THE STUDY ON MAPPING POLICY AND TOPOGRAPHIC MAPPING FOR THE INTEGRATED NATIONAL DEVELOPMENT PLAN OF THE PHILIPPINES



EDITION 1

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1. Introduction

The purpose of the Softcopy Exploitation Tool (SOCET SET®) software is to support imagebased softcopy applications such as map-making, mission rehearsal, and photo-interpretation.

SOCET SET generates databases and products such as Digital Terrain Models (DTM), reports, vector databases, orthophotos, image maps, and image mosaics. SOCET SET supports a wide variety of applications, including:

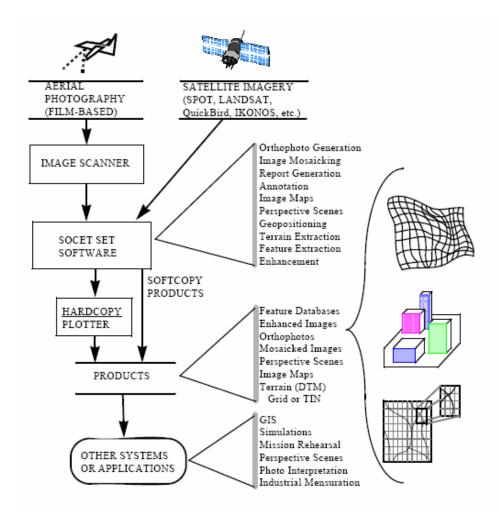
- Populating a GIS database (vector or raster)
- Producing image maps
- Civil engineering
- Mission planning
- Targeting
- Mission rehearsal
- Sensor research and development

The SOCET SET software consists of over sixty application functions that can be chained together to form a processing flow that inputs imagery, performs the requisite analysis, and produces the final hardcopy or softcopy products. This User's Manual describes the application functions in detail, including the following:

- Data import capabilities for imagery, feature, and terrain data
- Automatic extraction of Digital Terrain Model (DTM) elevation data
- Interactive graphical editing of DTM data
- Interactive two and three-dimensional feature data extraction
- Orthophoto generation
- Perspective scene generation
- Point positioning, three-dimensional mensuration, and targeting
- Image mosaicking
- Image enhancement
- Data export functions for softcopy databases (imagery, feature, and terrain data), and hardcopy products (image maps)

2. Typical Product System Flow

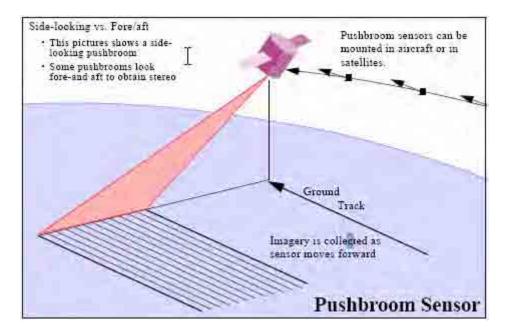
Imagery is input to SOCET SET from either a digital softcopy source, such as SPOT or Landsat, or by scanning film-based imagery. The workstation products are in either softcopy format (such as DTMs, vector databases, orthophotos, etc.) or hardcopy format (such as image maps or photorealistic perspective scenes).



3. Using Satellite Imagery

Overview of SPOT, JERS, and IRS

SPOT, JERS, and IRS Imports read imagery and geo-referencing information from CD-ROM, magnetic tape, and disk media into SOCET SET. SPOT imagery is available from SPOT Image Corporation and other distributors. JERS imagery is distributed by NASDA. IRS imagery is available from various distributors.



When to Use SPOT Image Import

You use SPOT Import when you have SPOT data and you want to exploit the image in the data set. You run SPOT Import after creating a project to hold the imagery. After importing a SPOT image, you can the proceed with Triangulation and then data extraction. SPOT Import works in projects with the Geographic, UTM, or Grid coordinate systems, but not the LSR coordinate system.

Formats Supported

SPOT imagery is supplied in a variety of formats and processing levels. The various formats are described below.

Categorized by spectral type, SPOT comes in several types:

- Multispectral without short-wave infrared (SWIR) (known as MLA or Xs) (3 bands)
- Multispectral with SWIR (known as Xi or I) (4 bands)
- Panchromatic (known as PLA, PAN, P, or M)

SOCET SET imports all the above types of SPOT imagery.

SPOT multispectral imagery comes in two formats: Band Interleaved (BIL) or Band Sequential

(BSQ). SPOT panchromatic imagery always comes in BSQ format. SOCET SET imports both

BIL and BSQ formats.

Your SPOT imagery may have been preprocessed by your supplier to assist with control or geopositioning.

There are four processing levels available from SPOT:

- 1A Raw. This is unrectified data and the pixels may have non-uniform GSD.
- 1B Rectified. The imagery has been resampled and geo-coded to a uniform GSD.
- 2 Controlled. Controlled support data is provided that is based on GCPs.
- S Stereo. A relative orientation has been performed on this SPOT stereo pair.

SOCET SET accepts processing levels 1A and 1B only. Processing level 1B is the most common type of SPOT imagery.

SPOT Image has introduced the DIMAP format. They are distributing all SPOT 5 data in this format and will be transitioning data from previous satellites to DIMAP. If you have a DIMAP data set, you must import it with SPOT DIMAP Import. SOCET SET supports the same SPOT DIMAP products as with previous formats, that is, SPOT full-scene 1A and 1B in both panchromatic and multispectral.

Finally, the SPOT tape format varies between SPOT distributors. SOCET SET accepts imagery in the standard format of the SPOT Image Corporation and in the standard format of the Canada Centre for Remote Sensing (CCRS) and Australian Centre for Remote Sensing (ACRES). The image formats processed by SOCET SET are taken from The SPOT Scene Standard Digital Product Format (S4-ST-73-01-SI), SPOT Image Corporation, 1995, and *Standard SPOT MLA/ PLA CCT Format* (DMD-TM85-428A), Canada Centre for Remote Sensing, 1985. SOCET SET supports the "CAP" data format.

Some CCRS SPOT data sets have a defect which causes the image to be shifted to the east or west. You can set a special environment variable when starting SOCET SET to fix the problem. There are two ways to set the variable. One is to add -setenv_no_arg CCRS_ROLL_INVERT to the file <install_path>/.socet_xxx, where "xxx" is the name of the machine you are working on. This method will always perform the correction for all CCRS SPOT imports until you edit the .socet_xxx file and take the instruction out. The other way is to start the SPOT Import task manually by typing:

% <install_path>/bin/start_socet -setenv_no_arg CCRS_ROLL_INVERT -single spot 1 xxx.prj

where "xxx" is the name of your project. This method only performs the correction for that

particular import session.

Some SPOT images in the CCRS (Canadian) format contain an error in the sensor attitude data on the tape header, which make it impossible to control the image with SOCET SET. If you find this to be true, ask your tape supplier for a replacement tape. This is not a problem with SPOT tapes produced by the SPOT Image Corporation.

Using SPOT images

When creating a project which will include SPOT images, the geodetic datum must be based on an earth-centered ellipsoid such as WGS 84. The reason for this is that the SPOT satellite ephemeris and attitude data are based on an earth-centered system. Before

importing your data, make sure your project has an origin near the center of your SPOT or JERS data set. It should be in the same hemisphere for Geographic projects, or the same UTM zone for UTM projects.

Interior Orientation is not required with SPOT images, since the sensor is a digital camera, resulting in a known, fixed relationship between each image pixel and the sensor lens.

SOCET SET can accommodate images from different sensors simultaneously. From the user's point of view, there is little difference between triangulating a block of frame images, SPOT images, or a mixture of both. When triangulating SPOT images, there are thirteen parameters which can be adjusted: the focal length, the 6 parameters of position and attitude, and the 6 first degree components of position and attitude with respect to time. Apriori estimates for these are obtained from the SPOT header data.

The recommended number of ground control points is 4–6 per model (or per multiple image strip if all images are from a single orbital pass.) Pointing accuracies range from 6–20 meters. If there are no ground control points available, the expected absolute distance error is approximately 500 meters. A single control point can correct for model offsets due primarily to timekeeping errors.

Two control points can correct for offset and azimuth errors.

Outputs

Outputs consist of an ASCII support file and a binary image file which is tiled with a header in a tiled format. The support file is created in the data directory used by the current project file. The display of support data is provided by the window popped-up from the main SPOT menu.

Importing From CD-ROM

SPOT Import recognizes the data format for SPOT Scene and CCRS CD-ROM products. On Unix, the CD-ROM must be mounted on the directory "/cdrom." If this is not the case, ask your system administrator to mount it there. The root directory of the CD ROM must have subdirectories called "scene01," "scene02," etc. for each scene on the disk. If you have difficulty importing, you can also try identifying the files with the Importing From Disk interface.

Importing From Disk

SOCET SET can use disk files for the SPOT data. There can be one single large file containing the Volume Directory File, Leader File, Imagery File, Trailer File, and Null Volume Directory File or these files can be kept separate. If the files have the SPOT Scene naming convention, e.g. vold_01.dat, lead_01.dat, imag_01.dat, trai_01.dat, null_01.dat, then you can click on just one of them and the rest will be filled in automatically. The disk file selection box also allows you to select more than one file. You can use this feature if you are having difficulty in importing a set of files and would like to try a different file ordering. The files are read in the order that you click on them. You can specify multiple files by clicking on them while holding the Control Key.

Transferring Data From Tape to Disk

You might want to transfer your data from a tape to disk so that it can be subsequently imported from disk on a different workstation. The steps to do this are as follows:

- 1. Mount the 9-track *CCT* on a tape drive. In this example the device name of the tape drive will be /dev/rmt/7n.
- 2. Use the <install_path>/bin/tape_struct executable to determine the files and record size.

% <install_path>/bin/tape_struct /dev/rmt/7n

As a result of this command the messages should reflect the file number and block size of the records in each file.

3. Edit the <install_path>/bin/copy_spot_to_disk script to reflect the input record block size. This script file should reflect the following commands which must be correct in order to copy records verbatim to disk files dd ibs=360 if=/dev/rmt/7n of=vold_01.dat

uu 10s=500 11=/uev/1111//11 01=v01u_01.uut

dd ibs=3960 if=/dev/rmt/7n of=lead_01.dat

dd ibs=8640 if=/dev/rmt/7n of=imag_01.dat

dd ibs=1080 if=/dev/rmt/7n of=trai_01.dat

dd ibs=360 if=/dev/rmt/7n of=null_01.dat

mt -f /dev/rmt/7n rewind

Some older SPOT images were on two tapes at 1600 bpi for a single image. If there is a second tape involved, then repeat these first three steps for the second tape as well using _02.dat in place of _01.dat for the output files.

Strip off the first 8640 bytes from part 2 of the image which is imag_02.dat using the following command:

dd if=imag_02.dat of=strip_02.dat bs=8640 skip=1 Second, you then concatenate the following input files into one output file:

> cat vold_01.dat lead_01.dat imag_01.dat strip_02.da trai_01.dat null_01.dat > scene1

4. Now proceed to import the disk image file, as described under importing from disk.

3.1 Orthomosaicking

3.1.1 Preparation

3.1.1.1 Create new Datum (e.g. PRS92) and Grids (e.g. PTM and UTM)

To add a new datum or grid, the ASCII files in this directory (C:\SOCET_SET_5.3.0\Internal_dbs\ GEODETIC) must be edited before running Create Project.

```
DATUMS
```

To create a new datum, you must add the appropriate information to file geodetic.dat

The values for each datum in the geodetic.dat file are arranged in pairs of lines. The values for each column are as follows.

