmap")
```

The list of object and subobject types can be found in the on-line documentation.

New Authorized Microlimages Dealers

France - TTI Production.

Microlimages is pleased to announce that **TTI** Production (Teledetection & Traitement D'Images) has become a Microlimages Authorized Dealer. Founded in 1994, **TTI** Production is located at 4 Place Questel, 30900 Nimes, in southeastern France. **TTI** has another office in Pau in southwestern France. **TTI** is owned by Jean Quaille and David Loy, who can be reached at voice (336)621-2025 and **FAX** (336)621-7360. Jean, as a principal in another company, originally introduced **PCI** products to France

and significantly expanded their user base. Fortunately for MicrolImages, he has chosen the **TNT** products for his newly formed firm, which will address the second generation market for integrated **GIS** and **IPS** systems in France and Northern Africa. **TTI's** principal's previous background is in remote sensing and **GIS** applications in geology for such organizations as Elf, the French Army, French Metro and in the Congo and Nigeria as well as all across France. MicrolImages is sure our existing French clients will find it pleasing to work with Jean, David, and their staff.

Mexico - CEGG, S.C.

MicrolImages is pleased to announce that **CEGG, S.C.** (Consultoria y Evaluaciones Geologicas Guanajuato) has become a MicrolImages Authorized Dealer. **CEGG** is owned by Juan Estaban G. Dobarganes B., and is located at Boulevard Guanajuato 9, Col. Loma Bonita, Guanajuato, 36000 Gto., Mexico. Juan can be reached at voice (524)732-5602 and **FAX** (524)732-3864. He is also a faculty member in Geology at the University of Guanajuato. Juan is well known to MicrolImages and others of you from the time he spent with Dr. Jack Paris at California State University at Fresno where he used old **DOS MIPS** extensively in his thesis research project. His personal area of expertise is in the application of remote sensing and geology to locating water resources and minerals in the arid areas of Mexico. Juan will now be making his expertise available to others by providing solutions using the **TNT** products.

Greece - Dienekis Information Systems S.A.

MicrolImages is pleased to announce that Dienekis Information Systems S.A. has become a MicrolImages Authorized Dealer. Dienekis is directed by Vogelis Rizos and is located at 354 Mesogion Avenue, AG. Paraskevi, Athens 15341, Greece (additional offices in Salonica). Dienekis was founded in 1988 and is a member of a closely held group of five companies, including Komvos S.A. in construction, Technologica Systems S.A. selling workstations and **PCs**, Financial Systems S.A., and Hellasnet offering Internet access and related network services. V. Rizos can be reached at voice (301)654-66757 and **FAX** (301)653-5734. V. Rizos and the Dienekis staff sold the first **ERDAS** system in Greece and the first Arc/Info using the now historical Prime computer. Since that time, this group has had extensive experience in this area with clients in the Greek Army, Navy, mining industries, municipalities, and so on with all levels of computer installations. It is with pleasure that MicrolImages announces that their choice is the **TNT** professional products.

Maryland - ABAX, Inc.

It is with singular pleasure that MicrolImages has the opportunity to introduce a brand new U.S. company as a MicrolImages Authorized Dealer. Those of you who attended MicrolImages' Annual Users' Workshop in January had an opportunity to meet Bart Mathews, the **GIS** coordinator for Carroll County, located just east of Baltimore and north of Washington **DC**. At the workshop, Bart made a presentation on the design of the 31 station **TNTmips** and **TNTview** system now in operation built up by him and his staff over the past five years in the Carroll County government offices. Bart and Kevin Stevens from the county **GIS** group and Robert King from the county **MIS** group have now formed **ABAX** Spatial Information Technologies Inc. to carry their ideas forward into other counties in Maryland and surrounding states' county and municipal governments. Bart and Bob can be reached at **ABAX**, 2065 Brick Church Road, New Windsor, **MD** 21776 and voice and **FAX** at (410)857-0230. All of us at MicrolImages appreciate the confidence you have and are showing in our products and efforts.

New Image Printers/Plotters Supported

No new printers were directly supported during this quarter.

New Scanners Supported

No new scanners were directly supported during this quarter.

Computers

Pentiums.

This quarter three Gateway computers are outlined. The first is the top of the line platform which consistently comes in as usual at just less than \$4000. This machine has moved up to 200 Mhz, 2.5 Gb of hard drive, and with an integrated **CD-Recorder**, which is becoming more and more useful to more and more **TNTmips** users. The second illustrates the low-cost personal version of a powerful Pentium platform which will run **TNTmips** like a workstation. The third is a low-cost Pentium Pro using the **P6** chip. Gateway continues to have the best for the least!

Remember that all the **TNT** products have been fully 32-bit (and 64-bit for **DEC Alpha** via **UNIX**) compliant for years. Therefore, they will take full advantage of the 32-bit execution optimization features designed into the Pentium Pro processor. The slower aspects of other's 16-bit programs affect only those programs and not the **TNT** products. **W95** also contains quite a bit of 16-bit code and runs about the same on a Pentium Pro. However, **NT3.5x** and **NT4** use only 32-bit code and will also benefit significantly from the 32-bit optimizations built into the Pentium Pro platforms.

