FILE

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PDP11 Mini Image Processing System

Program Documentation Reference

T.P. LEBAS

Internal Document No. 282

September 1988

NATURAL ENVIRONMENT RESEARCH COUNCIL

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ABSTRACT

This report is a reference document for use with the image processing facilities available at I.O.S.D.L. The system is run on a PDP11/34 together with a Grinnell high resolution colour monitor. The initial Mini Image Processing System (MIPS) was written by the U.S.G.S. for satellite imagery. Many new programs have now been added which are fundamental to side-scan imagery processing. There are over 70 programs described for the user, principally for GLORIA image processing.

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IMAGE PROCESSING

CONTRACT

PROJECT

PRICE

CONTENTS

Introduction

The following documentation is directed to users of the MIPS system who have already learned a little of the image processing facilities from the pre-designed "cookbook". It is hoped that this guide will allow the user to use their own parameter values. There are over 70 programs described here in varying amounts of detail, depending on their usefulness, and/or complexity. Some programs have no documentation and these are either still in a development stage or of little use in Gloria image processing, though they could be made executable if required.

The software was first developed by the U.S.G.S. on a PDP11/23 with the RSX-11M operating system. MIPS is now available on all PDP computers which run RSX-11M and also on some Micro-VAX machines. IOSDL, at present, has a PDP11/34, with about 140Mb of disk space (see diagram).

The executable programs are stored on the RK05 disk packs, with
DK1 - (SYSTEM) disk holding all the operating system executable programs,
DK0 - (PAF1PF) disk holding the regularly used MIPS executable programs and the
DK2 - (MIPS1) disk holding the rest of the MIPS executable programs. Additional MIPS programs will have to be stored on a fourth disk (MIPS2) since all the other disks are full. Image storage is on the DR0: and DR4: (non-removable) disk each of about 66Mb.

Simple Commands

The PIP command is the most commonly used command outside the MIPS programs themselves. It allows the user to look at files, directories, copy files, delete files, rename files and other utilities. To get a directory of your files type:-

```
> PIP/LI

DIRECTORY DR0: [40,2]                          Your image storage disk
                                               and account number
16-JUL-88 14:03                                Todays date

1.PIC;1        1451            C        10-JUN-88      10:18

TOTAL OF       1451. / 1451.  BLOCKS IN 1. FILES
```

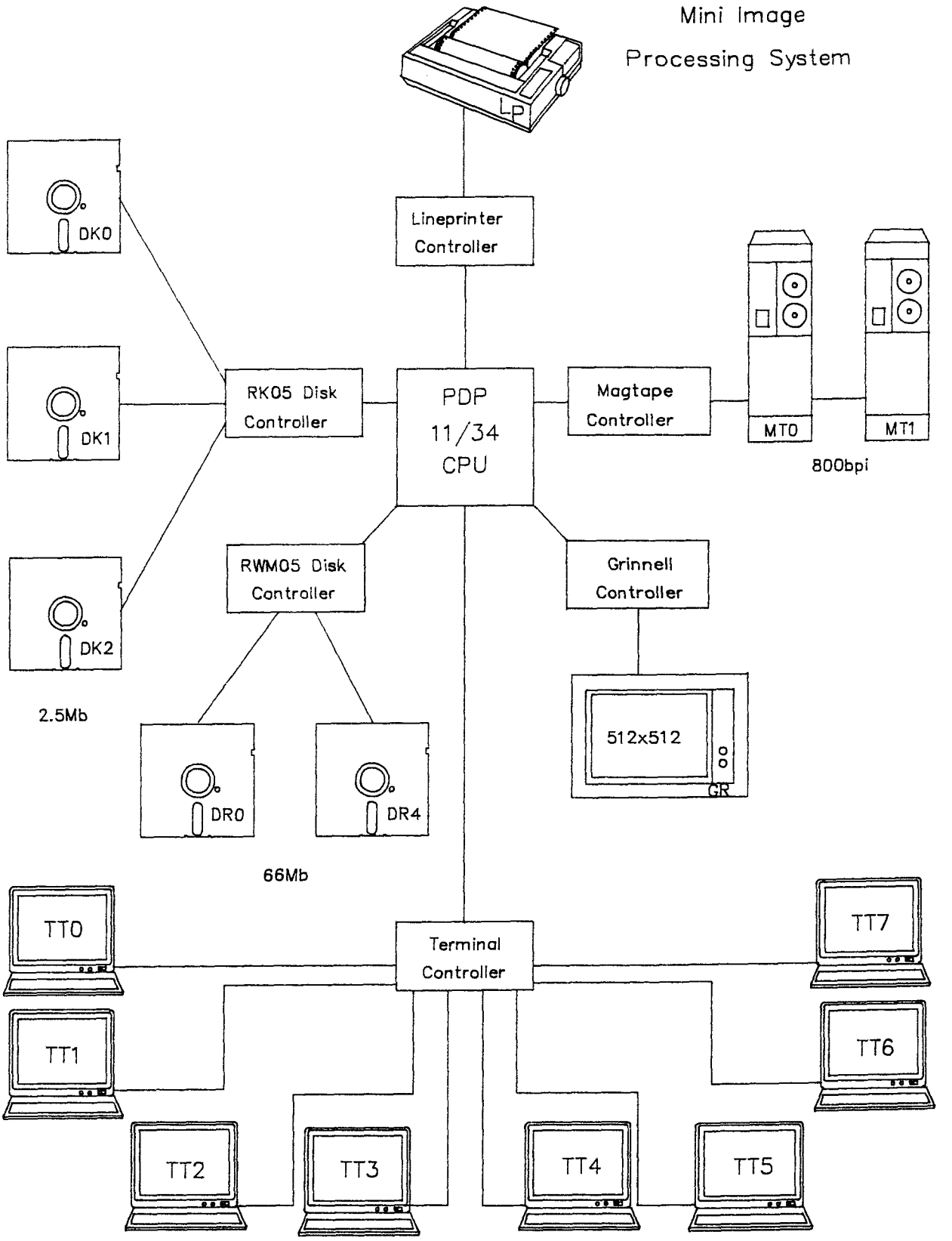
All files are in the format:- xxxxxx.xxx;n name, type (3 letters); version number. The size is given in blocks (one block is 512 bytes). The 'C' represents contiguous file space allocation which means that it is an image file, and the date and time is that of first creation.

To find out how much space is available on disk the following command is used:-

```
> PIP/FR

DR0: HAS  91966. BLOCKS FREE, 39714 BLOCKS USED OUT OF 131680.
```

This means that 91966 blocks are at present unused, but it does not mean that this space can be used entirely, since image files require contiguous space (i.e. en bloc). This unused space maybe filled in patches, leaving spaces too small to be usable. Thus it is always a good idea to remove small unwanted files as quickly as possible.


Mini Image
Processing System
LP
Lineprinter
Controller
DK0
DK1
DK2
2.5Mb
RK05 Disk
Controller
PDP
11/34
CPU
Magtape
Controller
MT0
MT1
800bpi
RWM05 Disk
Controller
Grinnell
Controller
512x512
GR
DR0
DR4
66Mb
Terminal
Controller
TT0
TT1
TT2
TT3
TT4
TT5
TT6
TT7

Deleting files is easy so care must be taken! If several files with similar names, types or version numbers need to be deleted an asterisk can be used to replace that whole field.

```
> PIP *.PRT;*/DE
```

This will delete all files with type 'PRT', any name and any version number. If ever you wish to delete all your files use *.*;* but be careful not to do it by accident!

Moving files, such as copying, listing or printing, is all done in the same way. Two arguments are used with the output device (file) first folowed by the input file with a equals sign between. For example:-

```
> PIP TI: = NAV2D.PRT      List 'NAV2D.PRT' on the screen

> PIP LP: = NAV2D.PRT      Prints 'NAV2D.PRT' on the lineprinter

> PIP 1A.PIC = 1.PIC       Copies file 1.PIC to 1A.PIC
```

More information about PIP can be found in the Utilities Procedure Manual (Folder 2).

MIPS Programs

All MIPS program are stored on either DK0: or DK2: and are executed by the command:-

```
RUN  DKn:$name
```

The following section lists all the programs available alphabetically. The name is given together with the storage disk holding the executable object file, and the area of storage of the source programs (which are either on DR4: or on a separate disk). A brief description is given of the program. If detailed computational equations are required the user is directed to the source program itself. Some extra information may be available in the form of similar or complementary programs or in some cases the equations used.