Line 1: Num D_name

Line 2: E_code A F dA dF*10^4 dX eX dY eY dZ eZ G_code s rX rY rZ use_approx

__ __ __ _____

The last 5 values (s, rX, rY, rZ, use_approx) are optional.

Num = serial number of the entry within the file. D name = name of the datum (sometimes abbreviated, should be 80 characters or less). E_code = 2 character code for the reference ellipsoid corresponding to this datum A = equatorial radius (semi-major axis) in meters. F =flattening (defined below). dA = difference between this datum's radius and WGS84 radius (reference only) $dF*10^4$ = difference between this datum's flattening and WGS84_flattening multiplied by 10,000 (reference only). dX, dY, dZ = offset of this datum's ellipsoid with respect to the centroid of the earth (WGS84), expressed in meters. eX, eY, eZ = error estimates for the datum offsets (+ or -, expressed in meters).

G_code = EPSG Geographic CS Type Codes, Based on EPSG Datum. Numbers 4200-4999: valid codes Number 0: undefined For details, see the website:

NOTE: Use meters to specify earth radius and XYZ offsets. DO NOT USE FEET. If you are working in a feet-based project, the conversions will be performed automatically for you by SOCET SET. Use radians to specify rotation.

The file 'geodetic.doc' is provided for reference and is not used by the workstation. However, you should add an entry to the geodetic.doc file,for reference purposes.

GRIDS

The file "grid_parameters" defines the various grids the operator may choose from when running the Project Creation function in SOCET SET. This file is used by the Project Creation process to create a menu for the operator to select a grid. A grid must be added to this file BEFORE running the project creation process if you want to use the grid. The format of the file is defined in comments in the file itself.

A grid is a localized coordinate system based on a map projection that is well suited to the local region. Every state has one or more grids defined, called 'State Plane' coordinate systems.

EARTH SHAPE

The oblateness of the earth may be expressed three different ways:

```
flattening = (a-b)/a;
eccentricity = sqrt ( (a**2 - b**2) / a**2 );
eccentricity_squared = (a**2 - b**2) / a**2;
```

Where a = equatorial radius, and b = polar radius. To compute ecc_squared from flattening, use this formula:

 $ecc_squared = f * (2 - f);$

FEET VS. METERS

```
_____
```

All distances in these files are measured in METERS. Distance values include:

- the earth radius
- XYZ offset of the datum
- XYZ offset error estimates of the datum
- false easting and northing

Do not use FEET units in these files!! If the coordinate system you are using is feet-based (as are many State Plane systems) don't worry: enter the data (false easting and northing) in these files in METERS, then select "Units = FEET" during the project creation process. Thereafter, all your input and output will be in FEET units. For more information, see the Project Management chapter of the DPW SOCET SET User's Manual.

Sample file of geodetic.dat

VERSION 1.0

######## # # DO NOT CHANGE THE FIRST LINE (the 'VERSION' line) # # This file contains the parameters for specifying datums. # Parameters for the standard datums are taken from # NIMA document "Department of Defense World Geodetic System 1984. # Its Definition and Relationships with Local Geodetic Systems". # TR8350.2, Third Edition, Amendment 1 (3 January 2000), # Appendices A.1, B.1-B.10 and C.1-C.2. # # NOTE: This file replaces old versions of both datum.dat # and geodetic.dat. # # You can add lines to this file, to specify other datums, if you # wish. If you do, be sure to follow the existing format. The # values for each datum in this file are arranged in pairs of lines. # See internal dbs/GEODETIC/README for the format. # ######## 1 WGS 72 2.000 0.00031000 0.0 1.0 0.0 1.0 WD 6378135.00000 0.0033527795 0.0 1.0 4322 2 WGS 84 WE 6378137.00000 0.00335281066475 0.000 0.0000000 0.0 1.0 0.0 1.0 0.0 1.0 4326 3 [ADI-M]_ADINDAN(Mean_Solution) CD 6378249.14500 0.0034075614 -112.145 -0.54750714 -166.0 5.0 -15.0 5.0 204.0 3.0 4201 4. PHILIPPINE (PPCS) CC 6378206.40000 0.00339007530393 -69.400 -0.37264639 -127.6220 0.0 -67.2448 0.0 F dA dF*10^4 E code Α dY dX eX eΥ -47.0431 0.0 0 0.99999893998 0.000014872241633 -0.000023769979580 eZ G_code dZ S rX rY 0.000007649875327 1 rΖ use approx

Sample file of ellipsoid.dat

```
VERSION 1.0
#
#
#
# DO NOT CHANGE THE FIRST LINE (the 'VERSION' line)
#
#
#
# This file contains reference ellipsoid names and their
# associated constants. Refer to NIMA document TR8350.2,
# Third Edition, Amendment 1, 3 January 2000,
# "Department of Defense World Geodetic System 1984",
# Appendix A.1
#
# You can add entries to this file if you desire.
# When doing so, please use the following guidelines.
#
# 1. Use underscores () instead of spaces in all
    ellipsoid names.
#
# 2. Make sure that you specify a unique 2-character
#
    ID code for the new ellipsoid. This will be
#
    the same code that you will use in file
#
    geodetic.dat for any datums that will use the
#
    new ellipsoid.
# 3. If you want to specify subclasses of ellipsoids
    (similar to the Bessel 1841 and Everest
#
#
    ellipsoids), the first character of the
#
    subclass line must be a space.
# 4. Equatorial radius, flattening and eccentricity
    squared values are included in this file for
#
    reference, but are not used by the software.
#
    It is not critical that these values be
#
#
    accurate in this file.
#
#
#
# Ellipsoid Name
                                 ID Code Equat. Rad(a) Flattening(f)
Ecc_squared
# -----
                                                  _____
#
Airy_1830
                                     AA
                                          6377563.396 0.003340850641
0.006670539999
Australian National
                                       AN
                                                           0.0033528918692
                                              6378160.0
0.0066945418545
Bessel 1841
 Ethiopia,_Indonesia,_Japan_and_Korea
                                       BR
                                             6377397.155 0.003342773182
0.006674372231
```

Namibia	BN	6377483.865	0.003342773182
0.006674372231 Clarke_1866	CC	6378206.4	0.00339007530393
0.00676865799729 WGS 1972	WD	6378135.0	0.0033527795
0.0066943179 WGS 1984	WF	6378137.0	0.00335281066475
0.00669437999014	~~	0010101.0	0.00000201000470

Sample file of grid_parameters

DO NOT CHANGE THE FIRST LINE (the 'VERSION' line) # # # This file is the grid file. This file defines the various grid coordinate # systems that the operator may select when creating a SOCET SET project. # This file is used by several SOCET SET applications: # # a) Project Create (selecting a Grid coordinate system) # b) Coordinate Measurement - CoordinateTransformation subwindow # c) Annotation - Gridlines / Ticks # d) Control Point Measurement - data entry coordinate system # e) Triangulation - Interactive Point Measurement # # ADDING GRID DEFINITIONS TO THIS FILE # ------# If you want to create a grid coordinate system and use it in SOCET SET, follow # these steps: # # 1) Edit this file. Add your new grid definition into this file. It is usually easiest to copy an existing grid definition and change it # rather than typing-it in from scratch. # You may add your grid anywhere in this file after the first "VERSION" line. # # Most users find it most convenient to place their grid as the first coord system. # # 2) You can delete other grid definitions out of this file if you want to. # # 3) Save this file back into /usr/geoset/internal dbs/GEODETIC/grid parameters # # 4) Start SOCET SET. When you run Project Create, you will see your Grid in the the list of grids when you select the Grid option under Coordinate Systems. #

- #
- #
- #

FORMAT OF GRID DESCRIPTOR

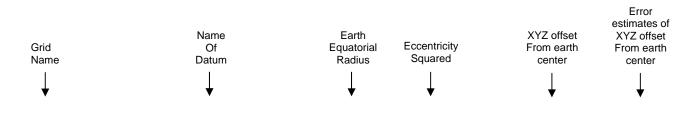
Each grid is described in three sections:

#

- # (1) The first line describes the grid name and datum info.
- # The grid name follows the keyword GRID_TYPE and may be any string you like:
- # it sole purpose is to distinguish between the various grids in this file.
- # The values for DATUM_NAME, DATUM, OFFSET and ERROR are those

contained

in file geodetic.dat for the datum in question.



GRID_TYPE al_e_27 DATUM_NAME [NAS-C]_NAD_27(CONUS) DATUM 6378206.4 0.00676865799729 OFFSET -8 160 176 ERROR 5 5 6

- # The numbers on this line can be in scientific notation (e.g. 6.69E-03) or in normal
- # floating point notation (e..g 0.00669).
- #
- # The XYZ offset is measured from the center of the WGS_84 ellipsoid (Z axis up thru
- # North pole; X axis thru Greenwich meridian; Y axis thru +90 degrees longitude).
- # #
- # (2) The middle lines describe the projection. The possible projections are:
- #
- # TRANSVERSE_MERCATOR_PROJECTION
- # CASSINI_SOLDNER_PROJECTION
- # HOM_PROJECTION (Hotine)
- # LAMBERT_CONFORMAL_PROJECTION
- # MERCATOR_PROJECTION
- # POLAR_STEREOGRAPHIC_PROJECTION
- # POLYCONIC_PROJECTION
- # STEREOGRAPHIC_PROJECTION
- # TRANSVERSE_MERCATOR_PROJECTION
- # UTM_PROJECTION

NEW ZEALAND # # SINUSOIDAL PROJECTION # # Each projection has a 2 to 4 lines of definition. # The content varies depending on the projection. The syntax for each projection is described below in the "sample" grids. # # For example, for UTM: # # keyword # defining the # projection # # V PROJECTION_TYPE UTM_PROJECTION # # ZONE 1 # # # (3) The last line holds false easting and false northing (in meters). # These are positive offsets added to the projection coordinates to force # most values to be positive. Generally, the Positive and Negative # false eastings are identical. IMPORTANT: If your grid does not # work properly, make the first and second numbers the same and # the third and fourth numbers the same, e.g. # F NORTH POS 10000000 F NORTH NEG 10000000 F EAST POS 500000 # F EAST NEG 500000 # # # FEET VS. METERS # ------# All distances in this file are measured in METERS. Distance values include: # # - the earth radius of the datum # - XYZ offset of the datum - XYZ offset error estimates of the datum # # - false easting and northing # # Do not use FEET units in this file!! If the grid coordinate system you # are using is feet-based (as are many State Plane systems) don't worry: # enter the data (false easting and northing) in this file in METERS, then # select "Units = FEET" during the project creation process. Thereafter, # all your input and output will be in FEET units. For more information, # see the Project Management chapter of the SOCET SET User's Manual. # # **# FALSE EASTINGS AND NORTHINGS** # ------# XY Coordinate values in a grid coordinate system are often negative (e.g. # X values are negative to the West of the origin point). However, many grids # are defined to force the XY values to be always positive. This is achieved NOT # by moving the origin point, but rather by adding artifical offsets to the # mathematically correct XY values. These offets are called "false northing" and # "false easting". These are usually large positive numbers.