Gateway **P5-200** (\$3899)

- Intel 200 Mhz Pentium
- 16 MB Synchronous **DRAM**
- 512 Kb cache
- 2.5 Gb 11 ms **EIDE** hard drive
- 17" Vivitron Color (.26 dp) Monitor
- 64-bit **PCI** bus based display
- board w/ 2 MB **WRAM**
- **CD-Recordable** w/ **SCSI** Controller
- 8X **EIDE CD-ROM** drive
- 3.5" diskette drive
- 12-bay tower case
- keyboard and **MS** mouse
- **W95, MS** Pro. Office (w/ Access db)
- 3 year parts warranty
- Gateway **P5-133** (\$1899) Gateway **P6-180** (\$2499)
- Intel 133 Mhz Pentium Intel 180 Mhz Pentium Pro
- 16 MB **EDO DRAM** 16 MB **EDO DRAM**
- 256 Kb cache cache ?
- 1.6 Gb 9 ms **EIDE** hard drive 2.5 Gb 11 ms **EIDE** hard drive
- 15" Vivitron Color (.26 dp) Monitor 15" Vivitron Color (.26 dp) Monitor
- 64-bit **PCI** bus based display 64-bit **PCI** bus based display
- board w/ 2 MB **WRAM** board w/ 2 MB **DRAM**
- 8X **EIDE CD-ROM** drive 8X **EIDE CD-ROM** drive
- 3.5" diskette drive 3.5" diskette drive
- 7-bay tower case 12-bay tower case
- keyboard and **MS** mouse keyboard and **MS** mouse
- **W95, MS** Pro. Office (w/ Access db) **W95, MS** Pro. Office (w/ Access db) 3 year parts warranty 3 year parts warranty

Portables.

The best high-end portable computer is still the same Toshiba as previously.

- Toshiba Tecra **720CDT** (\$?)
- Intel 133 Mhz Pentium
- 16 MB **EDO RAM**

- 256 Kb level cache
- 1.2 Gb removable hard drive
- **PCI** system bus
- 12.1" display of 1024 by 768 pixels
- 64-bit graphics accelerator
- full-motion video
- 6X **CD-ROM**
- 28.8 **FAX**/modem
- 16-bit sound blaster
- 2 **PCMCIA** card slots
- Infrared data port
- button mouse
- **W95**
- 3 year warranty

Promotional Activities

TNTlite promotional flier.

A new flier to promote **TNTlite** is enclosed with its insert coupon describing its download location and **CD** ordering procedures. Recently more than 20,000 copies of this flier have been distributed to Microlimages' internal inquirers master 12,000 entry list (8 years of records), 4,000 predominantly U.S. geography teachers interested in **GIS** in higher education, 6,000 mining companies in the Randol Mining Guide, and 1,000 agricultural managers. The standard small **TNT** products flier distributed with **V5.30** was also enclosed. Usually a third item was enclosed to relate the mailing to the particular interest area of the specific mailing list. For example, the enclosed piece entitled **Free Precision Farming** was added if the mailing was to an agriculturalist.

Over the next several months, this same flier will be distributed in a similar fashion to 6000 parties in archaeology, 4000 agronomists, 1000 agricultural consultants, 5000 selected geoscience teachers, 1000 international geoscience agencies, and so on.

Reward for published papers.

A Microlimages **MEMO** is enclosed entitled Reward for Published Papers and dated 10 June 1996. It describes a program whereby Microlimages will reward the author of each qualifying paper with a \$2000 cash payment. This is to encourage clients to publish results and to reward those who do for the positive publicity this brings to the **TNT** products. Anyone is eligible for this reward, including Microlimages staff, students, and users of **TNTlite**.

Free Precision Farming Software.

Microlimages has concluded that the **FREE TNTlite** products are very useful in the new area of Precision Farming. As a result, the enclosed long press release or short article outlining this application was written. Microlimages would like to use **TNTlite** via practicing farmers and related agriculturalists as a means of widely distributing **TNTlite**, and thereby knowledge, about the existence of all the **TNT** products.

TNT Product Information folder.

A sample of the new **TNT** products Information folder is enclosed. Unfortunately an error was made at the printers in the paper weight and too light of a paper stock was used, making the folder a bit flimsy. This folder is used to organize the detailed product folders, sample illustrations, and other materials provided by Microlimages in our larger envelope to each party who requests information on the **TNT** products. For the time being this same folder of material is being provided with each direct order to Microlimages for the **TNTlite** kit by a professional.

DCW sample map.

An 8 1/2 inch section of a larger regional reference map prepared from the standard Digital Chart of the World is enclosed. This segment illustrates the kind of reference map which can be easily prepared from this worldwide geodata set. It also illustrates a product which could have been totally prepared within the **TNTlite** version of **TNTmips** and printed on a low cost color printer.

Prices

Product Trade-ins Sought.

During the past quarter, MicroImages has accepted one of a kind software transfers (trade-ins) of current systems from dissatisfied users of our competitors' products. These new clients received full credit toward the purchase of the MicroImages products for the purchase price of their other systems if they were current. We still need a trade-in of one each of the following products: Arc/Info on a **UNIX** platform, **ERDAS** on a **UNIX** or **NT** Platform, Tydac-**SPANS**, and **ER Mapper** on a **UNIX** or **NT** platform.

Your proposed trade-in product must meet the following conditions.

It is the current version of the product.

Your license to the product can be legitimately transferred to MicroImages so that future upgrades for the product can be subsequently purchased directly from its manufacturer by MicroImages. For example, a discounted educational product probably could not be transferred or upgraded. You will need to check how you got your version, the license which you signed or accompanied it, or with its manufacturer.