During the execution of most (but not all) programs several formatted screens are produced, giving the user a prompt of either IPCSI> or PARAMS>. The former generally requires the names of files or devices needed in the program operation (i.e. input/output) and the latter generally asks for particular parameters required in the program's calculations. An example is shown, on each formatted screen, of the type of input format. A typical IPCSI> prompt could be:-

```
IPCSI>  1.MRG = 1.PIC        Here 1.MRG is the output file and 1.PIC is
                             the input file.
```

Similarly a typical PARAMS > prompt could be:-

```
PARAMS >  PRR = 30, SS = 33, HEADER = 'MOSAIC2'
```

If the user requires to cut down the image size this is done on input, and an image area switch is used. This takes 4 arguments: starting line, starting sample, number of lines and number of samples. Using the previous example:-

```
IPSCI>  1.MRG = 1.PIC/IA:1:446:1000:300.
```

The area used is 1000 lines starting at line 1 and 300 samples starting at sample number 446. The output file is allocated space to match the input i.e. 1000 lines and 300 samples. If an output file is required larger than the input file an image area can be added in the same way, though starting line and sample number must be 1.

Gloria images generally come standard sizes and the following table may be of use when selecting sub-areas. The numbers given are byte positions.

Pulse Repetition Rate	Starting Sample, with header	Number of samples with header	Number of samples without header	Number of lines in a 6 hour pass
20 sec	33	626	594	1080
30 sec	33	924	892	720
40 sec	33	1222	1190	540

MIPS Program summary

Display Programs

CLEARTB	Replaces Grinnell look-up table with zeroes
COLCOD	Colour coding
CURSOR	Displays image values surrounding cursor
DSPLAY	Transfers an image from disk to the Grinnell display
GRCLR	Clears Grinnell screen
NORMTB	Restores Grinnell look-up table to its normal state
POINT	Display co-ordinate values of cursor
RAINBO	Colour coding
READTB	Reads Grinnell look-up table and displays contents
SHOWB	Maps all data in blue channel to the grey channel
SHOWG	Maps all data in green channel to the grey channel
SHOWR	Maps all data in red channel to the grey channel
STRECH	Stretch
SWITCH	Displays all data as single channel grey

Gloria Processing Programs

AVGBRT	Average port and starboard image brightness
BARSCL	Scale bar pointing north
CONNAV	Converts navigation file to format needed by GLOVEC
CORH2O	Water column correction (new version)
DELTAV	Computes delta-velocity and aspect ratio corrections
FIXGLO	Converts old images into new format
GLHEAD	Point headers
GLORI2	Reads Gloria image tape to disk
GLOVEC	Converts navigation file to vector format
GL087	Reads Gloria image tape to disk (1987 Mark 3 format)
H2OCOL	Water column correction
LOGBEL	Converts 8 bit image back to 12 bit
MERGE	Merges navigation data into headers
MGHEAD	Replaces original header information
MRGNAV	Merges navigation data into headers (new version)
NAVDER	Finds possible errors in navigation file
NAVFIX	Corrects possible errors in navigation file
NAV2D	Copies navigation tape to disk
NAV2DK	Copies navigation tape to disk (new version)
NDRFIX	Corrects water column for shading problems
PRTNAV	Print navigation
SHADX	Applies 'maximum' shading correction
SHAD2	Applies 'average' shading correction
SLR2GR	Slant range to ground range

Utility Programs

BT2BT	Converts data from one bit type to another
FILLPL	Replaces a point or area with a specified DN value
GREYSC	Adds on 8 bit grey wedge to an image
LABELS	Lists and updates standard image labels
LIST	Generates printout of DN values in image file
MAKEIM	Creates an image with all one DN value
REWIND	Rewinds tape
SCALE	Changes the size of an image
STRETC	Stretches an image
TAPEIN	Reads MIPS archive tape
TAPOUT	Produces MIPS archive tape
URICBM	Extracts Seabeam data from tape
WTCMBO	Generates a weighted sum of 1 - 4 images

Image Analysis Programs

COLOUR	Combines 2 images to make a colour image
FLT16B	Filter 16 bit data
FLT8B	Filter 8 bit data
HISTDK	Produces a histogram of DN level occurrence
HSTGRM	Produces a histogram of DN level occurrence
HST132	Produces a histogram of DN level occurrence
LPF2B2	Low Pass Filter 2 by 2
MAPLN1	Enhances linear features
MDGRAD	Enhances linear features using modified gradient
MEDIAN	Applies median filter 3 by 3
MODE	Applies mode filter 3 by 3
SALTP	Bit error and random noise spike removed
SHADE	Shaded relief
SUN	Shaded relief (Lommel - Seeliger Law)
SUNREF	Shaded relief

Geometric and Mosaic Programs

GEOM	Generalised geometric transformations
MASKIM	Uses a stencil to mask an image
MOSAIC	Paste images together
NUPROJ	Converts one map projection to another
NUVU	3-D viewing
PIC	Converts "standard" digitizer format to image format
PTSPLT	Rasterizes a vector file
REGIS	Calculates geographic registration points
TVSTCL	Stencils on images

DK2: [175.17]

PROGRAM NAME AVGBRT

GENERAL DESCRIPTION -

Program to compute the average brightness of the port and starboard sides of an image and to add the difference to the darker side and save as a new image.

IPCSI Requirements -

One output file (usually .AVG)
One input file

PARAMS Requirements -

SS - Starting sample for image

Extra information -

PROGRAM NAME BARSCL

GENERAL DESCRIPTION -

Draws a north arrow onto the image using the latitude and longitudes stored in the image headers.

IPCSI Requirements -

One output file
One or two input files (the second must have the header information if the first does not).

PARAMS Requirements -

ISS	-	Length of the header in words
ARR	-	Keyword to indicate that a north arrrow is to be generated
XARR	-	Every XARR lines a north arrow will be generated as long as the ARR keyword has been set.
NLIN	-	The latitude and longitude of lines XARR and XARR + NLIN are to be used to compute the heading direction and thus the north direction.

Extra information -

1 word = 2 bytes

DKO: [225.6]

PROGRAM NAME CLEARTB

GENERAL DESCRIPTION -

Replaces the Grinnell lookup table with zeros

IPCSI Requirement -

None

PARAMS Requirement -

None

Extra information -

DKO: [225.2]

PROGRAM NAME COLCOD

GENERAL DESCRIPTION -

This program looks at the image on screen and assigns colours to the various density levels in a pre-designed colour levels, giving a colour coded image according to density levels. The cursor provides a density level pointer with output in the bottom left-hand corner.

Method Requirements -

MANUAL - User supplies all colour coding information
- ADD - Add a colour code
- NEW - Clear current colour codes
- SAVE - Save current colour codes
- RESTORE - Restore saved colour codes

SEMI - User supplies colour, cursor supplies colour range
Uses two cursors on grey wedge to define range.

HISTOGRAM - colour coding based on density level histogram
- DELDN - Number of density levels per colour to position the image
- DELPER - Percentage of Histogram assigned to each colour to partition the image
- COLOR - Keyword to vary through the range of colours before varying through the shades.
- SHADE - Keyword to vary through the range of shades before varying through the colours.
- SKIP - Number to skip every Nth colour or shade

e.g. DELDN = 20,SHADE,SKIP = 2

Extra information -

The SEMI option does not fully work - reason unknown.

To keep a colour code and exit the program, type cntl-C and ABO and then CLS. NORMTB will return the ordinary colours if necessary.

Similar program is RAINBO.

PROGRAM NAME BT2BT

GENERAL DESCRIPTION -

Takes an input file of one bit type (8, 16 or 32) and converts the data to a second bit type and places the results in an output file. The program can convert from 8 bit (integer), 16 bit (integer) or 32 bit (real) numbers to an output bit of 8, 16 or 32 in any combination.

IPCSI Requiremments -

One output file
One input file

PARAMS Requirements -

OBIT - Output file bit type (8, 16 or 32)
IBIT - Input file bit type (8, 16 or 32)
XMIN - Minimum value of input data
XMAX - Maximum value of input data

Extra information -

DK2: [176.15]

PROGRAM NAME COLOUR

GENERAL DESCRIPTION -

Combines two images to make a colour image, using the first image to define the colour and the second image to define the intensity. The colour image is made of three separate images - one red, one green and one blue.

IPCSI Requirements -

Three output files (usually .RED, .GRE, .BLU)
Two input files (in order of: colour, intensity)

PARAMS Requirements -

XR, XG, XB	-	Centre of Red, Green and Blue in the gaussian distributions of colour
SR, SG, SB	-	Standard Deviation of each colour in the gaussian distributions
HR, HG, HB	-	Weighting of each colour in the gaussian distributions

Extra information -

Colour coding the same as GAUSS in program RAINBO

DK2: [175.14]

PROGRAM NAME CONNAV

GENERAL DESCRIPTION -

Converts navigation file NAVIGATE.DAT to format needed by GLOVEC.

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

DK2:[175.10]

PROGRAM NAME CORH20

GENERAL DESCRIPTION -

This routine gets the input sonar image and uses depth information in the header to correct for the water column.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

None

Extra information -

DKO: [225.5]

PROGRAM NAME CURSOR

GENERAL DESCRIPTION -

Displays the image values on the Grinnell screen of cursors 1 and 2 onto the terminal screen. Gives both point values as well as an area average surrounding the cursors.