#

There are two false values for X: false easting positive and false easting # negative. The former is used when the X value is positive, and the latter # when the X value is negative. The same for Y: false northing positive and # false northing negative. # # The false easting positive and false easting negative should be identical # (we are not aware of any coordinate system in which they differ). # # The false northing positive and false northing negative are usually identical, # but will be different in some rare cases. For example, the UTM grids # (transverse mercator, with origin at the equator) use different values # for false northing positive and false northing negative. # # The false eastings and false northings are always defined in this file in # meters, even if you are defining a feet-based grid. If you are using a # feet-based grid, you may find the following conversion # table useful (note: these values are based on the # International Foot definition; if you are using the U.S. Survey Foot, these # values are not valid): # # FEET METERS (use in the grid definition below) # -----# 100.000 30.480 # 500.000 152,400 # 1,000,000 304,800 # 2,000,000 609,600 #

LATITUDE / LONGITUDE

All latitude and longitude locations are specified in radians, not degrees.

Degrees WEST of Greenwich are expressed as NEGATIVE radians. For example,

118 degrees west is represented as -2.059488517353309 radians.

If you have a location in degrees, and you need to convert it to radians, use

the degree-to-radian conversion program (activated under the Tools menu on the # main SOCET SET menu).

#

SCALE REDUCTION FACTOR:

The central scale factor is another way of expressing a scale reduction:

e.g. a scale reduction of 1:10,000 corresponds to a scale factor of 0.9999

This is used in transverse mercator, hotine oblique mercator, and

stereographic projections.

#

STATE PLANE DATUMS

The entire Unites States is covered by 122 grids called the State Plane grids.

There are two versions of the State Plane grids: an older set based on the NAD 27

```
# datum and a newer set based on the NAD 83 datum. This file contains both
# the old and the new state plane systems. For example, California Zone 6 is
# ca_6 (old, NAD-26) and ca_6_83 (new, NAD-83). For reference, the two datums
# used for State Plane grids are:
#
                                                      XYZ Accuracies
#
    Datum
              Equa.Radius ecc_squared XYZ offsets
#
    ----- ------
#
                           0.00676865799729 -8.0 160.0 176.0 5 5 6
    NAD 27
              6378206.4
                                                          0.0 2 2 2
    NAD 83
              6378137.0 0.00669438002290 0.0 0.0
#
#
#
# COMMENT LINES
# ------
# All lines in this file beginning with '#' are treated as comments and ignored.
#
#
# ECCENTRICITY AND FLATNESS
# ------
# The oblateness of the earth may be expressed three different ways:
#
#
  flattening
                = (a-b)/a;
  eccentricity
#
                = sqrt ( (a**2 - b**2) / a**2 );
#
  eccentricity_squared = (a^{**2} - b^{**2}) / a^{**2};
#
# Where a = equatorial radius, and
#
     b = polar radius.
#
# To compute ecc_squared from flattening, use this formula:
#
#
    ecc\_squared = f * (2 - f);
#
#
# GEOTIFF
# ------
# Each grid definition may be followed by an optional GeoTiff ID number line.
# The format is:
#
    GEOTIFF <id number>
```

```
# This line is optional, and if it does appear, it must be the final line
```

of the grid definition. The ID numbers are obtained from the GeoTiff

(a) Coordinate System

0

Coordinate system for all control points carried out under the Philippine Plane Coordinate System (PPCS) in <u>1992</u>. The characteristics of the PPCS are:

	PRS 92	No enorgia esta successi brits
(i)	Spheroid Projection	101 (M)
1-727-0	Clarke's Spheroid of 18	66/
	Semi-Major Axis	:6,378,206. 7
1	Semi-Minor Axis	: 6,356,583.8
	Flattering	: 1/294.98
	X Shift to WGS84	: -127.6220m
	Y Shift to WGS84	: - 67.2448m
	Z Shift to WGS84	:- 47.0431m
	X Rotation to WGS84	: 3.06762 arc seconds
	Y Rotation to WGS84	:-4.90291 arc seconds
	Z Rotation to WGS84	:-1.57790 arc seconds
	Scale Correction to WGS	S84 @1.06002ppm
100	n for	0.11999 893778

Projection Transverse Mercator, in zones of two (2) degrees net width

(iii) Point of Origin Intersection of the Equator and the Central Meridian of each zone, with Northing of 0 meter and Easting of 500,000 meters.

(iv) Scale factor at the Central Meridian : 0.99995 Zone No Central Meridian Extent of Zone

I 117° 116° 00' 118° 30' to п 119° 117° 30' to 120° 30' Ш 121° 119° 30' to 122° 30' 3=5 IV 123° 121° 30' to 124° 30' v 125° 123° 30' 127° 00' to Zone III was occupied for the project. Two (2) existing GPS

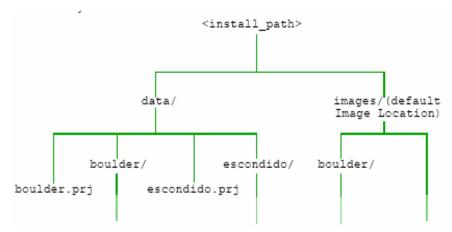
stations, namely NVY-1 and ISB-2, which were established by National Mapping and Resources Information Authority (NAMRIA) in 1992, were chosen and applied as the Northing and Easting geographical coordinates datum for the project.

-1-

3.1.1.2 Establishing the path/directory where the images are to be located.

Before you can import or display imagery with the software, you must create a project. You can think of a project as a container holding the data for a set of images you are going to utilize. The data you extract from a set of imagery will be stored in the project directory that contains that set of imagery. When you create a project, you specify the coordinate system and datum to use for the project. You also will specify the disk directories of where the project and imagery data will be stored. Most importantly, you give your project a name. The name of the project file is the name you assigned to the project with the extension.prj when it was created. The software stores the definition of a project in a special project file.

SOCET SET uses the computer file system to store its project data. The following figure depicts the directory tree the software uses to store its data.



Most software applications require that you first load a project. Once you have loaded a project, you can then operate on the imagery and other data contained therein. You can import images into the project, triangulate the images, perform feature and terrain extraction, and create image products to export. The locations of the image files are defined by entities called Image Locations.

1. .Create the path/directory location of the image file.

🔄 Images					- O ×
File Edit View Favorites Tools	Help				<u></u>
🕝 Back 👻 🕑 – 🎓 🔎 Search	h 🔁 Folders	🔄 🗙 🗳 🛄 -			
Address C:\SOCET_SET_5.3.0\images					🔁 Go
Folders	×	Name -	Size	Туре	Date Mo
🛅 bin		escon		File Folder	6/12/200
🖽 🧰 data		harbor_demo		File Folder	6/12/200
🖽 🧰 doc		pp		File Folder	6/4/2007
🗄 🦲 Escondido Training Data	e i i i i i	C spot		File Folder	6/9/2007
		Dtest		File Folder	6/4/200;
ica escon ica harbor_demo ⊞ica qu		253033180304090248431A.tif	2,264,884 KB	TIF Image	6/8/200:
spot	~	41			K

2. Open "SOCET SET 5.3.0" Click "Project", select "Create/Edit Project"



3. .A "Create/ Edit Project dialog box will appear. Click the browse button in the "Location "box.

Project:	escorOttames.pn
Project Path:	C:\SDCET_SET_5.3.0\data\escon2frames
Datum:	W65_84
Coordinate Syste	em: Grid / State Plane
Lat/Lon Format:	DD(MM/BS
Minimum Ground	Elevation (estimated) 200.00
	d Elevation (estimated) 400.00
Location esco	
currently in use	eate/Edit Project. Modifying projects by other stations is not advised escon2frames.prj loaded successfully

4. A "File Location" dialog box will appear. Click "Edit Locations" Edit Locations button



5. .A "location.list-WordPad" dialog box will appear. Type the directory (e.g. C:\SOCET_SET_5.3.0\images\spot). Then click "Save"

location.list -	WordPad
le Edit View	Insert Format Help
ÞEFAULT	C:\SOCET_SET_5.3.0\images
test	C:\SOCET_SET_5.3.0
trial	C:\SOCET_SET_5.3.0\images\trial
escon	C:\SOCET_SET_5.3.0\images\escon
spot	C:\SOCET_SET_5.3.0\images\spot

3.1.1.3 Creating Project.

You use Create/Edit Project to create your project. Since most SOCET SET applications require a project to be loaded, you must create a project before you can proceed with importing and extracting data.

1. .Click "File", select "New".

Create / Edit F	roject	
File Options Help		
New Load Asoject Save	C:\SDCET_SET_5.3.0\data	
Save As Exit	Select Coordinate System	
Vertical Reference Minimum Ground Ele	 ✓ Ellipsoid ✓ MSL EGM96 _ ✓ 	
Maximum Ground E		
Location. DEFAU	LT	
currently in use by	e/Edit Project. Modifying projec other stations is not advised. on2frames.pij loaded successl new project	
		3

2. .Click the down arrow **I** in the "Coordinate System" box and select "Grid / State Plane".

Greate / Edit P	roject	
File Options Help		
Project:	funded	
Project Path	C:\SOCET_SET_5.3.0\data	
Datum:	WGS_84	- 245
Coordinate System:	Select Coordinate System	-
Lat/Lon Format:	Select Coordinate System Geographic LSR (Local] LSR with Curvature	
Minimum Ground Ele	Grid / State Plane	
Maximum Ground El	and the second	
Location: DEFAU	10 10 10 10 10 10 10 10 10 10 10 10 10 1	
currently in use by	e/Edit Project. Modifying projects other stations is not advised new.prj loaded successfully new project	
		11

3. .A "Select a Coordinate System" dialog box will appear. Scroll down the arrow and select the desired coordinate system (e.g. Philippine_UTM_51N). Then click "OK".

PTM_zone_1(117) PTM_zone_2(119) PTM_zone_3(121) PTM_zone_4(123) PTM_zone_5(125)	British_National_Grid PTM_zone_1(117) PTM_zone_2(119) PTM_zone_2(121)	
PTM_zone_2(119) PTM_zone_3(121) PTM_zone_4(123) PTM_zone_5(125)	PTM_zone_2(119)	
PTM_zone_3(121) PTM_zone_4(123) PTM_zone_5(125)		
PTM_zone_4(123) PTM_zone_5(125)	FIM ZONE SHZI	
PTM_zone_5(125)		
Philippine_UTM_51N	PTM_zone_5(125)	
	Philippine_UTM_51N	

4. .Click the browse button in the location box. A "File Location" dialog box will appear. Select the image file location [e.g. spot (211451.2mb)] Then click "OK"

File Location		21
DEFAULT (211451		
test (211451.2MB) trial <no dir="" such=""></no>		
escon (211451.2M spot (211451.2MB		
		R.
DK I	Cancel	Edit Locations

5. .Type 0 in the "Minimum Ground Elevation (estimated) box and 1800 in the Maximum Ground Elevation (estimated) depending on the highest elevation of the project area. Click "File", then click "Save".

New	Untiled
Load Project	
	C:\SOCET_SET_5.3.0\data
Save Save As	PHILIPPINE_(PPCS)
Exit	Grid / State Plane 🤦
Lat/Lon Format:	DD:MM:SS Units: Meters
Vertical Reference	
	C Ellipsoid
Minimum Ground E	← Ellipsoid ← MSL EGM96
Minimum Ground E	← Ellipsoid ← MSL [EGM96 _] levation (estimated) 0

A "Project Name Selection" dialog box will appear. Type the desired project name (e.g. monospot) in the "Enter Project Name" box. Then click "OK" OK.

	? ×
Ĩ	
DK.	Cancel
	Ϊ DK

7. .Check the bottom box of the "Create / Edit Project" dialog box, if the project "monospot" was created.