The original invoice showing the actual price you paid for the product is available to establish your trade-in allowance.

General Reference.

An excellent technical reference book is available for those interested in integrated use of **GIS** and image analysis. It is Geographic Information Systems for Geoscientists: Modeling with GIS. Vol. 13 of the Computer Methods in the Geosciences. Graeme F. Bonham-Carter. 1994. Pergamon Press. 398 pages.

This book is profusely illustrated in color with example results from a wide variety of sample projects. These examples and illustrations were completed with other commercial software. However, the book is highly recommended for the serious **TNT** client, as it generally focuses upon concepts and results and not upon specific methods.

When reviewing this book, you will find that almost all of its examples could be completed with **TNTmips**. More importantly, almost all the examples could be completed with data sets whose sizes would fit within the limits of **TNTlite**. Thus, this book could serve as a text for a geoscience course using **TNTlite**. It would only be necessary to prepare local geodata sets fitting within **TNTlite** and illustrate the same concepts with more interesting local geodata.

The table of contents of this excellent reference is enclosed for your review. It can be directly ordered with your credit card by selecting the category of "**GIS**" at:

<http://www.elsevier.com>.

Direct access can be gained via:

<http://www.elsevier.com:80/catalogue/sal/560/18410/18410/30523/30523.html>

Other more traditional sources for ordering this book are:

US from Van Nostrand Reinhold Co. Inc., 7625 Empire Drive, Florence, KY 41042,

UK from Elsevier Science Ltd., The Boulevard, Langford Lane, Kidlington, OX5 1GB, and

Japan from, Elsevier Science Japan, Tsunishima Building Annex, 3-20-12 Yushima, Bunkyo-ku, Tokyo 113.

PC Magazine.

Pentium Classic: Still the One. *With enough power to handle today's applications, the Pentium Classic still reigns as the right choice for the most users.* **PC** Labs tests 101 Pentium-class machines - ranging from 120 to 166 Mhz -using both 16-bit applications and the new 32-bit **ZD** benchmark program, Winstone 32. by Robert Anthony etal. *PC Magazine*, Vol. 15, No. 12. June 25, 1996. pages 102 to 171.

HP DesignJet 755CM: The Long and the Short of Poster Printing. by Daniel Grotta and Sally Wiener Grotta. *PC Magazine*, Vol. 15, No. 12, June 25, 1996. pages 48 to 51.

[Toshiba] Tecra 720CDT Sacrifices Size and Weight for Groundbreaking Video. by Jan Ozer and Brian Nadel. *PC Magazine*, Vol. 15, No. 12. June 25, 1996. pages 39 to 41.

Portable Property. *PC Labs tests 58 presentation, value, and lightweight Pentium-class portable PCs to see which ones deserve a place in your briefcase.* by Cade Metz. *PC Magazine*, Vol. 15, No. 14, August 1996, pages 100 to 195.

Staff Additions

Anne Pamperl has just joined MicroImages as a scientific writer. She completed a Bachelor of Arts in Biology in 1976 and a Master of Arts in Biology in 1980 at the University of Missouri at Columbia. Anne's areas of expertise and experience are the writing and editing of many proposals, scientific, and environmental reports. She has also been involved in public relations and administration in previous positions. Prior to joining MicroImages, Anne was employed by the Nebraska Department of Environmental Quality, conducting oversight review of Superfund Site projects and writing reports. Her previous professional positions were in environmentally related activities at **EA** Engineering in Lincoln, Carolina Power and Light, and Westinghouse Environmental and Geotechnical Services. Anne will be working on the **TNT** product documentation as well as other writing projects.

Dr. Randall Smith (Randy) has just joined MicroImages as a scientific writer. Several of you are already acquainted with Randy as he has attended a previous MicroImages Advanced Users' Workshop as a client. Randy has been working with **TNTmips** and Dr. Jack Paris at California State University at Fresno since 1992, so he knows the **TNT** products very well. Concurrent with this activity and earlier, he kept his hand in teaching as a Lecturer and Visiting Assistant Professor of Geology at Tulane, Sonoma State, and California State University at Fresno teaching structural geology, sedimentary petrology, marine geology, and tectonics and sedimentation. For four years previous to this academic career, Randy was an Exploration Geologist with Sohio Petroleum Company in Denver and Dallas. His academic credentials are an A.B. in geology from Cornell University in 1974, a Master of Science degree at the University of British Columbia in 1979, and a Ph.D. in Earth Science from the University of California at Santa Cruz in 1983. His dissertation title was Geology of a Miocene Collision Complex and Associated Synorogenic Clastic Strata, Buton, Eastern Indonesia. Randy states his own personal interests at present are in geological applications of remote sensing, image processing, and geographical information systems. In addition to adding to the professional written materials available from MicroImages, Randy has also expressed an interest in providing professional training in the use of the **TNT** products.

Students. A number of students with varying backgrounds were employed by MicroImages this quarter to assist in the preparation of material and the layout of the web site, mass mailing preparation, and other related utility work. They include Tim Frentz, Bess Ghormley, Ryan Johnson, Chad Lauritsen, L.D. Miller, and Judy Shay.