Cursor Requirements -

The area size i.e. number of lines and samples can be altered for each cursor.

LINE - Number of lines
SAMP - Number of samples

e.g. LINE = 7, SAMP = 11

PARAMS Requirements -

None

Extra information -

Using the functions keys on the cursor control box: switch the FUN A or FUN B up and then press ENTER and switch the FUN key back down again.

DK2: [175.7]

PROGRAM NAME DELTAV

GENERAL DESCRIPTION -

This program does the anamorphosing correction, taking account of the ships speed. The speed is calculated using the latitude and longitudes contained in the header information.

IPCSI Requirements -

One output file (usually .VEL)
One input file (usually .MG1)

e.g. 1.VEL = 1.MG1

PARAMS Requirements -

RESO - Pixel resolution required in the along-track direction (line direction). Resolution less than 50 metres can use a lot of memory space and can lead to much duplication of pixels, unless the ships speed is reduced.

PRR - Pulse repetition rate - usually 30 though possibly 20 or 40.

Extra information -

Due to the program allocation of memory space maximum speed is about 12 knots.

DKO: [225.1]

PROGRAM NAME DSPLAY

GENERAL DESCRIPTION -

Program to display images on the Grinnell screen. The screen has 512 x 512 pixels and each pixel 12 bits. The 12 bits are divided into 3 colours, red, green and blue, thus giving 4096 possible colours. Black and white images are also available (using the red and green channels) giving 256 possible grey levels.

IPCSI Requirements -

One input file

PARAMS Requirements -

8BIT	-	Display data in 8 bit i.e. in black and white
4BIT	-	Display data in 4 bit i.e. in one colour only
RED	-	Use red channel only
GREN	-	Use green channel only
BLUE	-	Use blue channel only
GREY	-	Use grey channel only (made of red, green, and blue)
COMP	-	Automatic compression of image to fit screen (as near as possible using integer ratios).
CLIN	-	Line compression manual input
CSAM	-	Sample compression manual input
ZOOM	-	Automatic enlargement of image to fit screen
ZLIN	-	Line enlargement manual input
ZSAM	-	Sample enlargement manual input
CLR	-	Clear screen (of everything) before putting on new image.
FULL	-	Display on the full screen
HALF	-	Display on half the screen (1 to 4)
QUAD	-	Display on quarter of screen (1 to 4)
HORZ	-	Display with horizontal lines (default)
VERT	-	Display with vertical lines
RMSL	-	Starting line on TV screen to be used
RMSS	-	Starting sample on TV screen to be used
RMNL	-	Number of lines on TV screen to be used
RMNS	-	Number of samples on TV screen to be used
MIN	-	16 bit data minimum value
MAX	-	16 bit data maximum value
NEXT	-	Return to IPCSI for next image to be displayed
END	-	End program

e.g. 8BIT, COMP, CLR

STR Requirements -

Any number of pairs of data for the stretch co-ordinates

DK2: [375.15]

PROGRAM NAME FILLPL

GENERAL DESCRIPTION -

Replaces a single point or rectangular area with user specified DN values

IPCSI Requirements -

One input file (- care must be taken as this file is overwritten - no new file is created)

PARAMS Requirements -

DN	-	Density level value to be used to replace all existing values in image being processed
SL	-	Starting line coordinate
SS	-	Starting sample coordinate
EL	-	Ending line coordinate (not to be used for single points)
ES	-	Ending sample coordinate (not to be used for single points)
QUIT	-	To finish all additions

Extra information -

DK2: [175.11]

PROGRAM NAME FIXGLO

GENERAL DESCRIPTION -

Converts old GLORIA images (pre-1984) into the new GLORIA format

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

DATE - Starting date of the tape from which the data was taken (Format 'MM-DD-YY')

TIME - Starting time as above (Format 'HH:MM')

Extra information -

DKO: [325.4]

PROGRAM NAME FLT16B

GENERAL DESCRIPTION -

Filtering program for 16 bit data. Filters available are Low Pass Filters and High Pass Filters for smoothing or edge effect enhancement. Valid and non valid data can both be altered, either separately of each type, or together. A rectangular box-car is used made up of an odd number of samples and lines. All the pixels are summed in the box-car and the average is used in conjunction with the central pixel of the box-car, depending on the filter.

IPCSI Requirements -

One output file (usually .HPF or .LPF)
One input file

e.g. 1.HPF = 1.xxx

PARAMS Requirements - 2 Screens

First: Types of filtering available:-

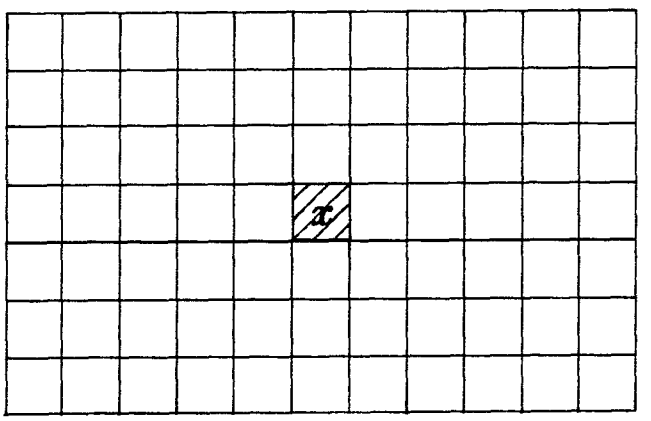
LPF	-	Low Pass filter changing all data
LPFZ	-	Low Pass filter changing non-valid data only
LPFV	-	Low Pass filter changing valid data only
HPF	-	High Pass filter changing all data
DIV	-	High Pass filter using divide option changing all data
TRIM	-	Unknown

Second:

LINE	-	Number of lines making box-car - should be odd
SAMP	-	Number of samples making box-car - should be odd
LOW	-	Lowest number for valid data
HIGH	-	Highest number for valid data
NORM	-	Offset value used to centre the output data
XFRC	-	Fraction of box-car needed for filtering to occur
XMIN	-	Minimum number of valid pixels in box-car required for filtering to occur
XMULT	-	Multiplication factor used to expand the range of results

Extra information -

Box–car Filter



11 sample by 7 line boxcar filter

Low Pass Filter $\dfrac{\sum x_{ij}}{n} \Longrightarrow x$

High Pass Filter $x - \dfrac{\sum x_{ij}}{n} + \text{NORM} \Longrightarrow x$

DKO: [325.3]

PROGRAM NAME FLT8B

GENERAL DESCRIPTION -

Filtering program for 8 bit data, Filters available are Low Pass Filters and High Pass Filters for smoothing or edge effect enhancement. Valid and non-valid data can both be altered either separately of each type, or together. A rectangular box-car is used made up of an odd number of samples and lines. All the pixels are summed in the box-car and the average is used in conjunction with the central pixel of the box-car, depending on the filter.

IPCSI Requirements -
One output file (usually .HPF or .LPF)
One input file

e.g. 1.HPF = 1.xxx

PARAMS Requirements - 2 Screens

First: Types of filtering available -

LPF	-	Low Pass filter changing all data
LPFZ	-	Low Pass filter changing non-valid data only
LPFV	-	Low Pass filter changing valid data only
HPF	-	High Pass filter changing all data
DIV	-	High Pass filter using divide option changing all data
TRIM	-	Unknown

Second:

LINE	-	Number of lines making box-car - should be odd
SAMP	-	Number of samples making box-car - should be odd
LOW	-	Lowest number for valid data
HIGH	-	Highest number for valid data
NORM	-	Offset value used to center the output data
XFRC	-	Fraction of box-car needed for filtering to occur
XMIN	-	Minimum number of valid pixels in box-car required for filtering to occur
XMULT	-	Multiplication factor used to expand the range of results

Extra information -

DK2: [300.3]

PROGRAM NAME GEOM

GENERAL DESCRIPTION -

Produces an image on a geographically correct grid. Requires a data file containing mathematical points of reference e.g. REGGEO.DAT

IPCSI Requirements -

One output file (usually .GOM)
Up to 5 input files (First is the image file, second is the mathematical registration data file such as REGGEO.DAT, files 3 to 5 are optional naming of work files)

e.g. M1.GOM = 1.MOS, REGGEO.DAT

PARAMS Requirements -

NULL - Value assigned to blank areas
(Default is 0 in 8 bit data and -32767 in 16 bit data)

Extra information -

a) Requires a lot of working space
b) Will require work files to be deleted when GEOM is complete
c) Generally takes a long time to work

DKO: [175.15]

PROGRAM NAME GLHEAD

GENERAL DESCRIPTION -

Produces a listing file of the header information (every hundred lines of image). Information provided is line number, date, time, latitude, longitude and a magnetic vehicle heading. The file produced is GLHEAD.PRT.