💽 Create / Ed	it Project	- 0 ×
File Options I	Help K	
Project:	manaspol	
Project Path.	C:\SOCET_SET_5.3:0\data\	monospot
Datum:	PHILIPPINE_(PPCS)	
Coordinate Syste	m: Grid / State Plane	×
Lat/Lon Format:	DDMMRSS - Uni	ts: Meters 💌
	MSL EGM96 Ilevation (estimated)	
Location spo	a con a	
	escon2frames.prj loaded successfu for new project ot.prj created	dly •

3.1.1.4 Importing the Image (SPOT DIMAP)

If you are importing SPOT data with three bands, you will see a popup menu asking which bands you want to import. If you select "All Bands (color)" the three bands will be merged into a single color (3-band) image file. The name of the support file will be what you entered in the name box. If you select "All Bands (grays)" the three bands will be put out as three separate monochrome images. The name of the support file(s) will be what you entered in the name box concatenated with "_band_n.sup," where "n" is "1" "2" or "3" for the three bands. If you select "Band n only," it will behave the same as "All Bands (grays)," except only the single band you select will be imported. For SPOT4, four bands are available.

1. Click "File", select "Load Project".



2. A "Select Project File" dialog box will appear. Select the project name (e.g. monospot.prj) that was created. Then click "OK"

_

- 😉 SOCET SET® 5.3.0Export_20070308 Copyright © BAE SYSTEMS National Security Solution File Project Preparation Extraction Products Output Preferences Tools Help Import Image ¥ Project: mono: Import/Reformat Minification X/Lon: 49624 Terrain . TIFF-RPC Image Dodge and Balance Features , Ortho 10.0 Interior Orientation þ. **ASCII Ground Points** Computer GeoTIFF **Control Point Editor ASCII Image Points** DOQ Multi-Sensor Triangulation 179 Full 💌 🏥 🕫 🗧 NITE Registration ĸ World File Network Resample Þ Frame laces **Build Fast Sensor Model** BINGO Frame Camera Calibration Panoramic QuickBird Basic ycle Bin QuickBird Standard WorldView Basic WorldView Standard ADS40 OrbView3 **IKONOS** LandSat SPOT DIMAP SPOT JERS IRS RADARSAT ERS
- 3. Click "Preparation", select "Import", select "Image" and then click "SPOT DIMAP".

4. A SPOT DIMAP IMPORT<monospot.prj> dialog box will appear. Put mouse arrow inside the "DIMAP files box and click right mouse button. Click the "Add" button.

SPOT DIMAP Imp	ort <monospol.pri></monospol.pri>	
DIMAP Files		
	Add	
Output Images		
Copy images to		
Location: spot		
Format:	TIFF Tiled	-
Edit Names		

ook in: 🔄 C:/JICA/Spot5_original/CD8/SCENE01/	-	0 E C	* 158 1
METADATA DIM			
	- -		
le name: "METADATA.DIM"	+		Open

6. The selected image file will be reflected in the "DIMAP Files" box. Set Format to TIFF TILED. Then click "Start"

SPOT DIMAP Impo	et «monospol.pri»	-101
DIMAP Files		
C:\JICA\Spot5_origin	al\CD8\SCENE01\MET/	ADATA.DIM
		12
Output Images		
Copy images to		
Location: spot		
Format:	TIFF Tiled	×
Edit Names		

7. See information at the bottom box and check if import is complete.

SPOT DIMAP Import ≤monaspol.pr > File: Options: Help	-101 ×
DIMAP Files	
C:\JICA\Spot5_original\CD8\SCENE01\META	DATA.DIM
×	1.1
Output Images	
🔽 Copy images to	
Location spot	
Format:	E
Edit Names	
Please wait Created 53033190602280235561A.sup Reformatting image Minifying 53033190602280235561A.sup Concatenating TIFF files Import complete	
	Start

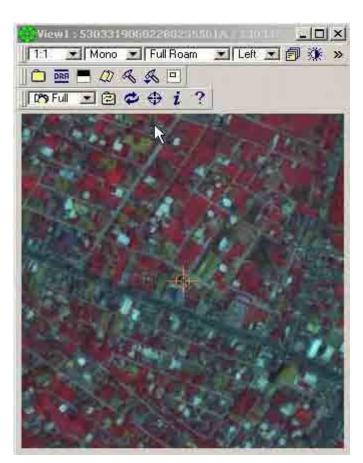
8. After importing the image, click "File", select "Load Images".



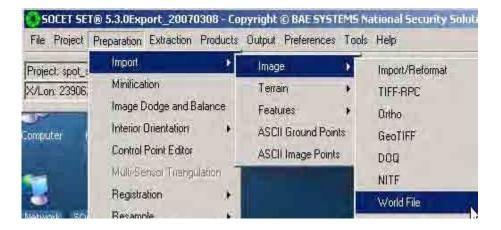
9. A "Image Loader" dialog box will appear. Click "Create" Create to create a view window. Select the image file name (e.g. 53033190602280235561A) and click "Load".

Image Loader		Rig	nt Filter
*	Refresh	1*	
50000index_all 53033190602280235561A 7173-III Angeles	Û	50000index_al 530331906022 7173-III Angele	280235561A
GRAPHICS_ONLY	Û	GRAPHICS_0	
	Load		
View Control Panel			_
View: 3 💌 Current Po	oint 💌	Create	Destroy
	Stereo Mo	del Manager	Close

10. A view window will appear displaying the imported image (e.g. SPOT).



- 3.1.1.5 Importing the Image (Topographic Map)
 - 1. Click "Preparation", select "Import", select image, and click "World File".



2. .An "Image Import" dialog box will appear. Put mouse arrow inside the "Input Image Files" box and click right mouse button. Click the "Add" button.

		1
	Add.	··· 🔓
Identity Only		Georeterencing
Output Image(s)	_	
C Support File (July	
Image and S	apport File	
Location: spot	_sata	
Image Format	TIFF Tiled JI	PEG 👱
Prefix:	Su	ffix:
Output Name:	<image/>	
elect input image	als)	
and a straight of the straight	.(



4. The selected image file will be reflected in the "Input Image Files" box. Click "Georeferencing".

Identity Only	R		Georeferenc	ina
Output Image(s)	, in the second se			
C Support File Only				
Image and Support	File			
Location: spot_sata				<u>.</u>
Image Format. TIFF T	iled JPEG	➡ Jf	PEG Quality: 9	0
Prefix:	7	Suffix:	r	1
Output Name: kimage	e>	-	1	1.

5. A "Georeference Data" dialog box will appear. Select "Other" under "Source" column. Click "Select World File". Click right mouse button.

Image	ULX	ULY	URX	URY	LRX	LRY	LLX	LLY	Source
7173-III Angeles	ipg						1		Other
I from file									
	tes (Other only)								
I from file] Let ground coordinal	tes (Other only)	C Átr	iixel center			Càtri	xel outer edge		

6. A "World File Selector" dialog box will appear. Select the required world file (e.g. 7173-III Angelse.jgw). Then click "Open".

Look in:	images			* E C* III	
My Repent Documents Desktop Wy Documents My Computer	SPOT_rectify 7072-I Olong 7073-I O'Don 7073-I O'Don 7073-I Mt Pin 7074-I San C 7075-II Dagu 7172-I Maloic 7172-I Maloic 7173-II Cabar 7173-II San N 7174-I San Jo 7174-I San Jo 7174-II Munc	apo, jgw nell, jgw arlos, jgw arlos, jgw Ing, jgw pan City 5m, jgw is, jgw jua, jgw iatuan, jgw alas, jgw alas, jgw ic, jgw	7174-III Geron 7174-IV Cuyap 7175-II San Nii 7175-III Sinalo 7277-IV Angat 7277-IV Angat 7273-III Sibul S 7273-III Gener 7274-III Palay. 7274-IIV Pantal 7275-III Burgo 50000index_al	o.jgw colas.jgw nan.jgw 5m.jgw spring 5m.jgw al Tinio 5m.jgw an City 5m.jgw pangan 5m.jgw s 5m.jgw	
My Network	File name:	7173-III Angele	es.jgw		Open
Place	Files of type:	World files (*.*\	u×*00	-	Cancel

7. The world file parameters will be reflected in the "Georeference Data" dialog box. Then click "OK".

	Image	ULX	ULY	URX	URY	LRX	LRY	ШX	ЩҮ	Source
Ű	7173-III Angeles.jpg	229735.203	1688673.810	259630.203	1688673.810	259630.203	1651103.810	229735.203	1651103.810	World
fo	om file									
-	om file ground coordinates (O	ther only)								

8. Set Image Format to TIFF Tiled JPEG. Then click "Start".

Image Import/Reformat <s< p=""></s<>	pot_sata (mp) _ _ X
File Options Help	
Input Image File(s)	
7173-III Angeles.jpg	
T Identity Only	Georeferencing
Output Image(s)	
C Support File Only	
Image and Support File	
Location: spot_sata	
Image Format: IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	JPEG Quality: 90
Prefix:	Suffix:
Output Name: <image/>	
Select input image(s)	
	Start
	1

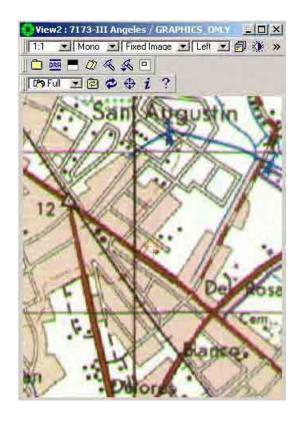
9. After importing the image (e.g.7173-III Angeles.jpg) is done, click "File", select "Load Images".



10. A "Image Loader" dialog box will appear. Click "Create" Create to create a view window. Select the image file name (e.g. 7173-III Angeles) and click "Load".

Left Filter		Ri	ght Filter
· · · · · · · · · · · · · · · · · · ·	Retresh]*	
50000index_all 53033190602280235561A 7173-III Angeles	1	50000index_all 53033190602280235561A 7173-III Angeles	
GRAPHICS_ONLY	+	GRAPHICS_	ONLY
	Luad	-	
View Control Panel	-	-	
View: Current Po	oint 💌	Create	Diestroy
	Stereo Mc	del Manager.	Close

11. A view window will appear displaying the imported image (e.g. 7173-III Angeles).



3.1.2 Import Ground Controls and SPOT Images

Ground Point Import reads ground point data in an ASCII format into the internal Ground Point File Format. The input ASCII file is restricted to one ground point per line. Each ground point contains a point ID along with an (X,Y,Z) coordinate. This information can be in any order, butit must all be on one line.Obtaining this window is as simple as clicking *Preparation* > *Import* >*ASCII Ground Point* Import on the main workstation.

ASCII Ground Point Imi	art Selar II DX
He Optime Help	
(nool File Format:	181
Input ASCII Bround Point Ele-	101
Dapat Grand Point File	
Unit	Pigert Narve
Charse project life Select input life	
	14

Ground point control types of horizontal, 3-dimensional, and vertical are used within SOCET SET. Ground points which have a value of 0.0 exactly will cause the control point type setting to change. If your data has a control point of 0.0 0.0 3.2, the point type will be set to vertical (Z only). If your data has a value of 2456.8 23778.9 0.0, the point type will be set to horizontal (X and Y only).

You use ASCII Ground Point Import to translate and import ground point data from an external source into the native SOCET SET ground point file format. The units of the data can be either decimal for UTM, grid, LSR, or Geographic projects (see below), or degrees minutes seconds for any project. Degrees minutes seconds must be entered as "+-DD:MM:SS.SSS". The presence of two colons is mandatory. When you create a Geographic project, you specify a preference for coordinate display. If you import a file with decimal numbers into a Geographic project whose display preference is "dd.dddd" the numbers will be interpreted as radians.