Testimonials

The following are some of the comments to MicroImages during the last quarter exactly as written except for the [edit] alterations in [brackets] to keep them anonymous. Obviously many more comments are received by MicroImages by voice but cannot be reproduced here verbatim as quotes. Please note that these quotations are not edited from their original form in spelling, grammar, punctuation, etc.

from a FAX from an Australian client on 13 April 1996.

*"I received the **ADB** key in exchange for the parallel key and am pleased to report that **TNTmips** is now running on a Power Mac. Thank you for providing the option to exchange keys so that this was possible."*

"To date all processes that I have tried, have performed as expected. I look forward to the continued refinement of the product."

[Note that this long-term client was able to switch from **W95** to the MacOS and immediately continue to use **TNTmips**. No relearning was involved to change platforms.]

from FAXes from an international representative. (using **V5.20**)

FAX before ordering on 4 March 1996.

"I think that they are also wanting to see what they are into before committing to larger amounts. They have, unfortunately, been 'stung' by certain other software vendors, so I can understand their caution. AutoCAD flatly refused to give them support with certain data-import problems, leaving them 'up the creek, without a paddle'."

FAX after training on 13 April 1996.

*"Just a brief note to keep you informed on developments at [a name]. Our office renovations are thankfully, almost complete so I can now devote more time to actual business matters. I have just returned from a very successful trip to [a country], where I delivered and installed [a new client's] **TNTmips** system. I would like to complement you and your team on a most excellent product. It was a privilege and a pleasure to represent such a refined software package. The whole week I was there we encountered only one minor bug. The [new client] has installed Pentium 133 machines, and both myself and the people I was training were impressed with the performance and speed of all the **TNT** processes we worked with. It was obvious that the **TNTmips** code has been designed for the machines of the future, and now that fast desktop machines have arrived, the software is able to deliver the performance that is needed for **IP/GIS** tasks."*

*"The [client] personnel were impressed with the ease of operation and user friendly interface of **TNTmips**, although being somewhat overwhelmed by the scope of the product. Within a day or two we were able to import or link to their existing databases and **CAD** files; their realization that they would not have to recapture all this data, but that their datasets were immediately available within **TNTmips**, providing the foundation for their **GIS** database, was a big plus for this client. When we were linking to a **DXF** file containing all the [client's] infrastructure data (8Mb), the [manager] remarked that he would be most surprised if this worked, since no other package had been able to import their **CAD** (other than **AUTOCAD** of course). After a minute or two we had the **CAD** imported and displayed on a georeferenced orthophoto image with exact registration. The [manager] then remarked that the money spent on the purchase of **TNTmips** had been fully justified with that one successful import! The*

*pinmapping process is also a boon to them, as they can now visualize their data as they have never before been able to do, and they are able to show management in the simplest graphical terms exactly how various key environmental parameters are behaving on a monthly basis. I left there with the feeling that [the clients] believed they had found a software tool that met their requirements and would open up many new possibilities for environmental management and analysis. I know that they were very keen to get started, though somewhat apprehensive about where they were going to find the time to fully utilize the functions of **TNTmips** within their busy schedules!"*

[The bug noted above was the need for a special coordinate system for this country which can be described and therefore used by entering its parameters in the User Defined projection system.]

from FAXes from an international representative on 12 April 1996. (using **V5.20**)

*"Several persons are working at [a client site] and they are all using **MIPS** [**TNTmips**] on Sun. They are scanning contour maps and polygon maps by themselves using an **A0**-size scanner and converting to vectors by **MIPS**. They are readily using **MIPS**!! Where is Erdas! Where is ArcInfo!"*

[The client site has multiple **ERDAS** and Arc/Info units purchased before **TNTmips**. Follow-up **FAXes** to this representative have identified that the use of these products has been reduced. They can be beat in a fair head-to-head comparison by staff who want to get work done rather than protect an empire!]

from email from a Uganda client on 30 April 1996. (using **V5.20**)

*"There is a third problem that cropped up recently: I bought printers drivers from **TNTmips** (level **D15**) about one year ago. I have been plotting [printing] map posters (up to **A0**) from **TNTmips** since then. It also happens one of our staff member is using arc/info and when she tried to plot an 11Mb of arc/info plot file, the plot [printer] (**HP 650C DesignJet**) displayed an error message that it was out of memory. **TNTmips** was able to handle even bigger files with only 4Mb of plotter [printer] memory without any problem. Plotting large files would be managed by **TNTmips** with the following message on the front panel of the plotter: receiving and plotting. But it would perfectly plot the file!"*

*In order to overcome the plotting the large Arc/Info plot files, we upgraded the plotter memory to 32Mb. In addition, we found out that the purchased plotter from the **USA** came with the so called Adobe printer drivers on a floppy, but also some sort of chip processor. We installed it. Guess what happened next! **TNTmips** refuse to plot map! Surely I do not know what happened. The print file is still made in **TNTmips** (takes about an hour for my size/number of layers of my poster) and it attempts to print. This time the message is 'receiving' continuously and then plotting. However, when it starts plotting, the ink cartridge vibrates at only one position as blank paper is quickly pushed out of the plotter. **TNTmips** then reports then printing is over, indicating time. I am yours."*

[One wonders at this point how things worked out for the ARC/INFO user after the upgrade. But, it goes without saying that we try to do it better and cheaper than ARC/INFO. This client's associate could probably have purchased a complete **TNTmips** software package for the price of adding this much memory to the **HP** printer for what **HP** charges for special add-on memory.]