IPCSI Requirements -

One input file

e.g. 1.MG2

PARAMS Requirements -

If more header information is required than just every hundred lines the following parameters can be entered -

DAT1	-	Date of starting point (format YYMMDD)
TIM1	-	Time of starting point (format HHMM)
DAT2	-	Date of ending point (format YYMMDD)
TIM2	-	Time of ending point (format HHMM)
QUIT	-	To exit the program
NEXT	-	Indicates that another file is required

Extra information -

The listing file containing the hundred line information is produced before the first PARAMS prompt. Therefore exiting at this point is quite common. The file is viewed using PIP TI: = GLHEAD.PRT

DK2: [200.6]

PROGRAM NAME GLORI2

GENERAL DESCRIPTION -

Reads raw GLORIA data from magnetic tape into memory. GLORIA data is expected in pre-1987 format.

IPCSI Requirements -

One output file (usually .PIC)
One input device (usually MT0: or MT1:)

e.g. 1.PIC = MT1:

PARAMS Requirements -

SFILE	-	The first file to be read into memory incrementing from the present position of tape - default is the next file
EFILE	-	The last file to be read into memory incrementing from the present position of tape - default stops the tape after reading one file
GAP	-	Keyword used if there is a gap at the beginning of the tape

Extra information -

DK2: [176.4]

PROGRAM NAME GL087

GENERAL DESCRIPTION -

Reads magnetic tape of raw GLORIA data into memory. Format of GLORIA data in 1987 format (which has slight change in header information positioning).

IPCSI Requirements -

One output file (normally .PIC)
One input device (normally MT1: or MT0:)

e.g. 1.PIC = MT1:

PARAMS Requirements -

SFILE - The first file to be read into memory incrementing from the present position of tape - default is the next file

EFILE - The last file to be read into memory incrementing from the present position of tape - default stops the tape after reading one file.

e.g. SFILE = 6,EFILE = 7

This reads 2 files the first being 6 files away from the present position.

Extra information -

The user is prompted to verify correct date and time requiring a simple Y/N answer.

Similar program is GLORI2

DKO: [225.14]

PROGRAM NAME GRCLR

GENERAL DESCRIPTION -

Clears the Grinnell screen (red, green and blue)

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

DKO: [125.10]

PROGRAM NAME GREYSC

GENERAL DESCRIPTION -

Program to add a grey scale or wedge of DN values onto the side of an 8 bit image.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

MIN - Minimum density level (DN value) for grey scale
MAX - Maximum density level (DN value) for grey scale

Extra information -

DKO: [250.3]

PROGRAM NAME HISTDK

Produces a histogram showing the frequency of occurence of each DN value (grey level) within an image. The histogram is saved in a file and is suitable for printing on a line printer.

IPCSI Requirements -

One input file

PARAMS Requirements -

MIN - Minimum value
MAX - Maximum value
COL - Column width of file (i.e. lineprinter)
TITLE - Heading to be put on the top of the listing

Extra information -

DKO: [250.2]

PROGRAM NAME HSTGRM

GENERAL DESCRIPTION -

Produces a histogram showing the frequency of occurrence of each DN value (grey level) within an image. The histogram is shown on screen (if it has VT102 capabilities). 80 columns of data are shown. Variance, mean and skew are also calculated and displayed on screen.

IPCSI Requirements -

One input file

e.g. 1.MG2

PARAMS Requirements -

LINC	-	Increment in line direction for sampling the image data.
SINC	-	Increment in sample direction for sampling the image data
YESO	-	Keyword to include zero DN values in calculations
NO255	-	Keyword to exclude 255 DN values in calculations

The continue prompt -

Y	-	Yes, returns to IPCSI prompt
N	-	No, exit program
R	-	Range, change range of Histogram

Extra information -

Similar to HST132

DK2: [175.6]

PROGRAM NAME H2OCOL

GENERAL DESCRIPTION -

Corrects the GLORIA sonar images for water column geometry problems using an automatic detection method. The program starts at the center of the image and searches to the side for a high first derivative which identifies the water column location. It then applies the correction.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

ISWT	-	Switch to indicate if the water is on the left or right or centre of the image (0, 1 or 2)
ITOL	-	Tolerance used to identify the water colum edge

Extra information -

This program does not use screen formating for IPCSI or PARAMS prompts

DK0: [125.11]

PROGRAM NAME LABELS

GENERAL DESCRIPTION -

Produces lists of standard RSX-11M image labels on disk and also allows addition and removal of text.

IPCSI Requirements -

One input file

PARAMS Requirements -

HIST	-	Print Histogram information if it exists in label.
FORM	-	Print label information on print file
TEXT	-	Print processing history text information
INIT	-	Initialise labels i.e. delete any currently held label information
UPDA	-	To add text to the end of file labels
NEXT	-	To prompt for a new file

Extra information -

DKO: [125.4]

PROGRAM NAME LIST

GENERAL DESCRIPTION -

Produces a numerical listing of pixels of all or parts of the image required - 8 bit or 16 bit.

IPCSI Requirements -

One input file

PARAMS Requirements -

LINC	-	Line increment
SINC	-	Sample increment
PAGE	-	Keyword to list total area on one page
HEAD	-	Label to be put on top of listing

e.g. LINC = 20, SINC = 20,HEAD = 'LIST OF PIC FILE'

Extra information -

DK2: [176.10]

PROGRAM NAME LOGBEL

GENERAL DESCRIPTION -

GLORIA data is acquired with 12 bits of information which is converted into 8 bits, using a pseudo-logarithmic scale. This program tries to convert the 8 bit data into 12 bit using the reverse pseudo-logarithmic scale. The results are stored in an 8 bit file thus the results are chopped by dividing by 16.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

None

Extra information -

12 bit value = $2^C * (S + 32) - 31$

where C = 3 most significant bits of 8 bit value
S = 5 least significant bits of 8 bit value

e.g. 01011101 (93) 213

8 bit 12 bit

PROGRAM NAME LPF2B2

GENERAL DESCRIPTION -

Applies a two-by-two low pass filter. Four pixels are averaged and the average put back in the top left corner.

IPCSI Requirements -

One output file (usually .2B2)
One input file

e.g. 1.2B2 = 1.VEL

PARAMS Requirements -

None

Extra information -

DKO: [125.12]

PROGRAM NAME MAKEIM

GENERAL DESCRIPTION -

Creates an image with all one DN value.

IPCSI Requirements -

One output file

PARAMS Requirements -

NL	-	Number of lines wanted on output image
NS	-	Number of samples wanted on input image
DN	-	Digital number to which image is to be set
BIT	-	Output file bit type (8, 16 or 32)

Extra information -

DKO: [325.6]

PROGRAM NAME MAPLN1

GENERAL DESCRIPTION -

Program enhances linear features using a semi-linear line detecting/mapping technique. The technique is one proposed G.J. Vanderburg (1975). It makes separate comparisons to left and right and so it does not respond to edges but will respond to isolated noise.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

None

Extra information -

(see also Chavez P. 1983 Bureau of Mines report on automatic linear feature mapping).

DK2: [300.21]

PROGRAM NAME MASKIM

GENERAL DESCRIPTION -

Produces a file of the masked image. It overlays a blank mask over the original image thus only showing the cut-out area(s).

IPCSI Requirements -

One output file
Two input files (first the image, second the raster file of the mask - usually .STL).

PARAMS Requirements -

MASK - Keyword to mask the image file using the stencil file

Extra information -

Used in conjunction with TVSTCL and PTSPLT

DKO: [325.7]

PROGRAM NAME MDGRAD

GENERAL DESCRIPTION -

Enhances linear features using a modified gradient, but instead of multiplying the constants A, B, C and D together this routine adds them - in case one is zero and thus no data would be seen.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

None

Extra information -

DKO: [325.13]

PROGRAM NAME MEDIAN

GENERAL DESCRIPTION -

Produces an output file using a three by three median filter.

MEDIAN = Mid-point of extremities of data

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

None

Extra information -

DK2: [175.2]

PROGRAM NAME MERGE

GENERAL DESCRIPTION -

Merges navigation data (from file NAVIGATE.DAT) into the header information of the raw GLORIA data - in old header format.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

None

Extra information -

Used in conjunction with GLORI2
- Similar to MRGNAV

DK2: [175.20]

PROGRAM NAME MGHEAD

GENERAL DESCRIPTION -

Merges header information from one file and adds it to another file on which the header information has been corrupted (usually done by filtering).

IPCSI Requirements -

One output file	(usually .MG1 or .MG2)
Two input files	(the first has the main image, the second has the uncorrupted header information.)

PARAMS Requirements -

None

Extra information -

The header information is contained in the first 16 words (32 bytes) in the sample direction.

DK0: [325.14]

PROGRAM NAME MODE

GENERAL DESCRIPTION -

Produces an output file using a three by three mode filter.