Edit Input Format Option

This window provides you with a way to specify the order of the information in the input file. Click *Options > Edit Input Format* on the ASCII Ground Point Import window. You can save this ordering in an input format file for later use with other ground point files.

The Fields column on the right of the ASCII Ground Point Import window (above), indicates the current order. To change a field setting, select the desired format from Format Selection on the left. Then click on the appropriate field on the right.

There are seven format settings from which to select: ID, X, Y, Z, Code, Ignore, and Illegal.

- "Code" has no meaning for ASCII Ground Points.
- "Ignore" is used to ignore any information that may be specified in a field.
- "Illegal" indicates that a field should not contain any information. The entire point is discarded should any information be found in a field marked as "Illegal." The following are some examples of legal settings for the input fields.



EXAMPLE 1	EXAMPLE 2	EXAMPLE 3
l: ID	1: Y	1: Ignore

EXAMPLE 1	EXAMPLE 2	EXAMPLE 3
2: X	2: X	2: X
3: Y	3: Z	3: Y
4: Z	4: Illegal	4: Z
5: Ignore	5: Illegal	5: Code
δ: Ignore	6: Illegal	δ: Ignore

3.1.2.1 Edit Ground Control Points file.

The GPS Ground Control Points file has several Field columns that need to be edited based on the seven Field column format settings (ID, X, Y, Z, Code, Ignore, and Illegal) being used in SOCETSET.

	Ele Edit y		<u>T</u> ools <u>D</u> ata <u>W</u> indow	51			e a question
6	100%	i 👔 🍟 MS	Pゴシック 11 •	B I U ≣≣≣	重\$%	1 .00 .00	建建
	220	041561	Reply wit	h Changes End Review			
	C21		260980.53				
	A	В	0	D	E	F	G
4			PRS92 X	PRS92 Y	Elevation	Elevation	difference
2	501	501_1	274572.52	1698191.53	33.00	20	13.00
3	502	502 GCP	284407.35	1689629.16	34.00	24.81	9.19
4	503	503 GOP	285036.27	1686969.12	42.00	22.28	19.72
5	504	504 JUNCTION	278627.80	1706457.48	37.00	22.63	14.37
6	505	505 JUNCTION	282713.07	1714043.42	46.00	30	16.00
7	506	506 BRIDGE	291496.24	1717591.18	55.00	46.71	8.29
8	507	507 GOP	293956.31	1719087.12	77.00	70	7.00
9	508	508 BRIDGE	299401.51	1724409.00	74.00	55.65	18.35
10	509	509 JUNCTION	300977.67	1729218.00	83.00	62.2	20.80
11	510	510 GOP	310398.82	1731545.73	202.00	200	2.00
12	511	511 JUNCTION	304110.74	1730564.91	100.00	87.07	12.93
13	512	512 BRIDGE	300660.70	1730234.01	72.00	60.06	11.94
14	513	513 BRIDGE	300486.72	1731078.03	76.00	62.41	13.59
15	514	514 BRIDGE	297375.89	1737378.17	88.00	80	8.00
16	515	515 GCP	296363.88	1737489.20	90.00	93.09	-3.09
17	516	516 JUNCTION	280582.30	1722327.55	52.00	37.93	14.07

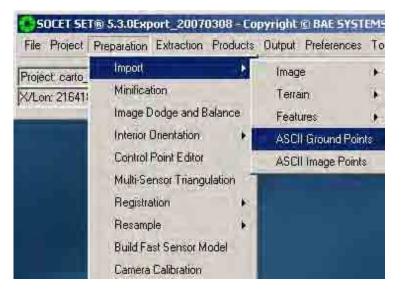
1. Open GPS Ground Control Points (text file) in Excel.

2. Delete unnecessary Field Columns. Then save file to *.csv format.

Microsoft Excel - gcp_list.csv							
: P I	Ele E	<u>E</u> dit ⊻ie	w Inse	ert F <u>o</u> rmat	Ioc	ols <u>D</u> ata	
		100%	*	📫 🗄 Arial			
: 🕞	123 8		2		3	1 63 1 7	
	D2	1		fx-			
	A		В	C		D	
1	501	27457	2.52	1698191	.53	33.00	
2	502	28440	07_35	1689629	9.16	34.00	
3	503	28503	36.27	1686969	9.12	42.00	
4	504	27862	27.80	1706457	.48	37.00	
5	505	28271	3.07	1714043	3.42	46.00	
6	506	29149	6.24	1717591	.18	55.00	
7	507	29395	6.31	1719087	.12	77.00	
8	508	29940)1.51	1724409	00.6	74.00	
9	509	30097	7.67	1729218	8.00	83.00	
10	510	31039	8.82	1731545	5.73	202.00	
11	511	30411	0.74	1730564	.91	100.00	
12	512	30066	60.70	1730234	1.01	72.00	
13	513	30048	36.72	1731078	3.03	76.00	
14	514	29737	75.89	1737378	3.17	88.00	
15	515	29636	3.88	1737489	.20	90.00	
16	516	28058	32.30	1722327	.55	52.00	
17	517	27823	39.21	1720170	0.60	54.00	

3.1.2.2 Import edited Ground Control Points File.

1. Click "Preparation", select "Import, and click "ASCII Ground Point".



2. An ASCIII Ground Control Point Import dialog box will appear. Click the browse button in the "Input File Format" box.

ASCII Ground Point Imp	oort <carto_sat< th=""><th>- 🗆 ×</th></carto_sat<>	- 🗆 ×
File Options Help		
Input File Format:	1	-
Input ASCII Ground Point File:		
Output Ground Point File.		
Units:	Project Native	z
Select input file		
		star)
		1

3. Another ASCIII Ground Control Point Import dialog box will appear. Select "Default.gcp". Then click "Save".

SCII Ground Po	int Import			? >
Save in	MISC		• + 6	
My Recent Documents	Default.gcp			
Desktop My Documents				
My Computer				
My Network	File name:	Default.gcp		Save
Places	Save as type:	ASCII Ground Point Files (*.gcp	p)	Cancel

4. Click the browse button in the "Input ASCII Ground Control Point File" box.

nput File Format:	Default.gcp	- H
nput ASCII Ground Point File:		
Jutput Ground Point File:	ſ.	
Jnits:	Project Native	
Select input file Write in the output file name.		

5. An "ASCIII Ground Control Point Import" dialog box will appear. Click the down arrow, browse and locate the directory where the gcp text file is located. Select the file (e.g. "gcp_list.txt"). Then click "Open".

ASCII Ground Po	int Import				? ×
Look in:	OJT_Data		•	- 🗈 💣 💷-	
My Recent Documents Destop My Documents	doc images SRTM gcp_list.txt gcp_list.xls				
My Computer My Remputer My Network Places	File name: Files of type,	gcp_list.txt			Open Cancel

6. Click "Options", select "Edit Input Format".

ASC	II Ground Point Im	port <carto_sat< th=""><th></th></carto_sat<>	
File 0	ptions Help		
Input	Edit Input Format Set Accuracy	ult.gcp list.tst	
Output I Units:	Ground Point File:	Project Native	
Write i	input file n the output file name: output file		
			Start
Edit Inp	out Format		14

An "Edit Input Format" dialog box will appear. Select the settings in the "Format Selection" box the fields (e.g. ID, X, Y, Z) that were used in your gcp text file. Then click "OK".

ormat Selection	Fields
X Y Z Code Ignote	1: ID 2: X 3: Y 4: Z 5: Ignore 6: Ignore
OK	Cancel

8. Type output ground point file name (e.g. gcp_spot) in the "Output Ground Point File" box.



9. Click "Options", select "Set Accuracy".



10. A "Set Accuracy" dialog box will appear. Type "7" in "X Accuracy" box, type "7" in "Y" Accuracy" box, and type "10" in "Z Accuracy" box. The values are the handheld GPS accuracy level in XYZ. Then click "OK".

? X
Cancel

11. Click "Start". Check the bottom box if conversion was successful.

Input ASCII Ground Point File: gcp_list.txt Dutput Ground Point File: o files\carto_sat\gcp_spot.gp Units: Project Native write in the output file Select output file Conversion has begun Conversion completed successfully	out File Format:	Default.gcp	1
Units: Project Native write in the output file Select output file Conversion has begun	Input ASCII Ground Point File:	gcp_list.txt	
Select output file	Output Ground Point File:	o files\carto_sat\gc	p_spot.gpf
Select output file Conversion has begun	Units:	Project Native	
	Select output file Conversion has begun	sstully	

•

3.1.2.3 Using Control Point Editor

Control Point Editor creates a file of control points, which are used by Triangulation. Use the Control Point Editor to create, view, edit, or change a file of control points.

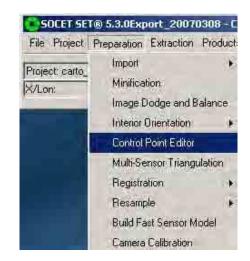
One of the important features of the Control Point Editor is that it lets you input the control point data in one coordinate system, and save the file in a different coordinate system. Selecting an alternative datum changes the display and input values. These are converted to/from the underlying project datum for storage in the .gpf file. This could be used, for example, when you have a pair of well-controlled images in a UTM project, but you want to collect control points for a State Plane project. The major capabilities of the Control Point Editor are as follows:

- Creates a new ground point file or modifies an existing ground point file.
- Saves the ground control points to the current project or a different project.
- Converts the list of points to any project's coordinate system and datum.
- Measures (in three-dimensional space) ground points from controlled imagery.
- Drives the extraction cursor to a three-dimensional ground point location for any point in the list.
- Displays and accepts control point data in the current project's coordinate system or an arbitrary coordinate system and datum.

There are four ways to build a file of control points:

- The Control Point Editor,
- The Interactive Point Measurement window of Triangulation,
- Ground Point Import, and
- Coordinate Measurement Log.

If you decide to use Control Point Editor for inputting your control points, you should run it after you create a project, but before running Triangulation. If you are going to use well-controlled imagery (e.g. PPDB) to fabricate control points, you must import the well-controlled images before running Control Point Editor. 1. Click "Preparation", select "Control Point Editor".



2. A "Control Point Editor" dialog box will appear. Click the browse button in the "Ground File" box.

ile Help				
round File: car		<i>C</i> 10		
ystem *cu	rrent_project	. Datum: PHIL	IPPINE_(PP	Elev (MSL)
Point List: 0 po	ints	_		A-9-51 - 5964
Find Point:		🔽 Exact Mate	h	① ひ
Point ID	_		Туре	Use
1				
	X/Long	Y/Lat	Z	
Coordinates	and the second s	Y/Lat	Z	
Coordinates Accuracy	and the second s	Y/Lat	Z	
CONTRACTOR STATE	and the second s	Y/Lat	Z	
CONTRACTOR STATE	and the second s	Y/Lat	Z	
CONTRACTOR STATE				
COTTON STATE STATE			aw Points	
COTTON STATE STATE				
Accuracy				
Accuracy	Mov			
Accuracy	Mov			
Accuracy	Mov			

3. A "Select Ground Point File" dialog box will appear. Click the down arrow button in the "Look in" box and locate the folder of the imported ground control point. Then click "Save".