[MicroImages' Software Support responded with advice on things to check on the setup of the printer. They were now trying to print from **TNTmips** via Postscript without changing the printer definition from direct print.]

email response from the same Uganda client on 2 May 1996. (using **V5.20**)

*"The second problem was failure to plot **A0** maps using **HP Deskjet 650C**. This has been solved! One of our staff had changed rotation of the map to be printed (90 degree). It was because of that that no printing could be effected from **TNTmips**. However, after my colleague recalled that she had indeed made some changes on the printer itself, we put it back to 0 degrees and I was able to print in **TNTmips**."*

from a **FAX** from an international representative on 26 April 1996.

*"Today I send a message to the [a University]. They are involved in the **UNIGIS**-courses for the German speaking countries (around 400 students). They have there a very good server with information concerning **GIS**. The head [a name] (I know him quite good) asked, if it is possible to copy **TNTlite** on there (**WWW-FTP**) server."*

*"Please inform me, if it is possible. If your answer is yes, I will send him a **CD-ROM** directly after getting from you a copy [was waiting for **V5.30** to arrive]"*

from a **FAX** response from Microlimages on 30 April 1996 to the above request.

*"Microlimages does not see any difficulties with the request from the [a University]. This is one of the ideas that we had in mind. Note that in order to make [it] available for all of the platforms, that [the company] can loan the University the **B** disk of your release materials. Note that if you provide a complete mailing address for [a name] that Microlimages will send a complete set of version **5.30** (disks **A** and **B**) free of charge."*

[This is how we designed the **TNTlite** program--anybody, anytime, anyplace, anyway.]

from a **FAX** from an international representative on 7 May 1996.

*"I received my copy of **v5.3** four days ago and have been using it solidly ever since. It has some great new features."*

from a **FAX** from an international representative on 8 May 1996.

*"The new **TNTlite** product is just what I needed out here in the flooded land of **ERM** [ER Mapper]. I intend to have it in all the Universities in the next few weeks... the price is very attractive to them !!!"*

*"The feedback I am getting on **ERM** is that even though the image processing capabilities of **ERM** are good that it does not fill the total requirement. This of course is a comment made after they have purchased and really tried to put it to work. With **TNTlite** we are now able to offer them something they can play with without having someone breathing down their necks. I intend to supply it selectively to a number of mining companies."*

from email from a South African client on 13 May 1996.

*"This message has a twofold purpose. First, to send a message to the listserver now that it is operating correctly and second, to inform you that the **TNTMips** link to Atlas**GIS** is working very well. I am really looking forward to the HotLink between **TNTMips** and Atlas**GIS**. Microlimages well done on the link - please keep us informed as to when we can access completed **TNTMips** - Atlas**GIS** link."*

from email from the same South African client on 14 May 1996.

*"Presently, I must say that I am very happy with **TNTmips** especially its stability, speed and functionality. The fact that Microlimages puts out a new release one a quarter is a major plus for the company, its user and the **GIS** industry in general. The release of **TNTlite** is also, I believe, a fantastic idea. [A name] is a distributor of Atlas**GIS** in Southern Africa and they will definitely exploit this offer of **TNTlite** and distribute it to many many institutions throughout the country."*

"From what I can gather, Microlimages is going from strength to strength and I am pleased that our company is a major user of your products."

from a **FAX** from an international representative on 13 May 1996.

*"Congratulation by the idea of **TNTlite**. I think other systems like **IDRISI**, free license of ArcInfo and Erdas will disappear. **TNTlite** is already installed in the [a national university]. Other schools of the university are very interested to use **TNTlite**. The [geography department] have big plans to teach geographic information system in some of courses using **TNTlite**. **TNTmips** will be very popular between the future professionals and increase the growing potential."*

*"I think **TNTlite** have a big advantage over free license of ArcInfo or Erdas for the university. The first point is **TNTlite** is FREE. No limitations in the number of users. A whole class have use it and continue use **TNTlite** at home. The limitation of raster size and vector polygons number is enough for docent purpose and **TNTlite** is very easy to use, no need complicated command to use like ArcInfo. The license of ArcInfo have an hi cost, because only expert users can use, ArcInfo **PC** is very limited and is not useful tools for teach purposes."*

*"[The representative] are preparing [national] data set to use with **TNTlite**. The idea is sow the power of **TNTmips** and use the data set for training purposes. I order to Terry 60 **TNTlite** to distribute between interested people."*

from a **FAX** from international representative on 16 May 1996.

*"I have a good feeling about **TNTlite** and it is amazingly easy to 'sell'! People don't hesitate to spend [US \$25] for the two **CD**'s - i.e. a split second decision! The good thing is that people are really buying and learning **TNTmips**. Now just a matter of waiting until people are convinced they should but the full version for their work. It will be interesting to note the lead time for people who purchase **TNTlite** and then decide they need **TNTmips**."*

*"From our point of view **TNTlite** could not have been released at a more opportune time."*

from a **FAX** from an international representative on 16 May 1996.

*"The **TNTlite** product is a coup! My partner and I have been discussing our vision of **GIS**, and **GIS** training for a while now, and reading our notes in the release **MEMO**, regarding your philosophy and approach to **GIS** (Geomatics! I agree) and its future place in the workplace and home, was like a summation of our own goals, and visions of where **GIS** is headed (or should be headed). I have no doubt that the **TNTlite** product is going to be a major success story, and will mark the real turning point in the history of desktop mapping systems. Once again, your competitors are going to have to 'play follow my leader', but I'm not sure if they can in this case."*

from a **FAX** from an Australian client on 17 May 1996.