MODE = Most frequent occurence in area

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

None

Extra information -

PROGRAM NAME MOSAIC

GENERAL DESCRIPTION -

Splices two or more mosaic pieces together onto an output image. The first running of the program must allocate space for the output image. Subsequent running can overlay other images on the output image or can average the values of overlap.

IPCSI Requirements -

One output file (usually .MOS)
Image area size (/IA: sl: ss: nl: ns) if on first file

One input file per iteration

e.g. 1.MOS/IA:1:1:1000:2000 = 1.MG2

PARAMS Requirements -

SL	-	Starting line for placing first line of the input image on the output image
SS	-	Starting sample for placing first line of the input image on the output image
IST	-	Keyword required when indicating that allocation of space is required i.e. with the first image
AVE	-	Keyword required when averaging of two image (input and output) is necessary on overlap. Without this the input image overlays and masks any previous image.

Extra information -

Care must be taken as the output file may already have data in it and thus this original image will be altered permanently.

DK2: [176.1]

PROGRAM NAME MRGNAV

GENERAL DESCRIPTION

Merges navigation data (from file NAVIGATE.DAT) into the header information of the raw GLORIA data using the encoded time in each file as a link. New header information then contains, time, date, position and depth and can subsequently be used for slant-range corrections etc.

IPCSI Requirements -

One output file (normally .MRG)
One input file (normally .PIC)

e.g. 1.MRG = 1.PIC

PARAMS Requirements -

None

Extra information -

File NAVIGATE.DAT must exist in the user area before running.
Used in conjunction with GL087

DK2: [175.12]

PROGRAM NAME NAVDER

GENERAL DESCRIPTION -

Finds possible errors in GLORIA navigation - uses file NAVIGATE.DAT and outputs to NAVDER.PRT.

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

Criteria used to produce a warning

latitude difference	>	.01°
longitude difference	>	.01°
depth difference	>	750 m

Invalid date or time.

DK2: [175.13]

PROGRAM NAME NAVFIX

GENERAL DESCRIPTION -

Corrects possible errors in GLORIA navigation. New data stored in NAV.DAT which when completed requires renaming to NAVIGATE.DAT using:-

```
PIP  NAVIGATE.DAT  =  NAV.DAT/RE
```

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

Starting date and time before and after the error is required.

DK2: [200.7]

PROGRAM NAME NAV2D

GENERAL DESCRIPTION -

Reads navigation file from magnetic tape into memory. It creates a file called NAVIGATE.DAT. The tape must be in DXFMT format (new or old format)

IPCSI Requirements -

One input device (usually MT0: or MT1:)

PARAMS Requirements -

DENS	-	Density of navigation tape in bits per inch (800 or 1600)
SFILE	-	Starting number of file to be read
NFILE	-	Number of files to be read
NEW	-	Keyword required if the tape is in the new navigation format

Extra information -

Both tape drives are, at present, 800 bpi.

DK2: [176.5]

PROGRAM NAME NAV2DK

GENERAL DESCRIPTION -

Reads navigation file from magnetic tape into disk memory. It creates a file called NAVIGATE.DAT. The tape should be in MERGE-MERGE3 or DXFMT format.

IPCSI Requirements -

One input device (usually MT0: or MT1:)

PARAMS Requirements -

DENS	-	Density of navigation type in bits per inch (800 or 1600)
MRG3	-	Data is in the MERGE-MERGE3 format
SWAB	-	Keyword to swap every pair of bytes
NFILE	-	Number of file to process.

Extra information -

Both tape drives are, at present, 800 bpi.

DK2: [175.21]

PROGRAM NAME NDRFIX

GENERAL DESCRIPTION -

NDRFIX corrects bad data in the near-nadir region of the GLORIA images if they exist after the standard processing is completed. This is accomplished by giving the width of the affected area about the nadir and two thresholds for the DN values of the near-nadir zone. The average of the line excluding near-nadir is taken if the difference of the DN value of the pixel and the DN is less than the second threshold then the DN value of the pixel is replaced with the average of the line. If the DN value of the pixel is outside the range the value is left alone. This program can also be used to remove zeros or low DN values from outside the near-nadir with port and starboard sides of the image having separate thresholds. However, the user must be careful with the thresholds used or the image can be affected in an undesirable way.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

SS	-	Starting sample to start processing the image
TOLL	-	The threshold to be used for the left hand side of the image. If the threshold is less than the average of the lefthand side of the image minus the pixel; the pixel is replaced.
TOLR	-	The threshold to be used similarly for the righthand side of the image.
TOLW	-	The threshold for the near-nadir. If the threshold is less than the average of the image minus the pixel: the pixel is replaced with the average of the whole line.
MIN	-	Minimum value that will be included in the average
MAX	-	Maximum value that will be included in the average
WID	-	Width of near-nadir area
TREP	-	If the pixel in the near-nadir area is greater than this DN value it will not be replaced regardless of anything else.

Extra information -

DKO: [225.6]

PROGRAM NAME NORMTB

GENERAL DESCRIPTION -

Returns the Grinnell screen back to the normal colours i.e. lower 4 bits red and upper 4 bits green.

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

DK2: [300.7]

PROGRAM NAME NUPROJ

GENERAL DESCRIPTION -

Provides data to GEOM to transform an image from one map projection to any other. GEOM must be run after this program to actually transform the image.

IPCSI Requirements -

Unknown

PARAMS Requirements -

Unknown

Extra information -

Program workings unclear.

PROGRAM NAME NUVU

GENERAL DESCRIPTION -

Generates a 3-D image viewed from the West (or East). It uses the first image as topography and the second image as an imaged stretched over the topography.

IPCSI Requirements -

One output file (usually .NUV)
One or two input images (First file is topography data and second file is the overlying image).

PARAMS Requirements -

PH1	-	Angle of tilt (from vertical) - Positive is looking from left (west)
MAXH	-	Maximum height expected
MINH	-	Minimum height expected
VERT	-	Vertical scale in meters per density level
HORZ	-	Horizontal scale in meters per pixel
EXAG	-	Vertical exaggeration
OPT	-	= 1 Tilt image = 2 Tilt height data (no image required) = 3 Make image vertical from tilted one, file must be at same tilt.

Extra information -

Requires displaying at right-angles - thus west being at the bottom of the screen i.e. use VERT with DSP.

DK2: [375.6]

PROGRAM NAME PIC

GENERAL DESCRIPTION -

Converts "standard" digitizer format to image format.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

PART	-	Part number
POIN	-	Do not draw lines between points
AVE	-	Average all data that falls on same point
MAX	-	Use maximum value at any point
SUM	-	Sum all data on same point

e.g. PART = 1, POIN, MAX

Extra information -

DK2: [176.16]

PROGRAM NAME POINT

GENERAL DESCRIPTION -

Interactive program to calculate positioning of a cursor on the image being displayed. Both screen and map co-ordinates are given for every cursor position entered. Points chosen are written to screen and to the print file.

IPCSI Requirements -

One input file (the one being displayed)

PARAMS Requirements -

CSAM	-	Compression or zoom factor in sample direction
CLIN	-	Compression or zoom factor in line direction (for zoom of 2 CLIN = 0.5)
XMIN	-	Minimum X value of image (in image co-ordinates)
XMAX	-	Maximum X value " " (" " " ")
YMIN	-	Minimum Y value " " (" " " ")
YMAX	-	Maximum Y value " " (" " " ")

Extra information -

To exit switch the FUN B up and press ENTER and switch the FUN B down.

DK2: [175.3]

PROGRAM NAME PRTNAV

GENERAL DESCRIPTION -

Program to print to a file, PRTNAV.PRT, part of the Navigation file NAVIGATE.DAT for closer inspection. Requires NAVIGATE.DAT to exist. Outputs:- Date, time, latitude, longitude, calculated heading, distance travelled in meters in increment, calculated velocity, meters per pixel, average and current depth and average and current magnetics.

IPCSI Requirements -

None

PARAMS Requirements -

SDATE	-	Starting date (format MM-DD-YY)
EDATE	-	Ending date (format MM-DD-YY)
STIME	-	Starting time (format HH:MM)
ETIME	-	Ending time (format HH:MM)
ITIME	-	Time increment (format HH:MM)

Extra information -

If the input line extends over 1 line - don't worry!

DK2: [375.20]

PROGRAM NAME PTSPLT

GENERAL DESCRIPTION -

Produces a raster file of the stencil file produced by TUSTCL. This raster file is required by MASKIM. It converts a line and sample vector file into a raster file.

IPCSI Requirements -

One output file (usually .MSK)
One input file (usually .STL)

PARAMS Requirements -

None

Extra information -

PROGRAM NAME RAINBO

GENERAL DESCRIPTION -

This program looks at the image on screen and assigns colours to the various density levels. The colours are defined in various different sliding scales. Definition can be either from gaussian distributions of red, green and blue, or linear ramps, or from a data file (RAINBO.DAT).