	-	Save

4. The GCP point ID will be reflected in the Point ID box. Select one point ID (e.g. 501), the coordinates XY and elevation Z will be shown in the Coordinates box. Edit the Accuracy values with respect to X/Long, Y/Lat, and Z.. Select another point ID and edit the accuracy. Repeat the procedures until all the needed point ID accuracy have been edited.

Find Point:	ints	xact Match		J	Û
Point ID		T	уре	Use	+
501		×	YZ Chtrl	* F	
502		and the second second	and the second se	- IA	
503			TRACTICIZED.	▼ ▼	
504		and the second se		× ×	and the
505		IX	YZ Cottl		
	X/Long	Y/Lat	Z		
Coordinates	274572.520	16981	91.530	33.000	
Accuracy	7.000		7,000	10.000	
≪elcome to Contro	MoveTo		Points		

5. Click "File", select "Save GPF.

J I⊽ E	xact Mate	h	ŋ	10
			- V	
		Type XYZ Critil XYZ Critil XYZ Critil XYZ Critil	Use - 17 - 17 - 17 - 17	*
		XYZ Cott		-
'Long 274572.520 7.000	16	2 38191.530 7.000	33.000 10.000	
MoveTo		aw Points		
Point E ditor.				
	274572.520 7.000 MoveTo	274572.520 16 7.000 MoveTo	XYZ Cntrl /Long Y/Lat Z 274572.520 1698191.530 Z 7.000 7.000 Z	XYZ Cntrl V XYZ Cntrl V XYZ Cntrl V Z74572.520 1698191.530 33.000 7.000 7.000 10.000

3.1.3 Measurement of Image Coordinates (Points)

There are four ways to measure ground points in imagery:

- Automatic Point Measurement (APM) (in Triangulation)
- Interactive Point Measurement for APM
- Interactive Point Measurement (IPM) for Blunder Detection
- Interactive Point Measurement for Simultaneous Solve

The decision of whether to run IPM before of after APM depends on the kind of ground points you have. The following table gives some guidance:

WHAT TO RUN SITUATION

APM before IPM	You have a few control points; and you want to Solve (after APM) before running IPM so that it is easier to find the control points in IPM.
IPM before APM	You measure some control points and some tie points in IPM (in one image only), then you run APM to transfer these points to other images and to measure additional tie points.
IPM only	You have just one image. Or, you have lots of control points and you don't need tie points.
APM only	You have no control points. To interactively review the tie points measured by APM, you use IPM. Neither APM or IPM You have measured the image points on an analytical plotter, and imported them with ASCII Image Point Import, and are using Triangulation only for the Solve process.

Control Points are points with known ground coordinates (XYZ, or XY, or Z). You must enter the location into the IPM window. Triangulation stores this data in the project Ground Point File. You must also use the extraction cursor to identify the control point in all the images in which the point is located. The image space positions are stored in the Image Point Files (IPF).

Tie Points are points on the ground that you can identify in two or more overlapping images, but you don't know the ground coordinate. You use the extraction cursor to identify the point in all the overlapping images. The image locations are stored in the Image Point Files (IPF). An entry is created in the Ground Point File (GPF) for each tie point. APM will create tie points automatically.

Check Points are points with known ground location (XYZ) that are not used in the solution, but are provided to help the operator perform a quality control check after the solution is complete. Check points are also called diagnostic points.

Ground Point is an umbrella term that includes Control Points, Tie Points, and Check Points.

Image points are the image space locations (in lines and sample coordinates) of Ground Points. A single image point is stored for every instance of a ground point in an image. For example, if a tie point is located in 4 overlapping images, and you measure it in 3 of the images, then 3 image points are stored. Image points are stored in the IPF files. An image point must be

associated with some ground point. If you somehow have points in IPF files which are not reflected in the GPF file, transfer them using the *Reset* > *Transfer* Image Points menu selection.

Ground Point Selection

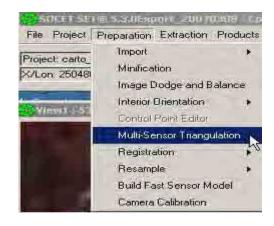
Ground Point consists of two tables containing ground point information. The upper table lists all ground points in the current Ground Point File. Clicking the LMB on any point in the table moves the extraction cursor to that point and loads the measured and unmeasured images.

Image Point Section

This area contains the image status list which displays all images containing the selected ground point. The point status is either locked or unlocked, measured or unmeasured. An X in the appropriate field indicates locked or measured. The Master field indicates which images are loaded left or right. The left master image is always used as the master when Auto Two or Auto All is selected.

3.1.3.1 Opening an Automated Triangulation file.

1. Click "Preparation", select "Multi-Sensor Triangulation".



2. An "Automated Triangulation" dialog box will appear. Click "Setup".

	Setup	
4 ulomat	ic Point Measureme	pt.
nteractiv	ve Point Messureme	ent 📋
Bu	under Dietection	
	Solve	
8	Soive BINGO	

3. A

"Setup" dialog box will appear. Click "Add" Add...

Setup <carte< th=""><th>sat.atf></th><th></th><th></th><th>? ×</th></carte<>	sat.atf>			? ×
Advanced	Ground Point Fi	le: [carto_sat.gp	fi -	-
Auto Populate	Setup Block	Exterior Init	1	
Strips			-	
Strip ID	1	lse Kappa		
Beve Inages Support P		Add.	Remove	
Fleverse Order		Remove	Image I	Jata
Help		DK.	1	ncel
				ABGE

 A "Strip ID Sequence" box will appear. Type a number (e.g. 1). Then click "OK"



5. A "Select Support File(s)" dialog box will appear. Select the image (e.g. 53231704022100242422A.sup) in the "Available" box. Click the arrow ➡ to copy the selected image to the "Selected" box. Then click "OK"

Select Support File(s) Mages		?
Wailable	Selected	
50000index_all.sup 53023180502180250541A.sup 53033180304090248431A.sup 53033180602280235471A.sup 53033190602280235561A.sup 53043190502030239362A.sup 7074.1 San Carlos.sup 7075.11 Dagupan City 5m.sup 7173.1V Tarlac.sup 7173.1V Tarlac.sup 7174.1V Cuyapo.sup 7175.111 Binalonan.sup GRAPHICS_ONLY.sup	53023170402100 ⇒	1242422A.sup
Filter	1	
	бк	Cancel

6. The created strip 1 will be reflected in the "Strips" box and the selected image (e.g. 53023170402100242422) will be reflected in the "Images" box.

Setup <cart< th=""><th>o_sat.atf></th><th></th><th>? ×</th></cart<>	o_sat.atf>		? ×
Advanced	Ground Poin	it File To	carto_sat.gpf
Auto Populate	Setup Block		Exterior Init
Strips	-		
Strip ID		Use	Карра
1		1	
Reve	rse Order	Add.	Remove
Support F	ile	Use	Sensor
	402100242422	217	SPOT5
Reverse Order	Add		Remove Image Data.
Help		- 1	OK Cancel
			s" box. A "Strip ID Sequence ext number (e.g. 2). Then clic

Strip ID Sequence		? X
sss,sss-sss(no_spaces)		
2		
	OK.	Cancel

 Select the next image corresponding to strip number 2. Click the arrow to move the image to the "Selected" box. Then click "OK"

nagès Available	Selected
50000index_all.sup 53023170402100242422A.sup 53033180304090248431A.sup 53033180602280235471A.sup 53033190602280235561A.sup 53043190502030239362A.sup 70744 San Carlos.sup 70754I Dagupan City 5m.sup 71734V Tarlac.sup 71734V Tarlac.sup 71744V Cuyapo.sup 71754III Binalonan.sup GRAPHICS_ONLY.sup	53023180502180250541A.sup
Filter	

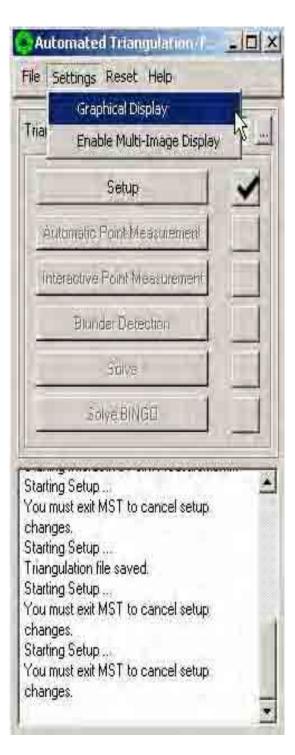
Repeat steps 7and 8 until all the needed images have been selected. Then click "OK"

S e	tup <cart< th=""><th>o_sat.atf≻</th><th></th><th></th><th></th><th>? X</th></cart<>	o_sat.atf≻				? X
Adv	/anced	Ground Poi	nt File Jo	arto_sat.g	pf	-
Auto	Populate	Setup Bloc	x E	xterior Ini	F	
Strip	15					
25	Strip ID		Use	Kappa		1
3			317			
-		N	417			
5		43	5		_	
6			6			
	Reve	rse Order	Add.		Remove	
Imag	jės					
	Support F	ile		Use	Sensor	
1	53043190	50203023938	52A.sup	V	SPOT5	
+ Rev	verse Order	Add		Remov	e Imag	e Data
	Help			OK		Cancel



10. Click "Settings" and select "Enable Multi-Image Display.

11. Click "Settings", select "Graphic Display".



12. A "Graphic Display" dialog box will appear. Check "Tie" box, "Control" box, "Icon" box, and "IDs" box. Click "Apply" Apply . Then click "Close" Close

Graphical Display	? ×
Attribute File	
🔽 Display	Rotate to First Strip
Point Graphics	ß
🔽 Tie	
🔽 Control	
F Check	
Filter by Number of Rays:	J.
Color by Number of Rays	
- Select Graphics to Draw-	
🔽 Icons	
Ds IDs	
T Ray Count	
T Image Residuals	
1,600000	- con/pixels tesidaals
3 000000.	sigma threshold
Ground Residuals	
1 000000	- cm/meter residuals
T Block Connections	
Image Graphics	
IT IDs	
Footprints	
Centers	
Apply Clos	e View

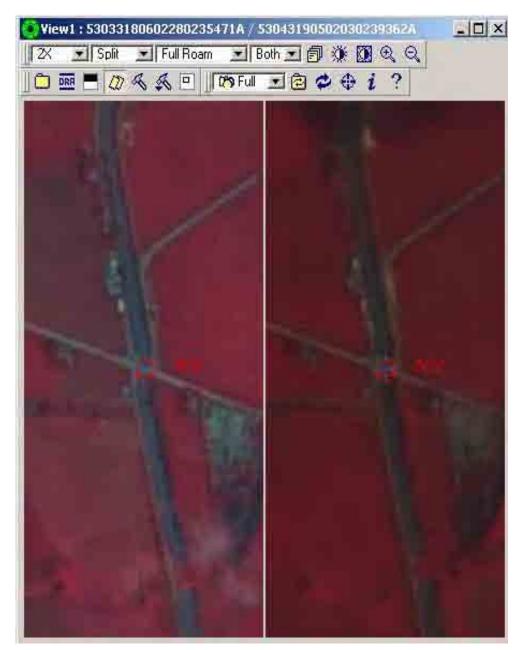
13. Click "Interactive Point Measurement".

iangulation file carto_sat.atf	
Settip	~
Automatic Point Measurement	
Interactive Point Measurement	~
Valunder Detection	
Solye	
Solve BINGD	
arting Setup	-

14. An "Interactive Point Measurement" dialog box will appear.

Point ID		Туре	Use	
501		XYZ Cntrl	- Use	
502		XYZ Chtrl	+17	
503		XYZ Cntrl	-12	
504		XYZ Chtrl		
505		XYZ Cntrl	- 17	
506		XYZ Chtrl	-	
X	/Long	Y/Lat Z		
Coordinates	274572.520	1698191.530	33.000	
Accuracy	7.000	7.000	10.000	
nage Points Image ID		Master Loci	K Measured	
magent				

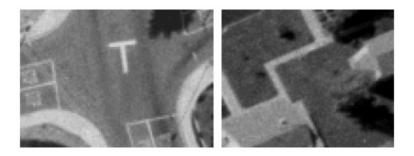
15. Select a point ID (e.g. 502) in the "Interactive Point Measurement" dialog box. The position of the selected point ID will be identified on the image. Move the cursor if necessary to adjust the location of gcp on the position described from the description data sheet.