*"[A company name] purchased **TNTmips** from [a Dealer], and I'm pleased to say we are most impressed with your product. The fact that we have been using the software since March without cause to contact your Technical Support service also compliments your documentation."*

from a **FAX** from an international representative on 17 May 1996.

*"We have been using **V5.30** at least 12 hours per day since it arrived and are pleased with the new features and stability. We have made good use of the thematic styling facilities since they appeared in the beta release. Is it my imagination or is version **5.3** faster than version **5.2** and the **5.3** beta?"*

[MicroImages has no explanation for apparent speed increase.]

from a **FAX** from a Kazakhstan client on 18 May 1996.

*"First let me say how pleased I am with version **5.3** of **TNTmips**. It is becoming a very powerful system for our purposes. I was particularly pleased to find geological fill patterns. Are geological symbol and line*

patterns in the pipe line?"

[Unfortunately such standard symbols are not yet available and require additional software development.]

from a **FAX** from an international representative on 18 May 1996.

*"**TNTmips v5.3** is working pretty well. Thank you for a magnificent software system."*

*"I used Arc/Info during three years before I changed to **TNTmips** and I wouldn't change back to Arc/Info in any case!"*

from email from Spain on 20 May 1996.

*"Last week I received the **CD-ROM** with **TNTlite** as well as some documentation about your products. The package is really nice. I installed it into my Power Mac at 90 Mhz and it is running fine. I also return to MicroImages the registration card. I plan to use the program for some weeks to exercise myself and to make plans for upgrade to the full version. Many thanks for your kindness."*

from email from a South African client on 31 May 1996.

*"Please let [a name] know I have designed a course using MicroImages comprehensive documentation and we are successfully using **TNTlite** to train all of our **GIS** staff on **TNTmips** now. **TNTlite** is a fantastic idea and I am sure that it will help leverage **TNTmips** much further into the **GIS** market where it deserves to be."*

from a **FAX** from an international representative on 8 June 1996.

*"I was asked to visit the [an organization] which has a **TNTmips**. [They] bought a **TNTmips** to bring **IPS** software with his Windows **95** laptop to take to [a country]. His boss is [a name] and Chief of the Remote Sensing Lab. This lab is a big **ERDAS** site in [this country] using four or five license."*

*"It seems that they had tried to conduct an image processing demo using **ERDAS Imagine NT** (I do not know if they bought it or it was loaned to them) for a visiting dignitary. The machine they were using was a Pentium Pro (200 Mhz) using our national version of Windows **NT**. Though Imagine was installed on the machine, they were told by the **ERDAS** dealer that the reason it would not work was that Imagine did not support the new video display board (they said it was an **MGA** or something). So [the client] called me suddenly the day before and asked if I could do a demo using their **TNTmips**. [The client] was not very familiar with **TNTmips** and so the objective of my visit was to make the installation and do some demo."*

*"Installation of **TNTmips** was so easy. **ERDAS Image** is using the same Sentinel parallel key so I did not need to install a driver. I just ran **SETUP_NT** which installed **TNTmips**. Then I imported the **ERDAS LAN** file (5 band) and **DISPLAY2Ded** it. They asked to do the unsupervised classification first, so I did and showed the result, **DISPLAY2Ded** the original raster and the classification result by opening two windows separately and geographically locked them together, just like **ERDAS**. Then I did a supervised classification (Max likelihood), and before that I showed them how to make training data using **FEATURE MAP**. They seemed impressed for the easy operation of **TNTmips**, then I did the classification and showed the results. Then they asked how to attach ground control points using a reference map so I showed them **GEOREFERENCE**. They said this operation was easier than **ERDAS**. We have heard this same input from [another client]. They had forgotten how to do this same georeferencing in **ERDAS** three days after they had put in a lot of effort learning it. They seemed satisfied and gave **TNTlite** to the visitor who said he would attempt to find the money to buy **TNTmips**."*

from a posting to **TNTtalk** from an international representative on 8 June 1996.

*"we use **TNTmips** at least 12 hours a day seven days a week and in three weeks we will officially become resellers [dealers] for MicroImages."*

from a **FAX** from an international representative on 12 June 1996.

*"I have also just heard that a [technical school] group in [Australia] have chosen **TNTlite** over an **ERMapper** special deal for their Cartography, **GIS** and Remote Sensing courses. Hopefully this will be the first of many."*

from email from a **TNTlite** recipient on 13 June 1996.