Method Requirements -

GAUSS	-	User supplies gaussian distribution colour range
LINEAR	-	Colour coding based on linear ramps
DATA	-	Colour coding based on input data in RAINBO.DAT
MIN	-	Minimum density level for colour coding
MAX	-	Maximum density level for colour coding

PARAMS Requirements -

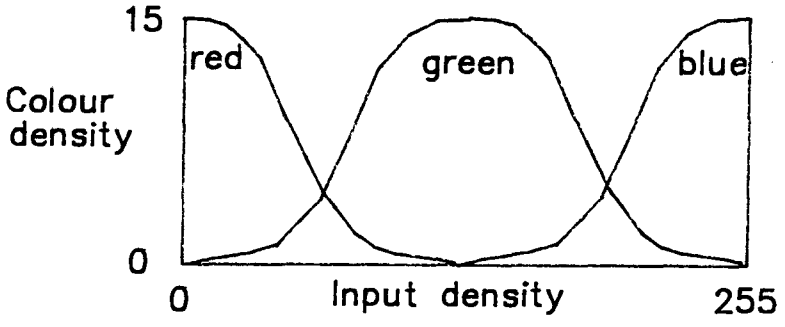
DELDN	-	Number of density levels per colour (default = 1)
SKIP	-	Number to skip every Nth colour
XR,XG,XB	-	Centre of Red, Green and Blue in the gaussian distributions
SR,SG,SB	-	Standard deviation of each colour in the gaussian distributions.
HR,HG,HB	-	Weighting of each colour in the gaussian distributions
YNOR	-	Keyword to normalise output colours i.e. R + G + B = 15

e.g. XR = 0, XB = 255, HR = 4, HG = 3, HB = 4, SG = 50, YNOR

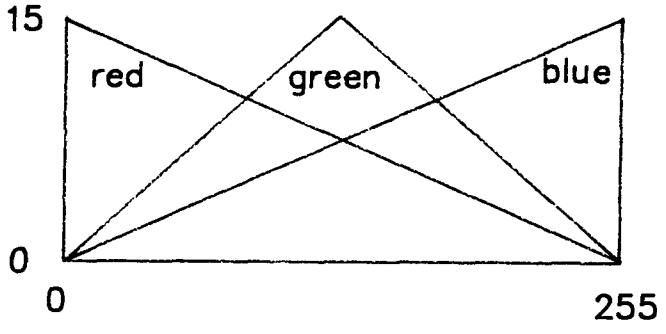
Extra information -

Similar to COLCOD

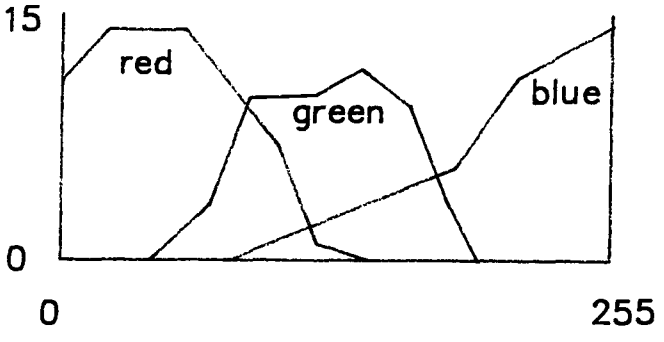
Rainbow colour coding techniques



GAUSSIAN DISTRIBUTION



LINEAR RAMPS



DATA INPUT

DKO: [225.5]

PROGRAM NAME READTB

GENERAL DESCRIPTION -

Reads the grinnell look-up table and displays its contents to the terminal in octal.

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

- seems not to work!

PROGRAM NAME REGIS

GENERAL DESCRIPTION -

Calculates the geographic positioning of Mosaic segments on a map. Produces a file called REGGEO.DAT which is to be used with program GEOM. Requires four control points with latitude longitude and heading. This program was written to replace the running of RANDOM, MCP and RANDOM.

IPCSI Requirements -

None

PARAMS Requirements - 5 main prompts

First screen:-	NROW	-	Number of rows of data to GEOM
	NCOL	-	Number of columns of data to GEOM
	DEG	-	Degree of equation for spline fit (2 or 3)
	PRR	-	Pulse repetition rate (usually 30 or 20 or 40)
Second screen:-	FIL	-	Filename containing control point
	NL	-	Number of lines in file
	CP	-	Control point line number
	LA	-	Latitude of control point (North is positive)
	LO	-	Longitude of control point (West is positive)
	HDG	-	Heading of vehicle at the control point (corrected).

N.B. These must be entered 4 times, 1 for each control point.

Extra information -

Planet?	-	usually EARTH!
Projection?	-	MERCATOR or
Scale?	-	0.05
Latitude Limits?	-	Two real numbers required (North is positive)
Longitude Limits?	-	Two real numbers required (West is positive)
New Pole?	-	C/R
Rotation?	-	C/R

Main calculation now occurs - errors should be less than 10.0
O.K. to Finish (Y/N) - 'No' allows alteration of control points and/or processing parameters.
It returns to first PARAMS and then to a new PARAMS

CPN	-	Control point number, to alter variables (1-4)
CP	-	Control point line number
LA	-	Latitude of control point
LO	-	Longitude of control point
HDG	-	Heading of vehicle at the control point

DK0: [200.4]

PROGRAM NAME REWIND

GENERAL DESCRIPTION -

Rewinds a magnetic tape - back to load point

Tape Requirements -

MT1: or MT0:

PARAMS Requirements -

None

Extra information -

Can also be done directly on tape drive.
Use REW to operate program.

DKO: [325.12]

PROGRAM NAME SALTP

GENERAL DESCRIPTION -

Filters out bit error and random noise using a nearest neighbour filter tolerance value. If the neighbour has a density level value greater than the tolerance the nearest bit value is corrected to remove the spike.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

TOL - Integer DN tolerance value to be used to identify pixels that have a bit error. If not specified TOL is calculated based on the histogram.

Extra information -

DK: [300.13]

PROGRAM NAME SCALE

GENERAL DESCRIPTION -

Expands or Contracts an image to any desired size. Will cause duplication or removal of points where necessary.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

IL	-	Number of lines in input image or denominator of the compression ratio in the line direction
IS	-	Number of samples in input image or denominator of the compression ratio in the sample direction
OL	-	Number of lines in output image or numerator of the compression ratio in the line direction
OS	-	Number of samples in output image or numerator of the compresion ratio in the sample direction.
LINE	-	Keyword to be used if input data represents contour or sparse random points with zero background.
LINC	-	Line increment input
SINC	-	Sample increment input

Extra information -

DK2: [350.12]

PROGRAM NAME SHADE

GENERAL DESCRIPTION -

Produces shaded relief image using incident light at any elevation and azimuth from North, North-West, West or South-West. Slope calculation is done from nearest neighbours, in horizontal and vertical directions.

IPCSI Requirements -

One Output file (usually .SHD)
One Input file

PARAMS Requirements -

DIST	-	Length of pixel in metres
SUNA	-	Elevation of sun from horizontal
SCAL	-	Scaling factor to normalise output into 8 bit image
LINE	-	Sun direction from North
SAMP	-	Sun direction from West
DAG1	-	Sun direction from South West
DAG2	-	Sun direction from North West

e.g. DIST = 200.0, SCAL = 300, DAG2

Extra information -

Can handle 8 and 16 bit data

DKO: [176.7]

PROGRAM NAME SHADX

GENERAL DESCRIPTION -

Applies a shading correction to the input data using a column maximum. Each column maximum is found then smoothed to remove any noise spikes. The reciprocal of the maximum is then used as a coefficient multiplier. This method therefore tries to calculate the system power envelope characteristics.

IPCSI Requirements -

One output file (usually .SHX)
One input file (usually .SLR)

e.g. 1.SHX = 1.SLR

PARAMS Requirements -

TOL1	-	The lowest value to be accepted as valid data
TOL2	-	The highest value to be accepted in the calculation of the maximum. Above this the data is assumed to be invalid i.e. noise.
NORM	-	The multiplication factor for the equation below
ISS	-	Starting word that has valid image data to be processed, the rest is header information and should not be processed.

Extra information -

$$\frac{\text{old pixel}}{\text{column maximum}} \times \text{NORM} = \text{new pixel}$$

Similar program - SHAD2

DKO: [175.5]

PROGRAM NAME SHAD2

GENERAL DESCRIPTION -

Applies a shading correction to the input data using a column average. Each column of data is summed and averaged. The reciprocal of the average is then used as a coefficient multiplier.

IPCSI Requirements -

One output file (usually .SH2)
One input file (usually .SLR)

e.g. 1.SH2 = 1.SLR

PARAMS Requirements -

TOL1	-	The lowest value to be accepted in the calculation of the average. Below this the data is assumed to be invalid i.e. noise.
TOL2	-	The highest value to be accepted in the calculation of the average. Above this the data is assumed to be invalid i.e. noise
NORM	-	The central position for the distribution of values see equation below.
ISS	-	Starting word that has valid image data to be processed, the rest is header information and should not be processed.