Note: It is a good idea to find the ground control markers in the image before you start measuring. It is very helpful to have a survey map or description data sheet that shows the ground control locations. Surveyors often use one of the

following as ground control markers:

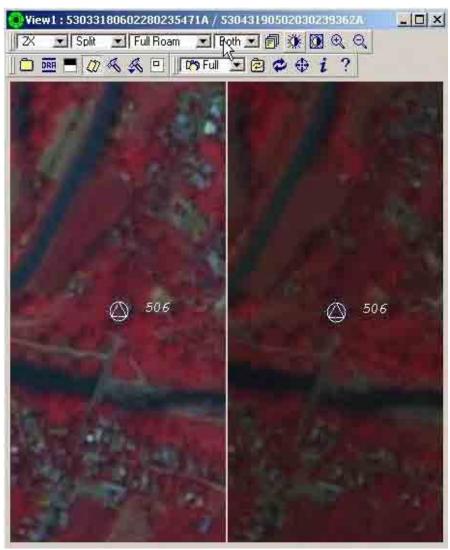
- A cross or T-shaped figure painted on the ground
- Some notable geographic feature, such as a bridge, hilltop, street intersection, building, flagpole, walkways, etc.



16. Once you have moved the cursor to the exact location, check "Lock" box in the "Image Points". Click "Auto Two" button if the point ID number is within two images. Then click "Save".

Poir	ht ID			Type		Use	1 (A)	
501	8.1 2		_	XYZ)		- 1-		
502				XYZI	Cntrl	- 17		
503			_	XYZI	Cntrl	- 17	-	
504				XYZI	Dntrl 🚽	- 17		
505				XYZ)	Cntrl 2	- 17		
506	506			XYZ Chtil		-11-	-	
-								
	1.	long	Y/Lat		Z	_		
-	Coordinates 291496.240			1717591.180			55.000	
Ac	Accuracy 7,000			7,000 1		10.0	0.000	
nage 1	Points Image ID 53033180602		I I	vlaster	Lock	Meas	ured	
	53043190502	0202000000		1	2	-		

17. Select Next point ID (e.g. 506). Check "Lock" box in the "Image Points". Click "Auto Two" button if the gcp is within two images (e.g. 53033180602280235471A and 53043190502030239362A). Then click "Save".



Note: If gcp is only within 1 image, just click "Sample" and then click "Save"

18. Repeat steps 15 and 16 until all the required gcp's have been measured.

3.1.4 Calculation/Inspection

3.1.4.1 Simultaneous Solve.

Simultaneous Solve performs a rigorous triangulation adjustment of a block of images to refine the estimates of their Triangulation parameters. Simultaneous Solve uses the weighted least squares method of adjustment in an iterative manner. It is capable of simultaneous adjustment of blocks of images taken by different sensors such as frame, panoramic, etc. It is also capable of recovering the interior geometry of the sensors via added parameters.

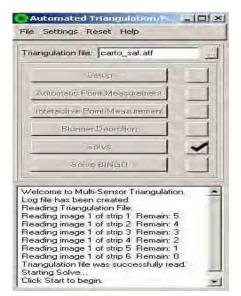
Simultaneous Solve requires the following input: image coordinates of control and tie points and their accuracies (image point files), ground coordinates of control points and their accuracies (ground point file), estimates of Triangulation parameters and their accuracies (support files and Triangulation file), and the interior geometry of the sensors (support files). All these data are automatically accessed by Simultaneous Solve without your intervention.

Simultaneous Solve uses a method known as "bundle adjustment" to determine the set of individual image parameter coefficients that minimizes the relative line/sample differences between points measured in overlapping images. The goal is to adjust the image parameters so that the position of a point in one image corresponds to the same point position in the other. If ground control is included, the parameters are adjusted so that the same image point corresponds to the same absolute position on all the overlapping images.

The method constructs a matrix of the linear equations and iteratively adjusts each of the independent image parameters until the solution converges below a pre-defined acceptance threshold. There are generally two problems that can happen with Simultaneous Solve: failure to converge, and excessive RMS residual error.

When you accept the solution, Simultaneous Solve will:

- Update the residual fields in the Ground Point File.
- Update the residual fields in each of the Image Point Files.
- Update the sensor model parameters in each of the Image Support Files.
- Write a Solution Accuracy Quality Report file (with extension .rep) in the project directory summarizing the image points, residuals, and solution quality.
- Write a second, more detailed Accuracy Summary Data report <atffilename>.atf.utri_rep. This contains information on QA statistics not available under the regular solve bundle adjustment method.
 - 1. After measuring all the needed gcp, click "Solve" in the "Automated Triangulation" dialog box.



2. A "Simultaneous Solve" dialog box will appear. Click "Start" Start.

Simultaneou	s Solve	
Math Model:	Rigorous	
Iteration:	1 of 8	
# Ground Pts.:		
Redundancy	0	
ROOT MEAL	N SQUARE (RMS)	
Image (pixels):	0.00	
X or Long	0.00	
YorLat:	0.00	
Z or Elev:	0.00	
	Display	
Presiduais	Report	
Parameters	1	
Start	Start At	
Save	Close	

3. Check if adjustment of measured gcp is finished shown at the bottom window.

🗭 Automated Triangulation (_ □ ×
File Settings Reset Help	-
Triangulation file: carto_sat.atf	
Sellig	E
Automatic Point Measurement	
Interactive Point Measurement	
Biunder Detection	
Solve	~
Solve BINGD	
Including strip 2 image 1 Including strip 3 image 1 Including strip 4 image 1 Including strip 5 image 1 Including strip 6 image 1 Indializing solution matrix Inverting solution matrix Computing Iteration #1 Computing Iteration #2 Computing Iteration #3 Adjustment finished	

3.1.4.2 Multi-Sensor Triangulation Residual

This window displays the residuals of image coordinates of all points and the residuals of ground coordinates of all control points. The residuals are displayed in a largest to smallest order based on image residuals.

The display residuals window provides a flexible interface to perform the following procedures:

- View lists of residuals
- Change the ground point type
- Toggle ground points ON and OFF
- Toggle individual image measurements ON and OFF
- Re-measure points

1. Click "Residuals" Residuals... in the "Simultaneous Solve" dialog box.

Math Model:	Rigorous
Iteration:	3 of 3
# Ground Pts.:	82
Redundancy	181
ROOT MEAN	N SQUARE (RMS)
Image (pixels):	1.295
X or Long T	8.056
YorLat:	9.810
Z or Elev:	4.286
[Display
Residuals.	Report
Parameters	1
Start	Start At.
Save	Close

2. A "Multi-Sensor Triangulation Residual" dialog box will appear. An RMS (Root Mean Square) **below 1** is acceptable. If your RMS is above 1 you probably made a mistake in measurement. Review the residual values of each gcp and check the point ID which you think needs to be re-measured.

_	D . UD	0.11	(weaks	110040	1 and	10.02	10	10.0000	1.00	0
	Point ID	State	Туре	Lon/X	Lat/Y	Ht/Z	Image ID	Measured	100000 Contraction of the second s	Sample
E	535		XY Cntrl	+1.17			53033180602280		-0.05	
2	328	X	XYZ Cntrl	+0.98	+0.70	+0.04	53033190602280	X	-6.34	- V22
3	324	X	XYZ Cntrl	-0.54	-0.48	-0.04	53033190602280	X	4.15	-2
6	368	X	XYZ Cntrl	-0.24	-0.67	+0.00	5303319060228(X	4.94	
5	323	Х	XYZ Cntrl	-0.39	-0.28	-0.02	53033190602280	Х	2.54	-2
)	303	X	XYZ Cntrl	+0.08	+0.34	-0.00	5303319060228(X	-2.40	-0
Č.	304	X	XYZ Cntrl	+0.62	+0.19	+0.06	53033190602280	х	-1.04	2
}							5303318060228(X	-1.28	1
ř.	335	X	XYZ Cntrl	-0.02	+0.32	-0.02	53033190602280	X	-2.13	÷Č,
1										
							and l			
					He-m	easure Poir	nt(s)			

3.1.4.3 Reviewing and correcting GCP measurement with residual errors.

Excessive RMS residual error

The RMS of all the image residuals for the block is reported once convergence has been achieved. The acceptability of the RMS residual error depends on the sensor type and GSD but should be less than 1.0 pixel in most cases. Values greater than this indicate that one or more points is mismeasured and is skewing the solution excessively.

The Display Residuals menu can be selected to view the current image and ground residuals for all the measured points sorted by magnitude. Unfortunately, the largest residual points may or may not be the culprit in skewing the solution.

The first strategy should be to turn off all control points and attempt a relative solution first, unless the bad tie point is obvious.

If you examine a point with a high residual and it looks like it was well measured, you can skip it and try other points until you find one that is mismeasured. Examine points with even numbers of image overlaps over 2 (4, 6) and check the points between the first, third, fifth, etc. images to make sure that the point is measured at the same location.

Also, move and remeasure points which are on rooftops or in trees. Trees tend to move somewhat in windy conditions, or are difficult to measure accurately and distort the solution when used for tie point locations.

It is recommended that solutions with excessive RMS error should be discarded and not Saved. It is likely that the resulting math models are degenerate, or at least worse than the existing approximate math model. If the relative solution (control points OFF) shows good RMS error results, the math model can be Saved and the control points can be later remeasured. Usually the problem is not the measurement but the absolute ground position specified for the point. You

should confirm from the original hardcopy control database, or other sources, that you have the right coordinates for the right image point, and that the elevation data is consistent with the project units (feet vs. meters, MSL vs. Ellipsoid) as specified.

1. After all the measured points have been calculated, using the "Multi-Sensor Triangulation Residual" dialog box, identify and select point ID's which has a large Lon/X and Lat/Y value. Click right mouse button and select "OFF".