*"I was very impressed to receive the packet with **TNTlite** as a marketing tool. Very well done. I like the idea of full functionality with a 512 x 512 and I believe 7-bit limit. Excellent for training and introducing the technology! And the **CD** was appreciated (I will look for a portable **CD** to hook up to my Power Mac 7100/66 here at work so I can load it."*

*"I am supervisor for [a major oil company's] significant remote sensing effort - based out of [a state] but serving our business units worldwide. We have lottsa hardware and software, but I have always been intrigued by your operation. [A name] gives you very high marks. I know nothing about you but read your **TNTlite** literature cover-to-cover."*

*"I visited and gave demo/lectures/lead discussions at over 15 universities across the **USA** the past several months as an American Association of Petroleum Geologist (**AAPG**) Lecturer. The topic was practically using remote sensing and associated technologies (**CAD**, **GPS**, **GIS**, and **DEM**'s) for geological and environmental applications. I was using a **PC** laptop with **PCI**'s Handler and ArcView demos. My message was that now was the time to use **PC**'s and friendly software to get into remote sensing."*

*"At the time of the tour I did not have access to **TNT** products. Since then I have taught a course at a **GSA** conference and most recently at the National **AAPG** conference. I may be teaching a course at the National **GSA** in Salt Lake City in '97. I have written a coursebook and use georeferenced Landsat **TM**, scanned topo & geologic maps, and **DEM**'s of the Salton Sea area (a large overview about 2000 x 2000 and a smaller version 1024 x 1024 - all are georeferenced in **PCI** format). I am interested in reducing the size of my digital data to fit **TNTlite**'s requirements. The **TM** data are older than 10 years so there is no copyright on them - free to give away to inspire students, faculty, and small business people - much like your philosophy! And the **TNTlite** software is free. Looks like a winner to me!"*

*"I feel quite frustrated that most of the students cannot interact with the digital data I am willing to leave with them because they cannot afford the software with the necessary functionality. I leave it with the schools for loading on their **UNIX** client-server set-ups, but that is very restrictive and not very constructive for the students. I hope **TNTlite** supports georeferencing so when roaming the imagery sees Lat/Long or **UTM** coordinates instead of irrelevant line/sample #...?..."*

*"For image processing, I am most familiar with **PCI**, **ER-Mapper**, **ERDAS**, and **ENVI** (we still run bankrupt Terra-Mar software (Microimages) on a beefed-up 486...it does an excellent job with colors!). We use Microstation & Auto**CAD** for vector work. And we use ArcInfo & MapInfo for **GIS**. However, it may be that for my teaching and intro work, **TNT** products are the best solution for me...maybe there is even a place in the company for the **TNT** products if we figured out how to use it!"*

*"I would like to receive a copy of **TNTatlas**...Prototype 2. It is of my backyard out here and may be very convincing! We give a lot of tours to government & industry people from around the world."*

"Thanks for listening. Keep up the good work. I am on the road for a couple of weeks, but hope to see a package or some note from you on my desk when I get back."

from an Internet **GIS** newsgroup posting from Sweden on 18 June 1996.

*"A recent posting to this list promoted the **TNTmips**, as an alternative to MapInfo or the software from **ESRI**."*

"This looked promising, and they even offered a lite/demo version available for download."

"But beware - they must be joking - I found that the downloadable executable for my Win3.x system amounted to 62 MB !! (sample data was 10-20 MB !!). Now, who would expect it possible to perform such a download without time-outs!"

"I'd never make it, in spite of a reasonably fast leased line to the Internet."

[First, in no way has MicroImages ever claimed that **TNTlite** was some kind of trivial demo program. Our passouts and web site are pretty clear on what it is. Second, this individual's slow and unreliable Internet access (regardless of what he says) is a problem of his local service provider and his organization, certainly not MicroImages. Inability to reliably download large items via Internet does not make **TNTlite** any less free or useful. Those with high speed access to the Internet, such as universities and related, are downloading routinely. Anyway, the following was the response to this from someone else.]

[However, we do listen, so this posting did cause MicroImages to implement the piece-by-piece downloading procedures noted earlier.]

from an Internet response from Tasmania posted on 18 June 1996.

*"They will supply it on **CD-ROM** for basically the cost of freight, and registration gets you one free upgrade, i.e. saves you the cost of another lot of freight! Its a pretty good deal, especially since all your friends/students can then copy the **CD-ROM** legally for nix."*

[Obviously, this party can read and understand. MicroImages has no **TNT** professional products installed in Tasmania. Neither this party nor his organization are clients of MicroImages. MicroImages also has no previous contact with them and did not supply them directly with the **TNTlite CD** which they must have obtained via a dealer.]

from an Internet **GIS** newsgroup posting from Texas on 18 June 1996.

*"Well, I sure hope you guys are for real. I am an Atlas**GIS** user and a fairly dedicated one at that. When I saw a message placed on [a name's] list I was intrigued enough to give you guys my credit card number and order **TNTlite**. It sounds like a great product and look forward to trying it out."*

from email from a South African client on 19 June 1996.

"Dear [a name]"

*"Thought I would give you some information on **TNTmips** as a user of both of it and Atlas**GIS**. We are presently working with the people at MicroImages to get a 'hotlink' between Atlas**GIS** and **TNTmips**. The import routine works like a dream and once in **TNTmips**, there are no end of things that can be done in **TNTmips**. Types of things that can be successfully done in **TNTmips** include routing, Voronoi regions, full vector editing (splining, thinning, sliver polygons, etc.) and many more functions. In fact, **TNTmips** seems to have taken a couple of pages out of Atlas's book."*

*"The end result is that Atlas**GIS** has a 'big brother' which gives a lot more functionality. In my opinion, the combination of Atlas**GIS**'s user-friendliness in the desktop environment and **TNTmips** in the full **GIS/CAD**/raster environment is a world beater and is only something that Arc-Info/**ERDAS**/Arc-**Cad**/ArcView users can dream about. On the other hand, as a user I could be 'biased'. Nevertheless, I thought you might be interested to hear from someone who is a user of both systems."*

"Cheers"

from email from a professor from Spain on the dates noted.