Extra information -

$$\frac{\text{old pixel}}{\text{column average}} \times \text{NORM} = \text{new pixel}$$

Similar program - SHADX

DKO: [225.7]

PROGRAM NAME SHOWB

GENERAL DESCRIPTION -

Maps all data in the blue channel to the grey channel (on the Grinnell).

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

See also SWITCH

DKO: [225.7]

PROGRAM NAME SHOWG

GENERAL DESCRIPTION -

Maps all data shown in the green channel to the grey channel (on the Grinnell)

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra Requirements -

See also SWITCH

DKO: [225.7]

PROGRAM NAME SHOWR

GENERAL DESCRIPTION -

Maps all data shown in the red channel to the grey channel (on the Grinnell).

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

See also SWITCH

DK2: [175.4]

PROGRAM NAME SLR2GR

GENERAL DESCRIPTION -

Calculates the slant-range to ground-range correction creating a new image having removed the water-column and stretched the sea floor according to the depth present at the nadir. Requires depth information in the header.

IPCSI Requirements -

One output file (usually .SLR)
One input file (usually .MRG)

e.g. 1.MRG

PARAMS Requirements -

PRR - The pulse repetition rate of the GLORIA system during recording (usually 30 though possibly 20 or 40). 30 is default.

e.g. PRR = 20

Extra information -

DKO: [225.3]

PROGRAM NAME STRECH

GENERAL DESCRIPTION -

Interactive program to change the stretch parameters on the screen. Uses the joystick or rollerball with the enter key.

Requirements -

SINE	-	Select sine automatic stretch mode
LINEAR	-	Select linear automatic stretch mode
THEMATIC	-	Select thematic automatic stretch mode
MANUAL	-	Select manual input mode

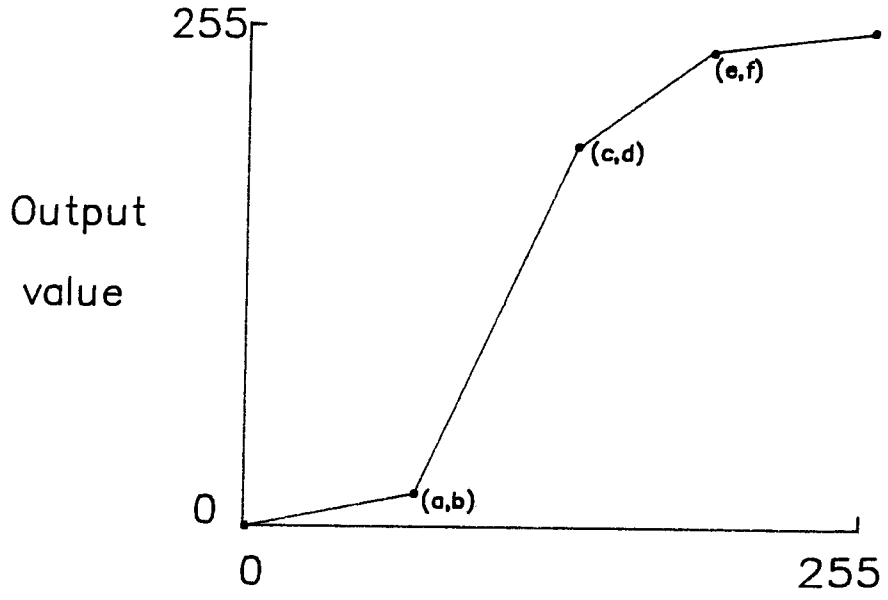
e.g. 0.0 150-255 255-255

8BIT	-	Type of data displayed on screen
DELR	-	Delta x for red data (in SINE option)
DELG	-	Delta x for green data (in SINE option)
DELB	-	Delta x for blue data (in SINE option)

Extra information -

In LINEAR mode moving the cursor horzontally will move the central position horizontally and moving the cursor vertically will change the slope about the central position.

Contrast Stretch



Stretch values

0–0 a–b c–d e–f 255–255

DKO: [350.16]

PROGRAM NAME STRETC

GENERAL DESCRIPTION -

Produces new image with altered stretch parameters. Similar to STRECH except it saves the new image under a new name.

IPCSI Requirements -

One output file
One input file

PARAMS Requirements -

TYPE	-	Switch on type of stretch i.e. by 'TABLE' or 'LINEAR'.
NMIN	-	Input density level mapped to 0 in LINEAR option.
NMAX	-	Input density level mapped to 255 in LINEAR option.
NPAR	-	Number of stretch point pairs in TABLE option

Extra information -

DKO: [225.4]

PROGRAM NAME SWITCH

GENERAL DESCRIPTION -

Displays the data contained in the red, green or blue channels as a single 4 bit channel of grey data.

IPCSI Requirements -

None

PARAMS Requirements -

None

Extra information -

See also SHOWR, SHOWG and SHOWB.

DK2: [350.17]

PROGRAM NAME SUN

GENERAL DESCRIPTION -

Computes reflectance given at any sun elevation and direction using the Lommel - Seeliger law (see below).

IPCSI Requirements -

One output file (usually .SUN)
One input file

PARAMS Requirements -

SUNA	-	Sun elevation (from horizontal)
DIRC	-	Azimuth of sun (0 - 360)
VERT	-	Vertical scale in meters per density level.
HORZ	-	Horizontal scale in meters per pixel
EXAG	-	Vertical Exaggeration
VEL	-	Viewing elevation (from horizontal)
ISLP	-	Number of pixels used in gradient calculation

Extra information -

$$\text{Reflectance} = \frac{1}{1 + \frac{\cos E}{\cos I}}$$

where E = The angle between observer and the slope normal
I = The angle between the sun and the slope normal

DK2: [176.13]

PROGRAM NAME SUNREF

GENERAL DESCRIPTION -

Creates a shaded relief image from the slope given any sun elevation and azimuth. Topography can be exaggerated if required. The value returned is the cosine of the solid angle between the slope normal and incident light.

IPCSI Requirements -

One output file (usually .SUN)
One input file

PARAMS Requirements -

S	-	Sun elevation from vertical (in degrees)
SAZ	-	Sun azimuth from north (clockwise)
VERT	-	Vertical scale in metres per density level
HORZ	-	Horizontal scale in metres per pixel
EXAG	-	Vertical exaggeration
ISLP	-	Number of pixels used to calculate the gradient.

Extra information -

DKO: [200.1]

PROGRAM NAME TAPEIN

GENERAL DESCRIPTION -

Reads images from magnetic tape into memory. The images need not be MIPS standard as long as they are in byte format.

IPCSI Requirements -

One output file
One input device (usually MT0: or MT1:)
Tape switches

Switches -

/FL: - Number of file on tape (sequential)
/DN: - Density of magnetic tape (usually 800) in bits per inch
/IA: - Image area size giving number of lines and number of samples in order :SL:SS:NL:NS (SL and SS will always be 1) - see glossary
/LB: - Whether the tape has labels (Y or N)
/LI: - Line Increment
/SI: - Sample Increment
/BI: - Bit type (8, 16 or 32)

e.g. 1.PIC = MT0:/FL:/ON:800/IA:1:1:1728:2160/LB:N/BI:16

Extra Information -

Both tape drives are at present 800 bpi:

Byte format: 8 bit - 1 byte = 1 pixel
16 bit - 2 bytes = 1 pixel (LSB, MSB)

DK0: [200.2]

PROGRAM NAME TAPOUT

GENERAL DESCRIPTION -

Dumps image onto magnetic tape from memory - The image format is in byte format.

IPCSI Requirements -

One output device (usually MT0: or MT1:)
Tape switches
One input image

Switches -

/FL: - Number of file on tape (sequential)
/DN: - Density of magnetic tape (usually 800) in bits per inch
/LB: - Whether the tape needs labels (Y or N)

e.g. MT1:/FL:1/DN:800/LB:N = 1.MG2

N.B. All three switches must be present.

Extra information -

Both tape drives are at present 800 bpi:

Byte format: 8 bit - 1 byte = 1 pixel
16 bit - 2 bytes = 1 pixel (LSB, MSB)

DK2: [225.15]

PROGRAM NAME TVSTCL

GENERAL DESCRIPTION -

Marks an image to be cut with mosaic lines using the onscreen cursor. Requires the image to be shown on screen and the screen pixel characteristics to be known. Number 1 cursor is used and can be controlled by both the rollerball and joystick.

IPCSI Requirements -

One output file (usually .STL)
One input file (the image displayed)

PARAMS Requirements - 2 PARAMS prompt

First	SL	-	Starting line of image displayed
	SS	-	Starting sample of image displayed
	NL	-	Number of lines of image displayed
	NS	-	Number of samples of image displayed
	CLIN	-	Line increment of image displayed
	CSAM	-	Sample increment of image displayed
	MIN	-	Minimum value of stretch
	MAX	-	Maximum value of stretch
Second	SPNT	-	Starting point - point to point mode
	EPNT	-	Ending point - point to point mode
	CONT	-	Continuous line mode
	CHECK	-	Check green/blue
	UNDO	-	Undo points
	CLOSE	-	Close boundary
	MOVE	-	Move boundary
	DONE	-	Done with stencil

Extra information -

When doing a stencil try not to create sharp angles (i.e. less than 90°) on the inside of the polygon. It is best to have curved edges. The number of points used is immaterial.

PROGRAM NAME URICBM

GENERAL DESCRIPTION -

Reads seabeam data file from magnetic tape into disk memory. Format is a Univ. Rhode Island. "special".

IPCSI Requirements -

One output file (usually .CBM)
One input device (usually MT0: or MT1:)

PARAMS Requirements -

LAT1	-	Maximum latitude	(south is negative)
LAT2	-	Minimum latitude	(south is negative)
LON1	-	Minimum longitude	(west is negative)
LON2	-	Maximum longitude	(west is negative)

Extra information -

DK2: [350.21]

PROGRAM NAME WTCMBO

GENERAL DESCRIPTION -

Combines up to 4 files into 1 output file giving each input file a different weighting if required. A constant may also be added to every pixel on the output image to keep the results in the 8-bit positive range.

IPCSI Requirements -

One output file (usually .WCO)
Up to four input files

e.g. 1.WCO = 1.XXX, 1.YYY, 1.ZZZ

PARAMS Requirements -

CON1 - Weighting coefficient for 1st input file
CON2 - " " " 2nd " "
CON3 - " " " 3rd " "
CON4 - " " " 4th " "
CON5 - Constant to be added to the output file to keep the results within the 8-bit positive range.

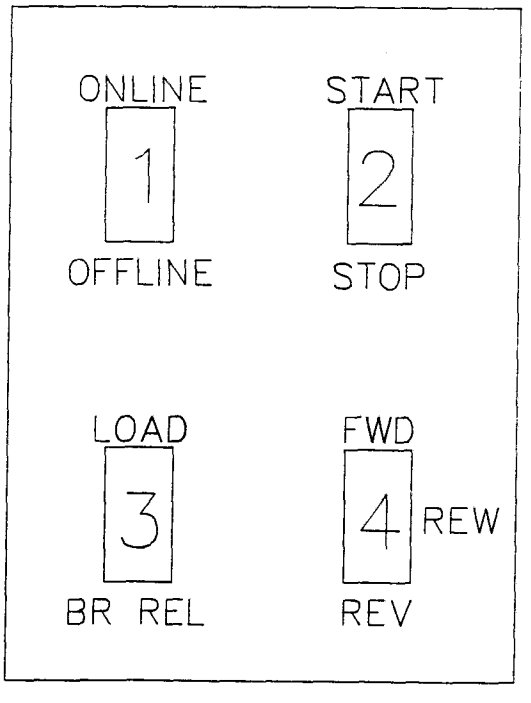
e.g. CON1 = 1, CON2 = .5, CON3 = .5, CON5 = 128

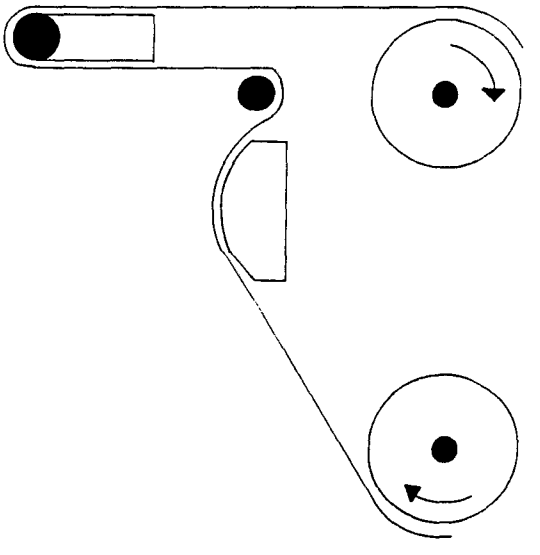
Extra information -

To mount a tape:

a) Push 1 to OFFLINE
b) Push 3 to central position and then to BR REL
c) Load tape (see diagram)
d) Push 3 to LOAD
e) Push 4 to FWD
f) Push 2 to START (repeat e & f until tape moves)
g) Push 1 to ONLINE
h) Type at terminal ALL MTn: (n=0 or 1)

To dismount a tape:
a) Rewind tape (type REW)
b) Type at terminal DEA MTn: (n=0 or 1)
c) Push 1 to OFFLINE
d) Push 2 to STOP
e) Push 4 to REV
f) Push 2 to START (repeat e & f until tape moves)
g) Push 3 to BR REL
h) Remove tape





Hardcopy Facilities

The main hardcopy service is via the Optronix filmwriter at Keyworth. A tape is prepared using TAPOUT which has the images required. The tape must have no labels (i.e. /LB:N), and be at 1600 bpi (translation can be done from 800 bpi in the main computing facility). It is then sent in the appropriate packing, to:-

Kevin Davidson
British Geological Survey
Optronix Service
Nicker Hill
Keyworth
NOTTINGHAMSHIRE NG12 5GG

A request sheet is also required - see example. The image is then written on a film 8 by 10 inches. Each pixel is equal sized depending on the maximum number of lines or samples (see table).

Maximum Number of pixels	Pixel size in microns	Size of image in millimetres
512	100	52
1024	100	103
1500	50 (100)	75 (150)
2048	50 (100)	103 (205)
2500	50	125
3000	50	150
3500	50	175
4096	50	205
4500	50	225
>4500	25	>112

REQUEST FOR OPTRONICS SERVICES

NAME: Tim Le Bas

ADDRESS: I.O.S.D.L.
Brook Road
Wormley
SURREY

DATE: 14.7.88

NUMBER OF TAPES: 1

PROJECT/GRANT CODE (for charging): M3A - 301 - 12

DETAILS

TAPE LABEL	FILE	SAMPLES	LINES	FILTER	
TIMTAPE	1	1024	720	Black/White	
	2	2010	1500	Red	One image
	3	2010	1500	Green	
	4	2010	1500	Blue	

Spot size 50 μm

GLOSSARY

ALL	Allocate command (for tape drives)
COMPOSITE MOSAIC	The finished product - a whole series of masked files combined together
COMPOSITE SEGMENT	A straight-line section, composed of part of one to several files butted together
ctrl-C	Control C (aborts anything - type ABO to prompt MCR>)
ctrl-Q	Control Q (restarts output listings)
ctrl-S	Control S (stops output listings)
ctrl-Z	Control Z (ends most programs successfully)
DAT	Data file
DEA	Deallocate command (for tape drives)
DISKIO	Input/output program for data files
DK	RK05 Removable disk device mnemonic
DN	Density value of pixel (0 to 255)
DR	RWM05 Fixed disk device mnemonic
DSP	Display program for images on the Grinnell
GOM	A composite segment after it has been registered in a map area
GR	Grinnell device mnemonic
HDG	GLORIA vehicle heading
HPF	High pass filtered image
IA	Image area, subset of whole file defined by 4 figures - SL:SS:NL*NS
IPCSI	Input prompt for files to be used by the program
LP	Lineprinter device mnemonic
LPF	Low pass filtered image
MGI	Image with header information merged in for first time
MG2	Image with header information merged in for second time, finished product of preprocessing stage
MIPS	Mini Image Processing System
MOS	Mosaic file containing composite segment
MRG	Raw data file with navigation data merged into headers
MSK	Masked image after stencilling with unwanted data and noise removed
MT	Magnetic tape drive device mnemonic
NAVIGATION DATA	Data from the onboard computer, usually in MERGE-MERGE format (DXFMT)
NL	Number of lines
NS	Number of samples per line
PARAMS	Input prompt for parameters to the program
PIC	Raw data file from tape or final mosaic file
PIP	Peripheral Interchange Program
PRR	Pulse Repetition Rate (usually once every 30 seconds)
PRT	Print file, produced by various programs to show file information and processing information

RSX-11M	Operating System used by the PDP
SH2	Shaded image
SL	Starting line number
SLR	Slant range corrected image
SS	Starting sample number on line
STL	Stencil file contains vector data of stencil to remove unwanted data and noise, or overlapping data
STR	Stretched image or Stretch prompt in DSP
TMP	Temporary file (e.g. used by COLCOD)
TSK	Task file - these contain the executable programs
TI	Terminal device mnemonic
VEL	Image corrected for velocity of ship
WCO	Weighted combination image
WRK	Work File used in processing - can be deleted if seen
2B2	Low pass filtered image (2 by 2)