on 20 June 1996

*"I am a professor of geography in the [a University]. I am very interested in **TNT** for Windows **NT**. Please, send me more information about this **GIS** software, (Price list please) and his integration with remote sensing software (**ENVI**, **ERDAS Imagine**, **EASI-PCI**, **ERMAPPER**)."*

[This individual seems acquainted with and experienced with the use of a number of commercial image processing packages.]

on 20 June 1996

[Later in the day this professor discovered the order form on the home page at microimages.com and filled out and emailed an order for **TNTlite**. He supplied a credit card number for \$50 and requested that it be sent via air express.]

on 21 June 1996

[A **TNTlite** kit and the standard collection of promotional materials for the **TNT** professional products were shipped out from MicroImages.]

on 23 or 24 June 1996

[These materials should have arrived in Spain.]

on 26 June 1996

"I am very interested, and very surprised with the power of the product too. Before I want to make some questions: [Some questions about the features to purchase followed.]"

[It is not the above statement that is significant here, but the circumstances which surround it.]

on 27 June 1996

[the professor requested a pro forma for a professional **TNTmips** via email, and it was prepared and **FAXed**.]

on 27 June 1996

[MicroImages mailed all of 4000 **TNTlite** fliers and **TNT** professional product fliers around the world (mostly in the U.S.) to a special purchased mailing list of Geography Professors who are involved in some fashion with **GIS**.]

on 9 July 1996

[This professor purchased a **TNTmips** system for his Department use and to support his students' use of **TNTlite** by returning the signed pro forma. This transaction follows the model MicroImages would like to use with the **TNT** products. Students and teachers can use it as freely as possible. However, some academic locations may subsequently choose to purchase a **TNT** professional product to support their students' activities in the form of geo-data preparation, larger graduate research projects, etc.]

from a **FAX** from a German client on 8 July 1996.

*"First of all I would like to thank for [a name's] support in April. The program works and I have managed to print brilliant large maps (0.50m x 1.40m) on the **HP650c**. I like and really need the possibility and functions of **TNTmips**, especially the proper import of **AutoCAD** and **ARCdata** (better experiences than I had with **ARCView**). Our current main tasks are environmental assessment, e.g. for road planning. We are using the software on a hardware as follows: a Pentium 166 with 32 MB **RAM** with a 21" and 17" monitor, each supported by a **MB ELSA Winner** graphic card. The program is run from the harddisk, data are stored on the **NOVELL** net server. We use a **CALcomp DBII** size A1 digitizer and a combined mouse and digitizer driver."*

[Continues on in the next paragraph to outline a current problem.]

from an email from a student on 10 July 1996.

*"I just spent all night downloading **TNTlite** for my Mac ó 68030 w/**FPU**. The download has been successfully de-binhexed and expanded."*

[Continues on with question on installation, how many downloads are being made every day.]

from an email from an Australian client on 18 July 1996.

"My partner [a name] and myself, have a small geological consulting operation in [a state]."

*"We have been using **TNTmips** for a little over a year now, and find it is very useful software."*

*"Most of the work that we have been using **TNT** for involves the use of very large data sets, some being in excess of 500Mb."*

*"As you can imagine, some computing processes on data sets of this size can take quite a considerable time to compute even on a high end Pentium **PC**."*

*"My question to you is ... How much would it cost us for you to supply us with a very basic Hardware key to run **TNT** processes on a separate machine? This Key would not need to allow any printing or scanning devices, etc."*

*"We have three high end Pentium machines all containing at least 64Mb of **RAM** and 6Gb of **SCSI** disk space running Windows **95**."*

"Ideally we would like to be able to utilize all of these machines for the processing stages of our data."

"I have tried Multitasking on a single machine however this does not seem to give me any overall speed gain and I feel that the only way that I am going to be able to finish these tasks quicker is to utilize the other two machines that are available to me."

"I am sure that one day soon true parallel processing on a single machine will be possible. But until then I am forced to make this request for additional hardware key or keys and hope that the cost will not be too great."

[This is a good illustration of the benefits to clients of MicroImages' pricing structure. This client can purchase two additional basic keys with a resolution just high enough to provide a decent windows interface (e.g. **D30**, **D35**, or **D40**). However, in the base price these keys will also provide every available **GIS** and image analysis process--no options needed! If they were using a competitor's product, they would have to pay for a long list of occasionally used modules to triplicate the analysis functionality of their first unit. But, this client can simply use their available two additional computers with two additional base keys to triple their throughput at less than the cost of their original **D60** based system. As they recognize, all peripheral activity, such as printing and scanning, can be done with the

existing base key.]

Abbreviations_

For simplicity, the following abbreviations were used in this **MEMO**.

W31 = Microsoft Windows **3.1** or **3.11**.

NT or **NT4** = Microsoft **NT 3.1**, **3.5**, or **4.0** (**3.1** is error prone and thus the **TNT** products require the use of **3.5** and its subsequent patches).

W95 = Microsoft Windows **95**.

Mac = Apple Macintosh using the 68xxx Motorola processor and **MacOS 6.x** or **7.x**.

PMac or **Power Mac** = Apple Macintosh using the 60x Motorola Power**PC** processor and **MacOS 7.x**.

MI/X = MicroImages' **X** server for Mac and **PC** microcomputer platform and operating system.

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