1	Point ID	State	Type	Lon/X	Lat/Y	Ht/Z	Image ID	Measured	Line	Sample 🔺
8					Altered		- 5303318060228(House a contract	-0,40	a reference in the second
9	328	X	XYZ Cnttl	-0.06	+0.12	-0.01	53033190602280	X	-0,73	-0.60
10	528	X	XYZ Cntrl	+6.07	-3.31	+8.49	5302317040210(X	0.02	-0.78
11							53033180602280	X	0.11	0.48
12							53023180502180	X	-0.10	0.43
13	311	X	XYZ Chtil	+0.10	+0.03	+0.01	53033190602280	X .	-0.38	0.59
14	321	X	XYZ Cntrl	+0.08	-0.04	+0.01	53033190602280	X	0.13	0.61
15	592		LXXZ Cntrl	+25.92	+10.91	+7.92	5302317040210(X	-0.22	0,29
16	555	×	OFF Cntrl	-3.02	+2.30	+7.19	53033180602280	X	-0.33	-0.15
			ON							
					Rei	measure P	oint(s)			

2. In the "Automated Triangulation/Full Block" dialog box, click "Interactive Point Measurement".

Automated Triangulation/Full Block	
File Settings Reset Help	
Triangulation file: carto_sat.atf	
Setup	
Automatic Point Measurement	
Interactive Point Measurement	~
Blunder Detection	- 1
Solve	~
Solve BINEC	
Starting Solve Click Start to begin. Beginning Solution Loading solution data array Loading triangulation (SUP/IPF/GPF) data Including strip 1 image 1 Including strip 3 image 1 Including strip 5 image 1 Including strip 5 image 1 Including strip 6 image 1 Including strip 6 image 1 Including solution matrix Inverting solution matrix Computing Iteration #1 Computing Iteration #2 Computing Iteration #3 Adjustment finished. Starting Interactive Point Measurement	

3. An "Interactive Point Measurement" will appear. Click the down arrow. Locate and select control points (e.g. 538) that were turned off.

X/Long Y/Lat Z X/Z Cntrl V 40 XYZ Cntrl V 41 XYZ Cntrl V X/Long Y/Lat Z Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000	38 XYZ Chtil 39 XYZ Chtil 40 XYZ Chtil 41 XYZ Chtil XYZ Chtil V X/Long Y/Lat Zoordinates 253427.090 Accuracy 7.000 7.000 7.000	38 XYZ Chtil 39 XYZ Chtil 40 XYZ Chtil 41 XYZ Chtil X/Long Y/Lat Zoordinates 253427.090 Accuracy 7.000 Accuracy 7.000 Image ID Master Lock Measure	Point ID			Туре	U	se
339 XYZ Cntrl 540 XYZ Cntrl 541 XYZ Cntrl 541 XYZ Cntrl X/Long Y/Lat Z Z Coordinates 253427.090 Accuracy 7.000 Accuracy 7.000 Image ID Master Lock Measure	539 XYZ Cntrl 540 XYZ Cntrl 541 XYZ Cntrl 541 XYZ Cntrl X/Long Y/Lat Z Z Coordinates 253427.090 Accuracy 7.000 Accuracy 7.000 Image ID Master Lock Measure	539 XYZ Cntrl 540 XYZ Cntrl 541 XYZ Cntrl 541 XYZ Cntrl X/Long Y/Lat Z Z Coordinates 253427.090 Accuracy 7.000 Accuracy 7.000 Image ID Master Lock Measure	537			XYZ Cntrl	- V	
540 XYZ Cntrl 541 XYZ Cntrl 541 XYZ Cntrl X/Long Y/Lat Z Z Coordinates 253427.090 Accuracy 7.000 Accuracy 7.000 Tool (10.000) age Points	540 X/Z Cntrl 541 X/Z Cntrl 541 X/Z Cntrl X/Long Y/Lat Z Z Coordinates 253427.090 Accuracy 7.000 Accuracy 7.000 Accuracy 7.000 Master Lock Master Lock	540 X/Z Cntrl 541 X/Z Cntrl 541 X/Z Cntrl X/Long Y/Lat Z Z Coordinates 253427.090 Accuracy 7.000 Accuracy 7.000 Tool 10.000	538			XYZ Cntil		
Mile Club Mile Club 641 XYZ Cntrl XYZ Cntrl XYZ Cntrl XYZ Condinates 253427.090 Accuracy 7.000 Accuracy 7.000 age Points Image ID Master Lock Measure	541 XYZ Cntrl XY	X/Long Y/Lat Z X/Long Y/Lat Z Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000 age Points	539			XYZ Cntrl	- 1	
X/Long Y/Lat Z Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000 age Points	X/Long Y/Lat Z Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000 age Points	X/Long Y/Lat Z Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000 age Points				XYZ Cntrl	¥ 17	
Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000 age Points	Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000 age Points	Coordinates 253427.090 1689772.100 24.000 Accuracy 7.000 7.000 10.000 age Points	541			XYZ Cntrl	<u>·</u>	
Accuracy 7.000 7.000 10.000 age Points Image ID Master Lock Measure	Accuracy 7.000 7.000 10.000 age Points Image ID Master Lock Measure	Accuracy 7.000 7.000 10.000 age Points Image ID Master Lock Measure		X/Long	Y/Lat		z	1
age Points Image ID Master Lock Measure	age Points Image ID Master Lock Measure	age Points Image ID Master Lock Measure	Coordinates	253427.090	168	9772.100	24	1.000
Image ID Master Lock Measure	Image ID Master Lock Measure	Image ID Master Lock Measure	Accuracy	7.000		7.000	10	0.000
	in a second s		Image 1D	602280235561A		aster Lo	ck Me	asure

4. The position of the select point ID (e.g. 538) will be identified on the image in view 1 and also in the gcp index in view 2. Set active view 1 and move cursor to a new position.

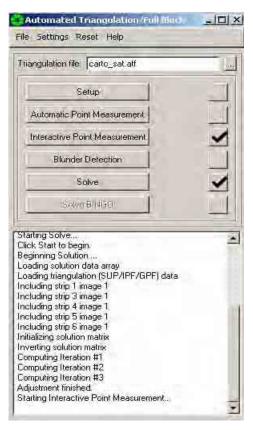
🙀 View1 : 530331:9850228023558 FA / 5398 12110(5001) 112 🔤 🔲 🗙	View2 : 50000index_all	
2× Mono ▼ Full Roam ▼ Left ▼ ● ● Q Q □ </th <th>RLAC</th> <th>C</th>	RLAC	C
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	A JUNCTION \$535 2_GCP \$534_JUNCTION \$536_GQ	D DIVICI.
A CONTRACTOR OF THE STATE		
	●537_BRIDG →538_G	P
and the	•540 GCP	
	7	
	PC-11	
A REAL PROPERTY AND A REAL PROPERTY A REAL PRO		

5. Check "Lock" in the "Image Points" box, select "Sample" and click "Save".

Poi	int ID				Туре	i.		Use	K
533)				XYZ		~	2	
534					XYZ	Cntrl	~	1	
535	;				XYC	ntrl	~	~	
536	;				XYZ	Cntrl	~	2	
537					XYZ	Cntrl	v	2	
538	}				XYZ	Cntrl	~	9	
		X/Long		Y/Lat		z			
E	ordinates		427.090		689772	and the second		24.000	
A	curacy		7.000		7.	000		10.000	
nagi	e Points Image ID	ŕ			Master	Lock			311
1		06022802355	561A		L		E	2	

Note: Repeat steps 3 - 5 until all the control points that were turned off were selected, viewed and remeasured if necessary.

6. Click "Solve" in the "Automated Triangulation" dialog box.



7. A

"Simultaneous Solve" dialog box will appear. Click "Start". Then check the RMS if value result is less than 1. Then Multi-Sensor Triangulation is ok.

Simultaneou	s Solve ? ×
Math Model:	Rigorous
Iteration:	1 of 8
# Ground Pts.:	87
Redundancy:	201
ROOT MEA	N SQUARE (RMS)
Image (pixels):	0.532
X ar Long:	6.433
YorLat:	6.559
Z or Elev:	3.121
1	Display
Residuals,	Report
Parameters	1
Start	Start At
Save	Close

3.1.5 Using SRTM Data

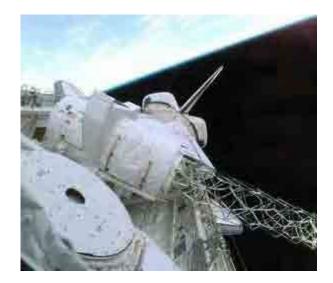
3.1.5.1 What is SRTM?

The Shuttle Radar Topography Mission (SRTM) is an international research effort that obtained digital elevation models on a near-global scale from 56 °S to 60 °N, to generate the most complete high-resolution digital topographic database of Earth to date. SRTM consisted of a specially modified radar system that flew onboard the Space Shuttle Endeavour during the 11-day STS-99 mission in February of 2000. To acquire topographic (elevation) data, the SRTM payload was outfitted with two radar antennas. One antenna was located in the Shuttle's payload bay, the other on the end of a 60-meter (200-foot) mast that extended from the payload bay once the Shuttle was in space. The technique employed is known as Interferometric Synthetic Aperture Radar.

The elevation models are arranged into tiles, each covering one degree of latitude and one degree of longitude, named according to their south western corners. It follows that "n45e006" stretches from $45^{\circ}00'$ N, $6^{\circ}00'$ E to $46^{\circ}00'$ N, $7^{\circ}00'$ E and "s45w006" from $45^{\circ}00'$ S, $6^{\circ}00'$ W to $44^{\circ}00'$ S, $5^{\circ}00'$ W. The resolution of the cells of the source data is one arc second, but 1" data have only been released over United States territory; for the rest of the world, only three arc second data are available. Each one arc second tile has 3,601 rows, each consisting of 3,601 16 bit bigendian cells. The dimensions of the three arc second tiles are 1201 x 1201.

The elevation models derived from the SRTM data are used in Geographic Information Systems. They can be downloaded freely over the internet, and their file format (.hgt) is supported by several software developments.

The Shuttle Radar Topography Mission is an international project spearheaded by the U.S. National Geospatial-Intelligence Agency (NGA) and the U.S. National Aeronautics and Space Administration (NASA).



Part of the SRTM hardware is photographed through Endeavour's aft flight deck windows about halfway into the mission. The mast is deployed from the mast canister, and the main antenna can be seen behind the mast.



Artist representation of SRTM in space. Main antenna is located in the payload bay, the mast is deployed to 60 meters (200 feet), and the outboard antenna is attached to the end of the mast. (Courtesy of the German Aerospace Center)

Version 1 of the SRTM data consists of the original Digital Elevation Models produced by the SRTM project with data from the STS-99 mission in Feb., 2000, and delivered to

the National Geospatial-Intelligence Agency (NGA.) These data are unedited and contain spurious data points in area of low radar backscatter such as water bodies.

Version 2 is the results of a substantial editing effort by the NGA and exhibits well defined water bodies and coastlines and the absence of spikes and wells (single pixel

errors), although some areas of missing data ('voids') are still present. The Version 2 directory also contains the vectorized coastline mask used by NGA in the editing, called

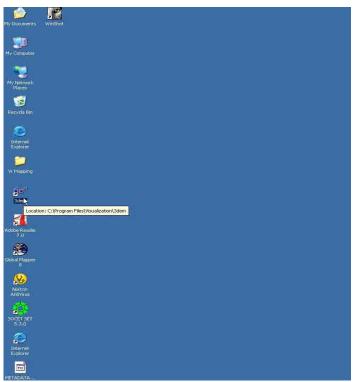
SRTM Water Body Data (SWBD), in shapefile format.

Version 2 is a superior product and it is recommended for most users.

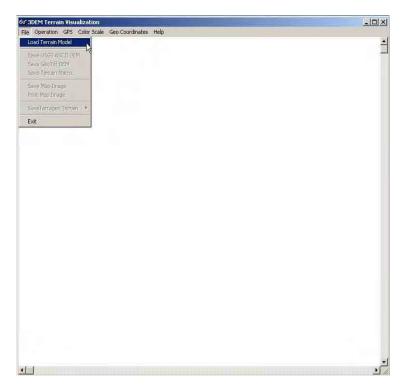
3.1.5.2 Data download from internet SRTM data can be downloaded from ftp://e0srp01u.ecs.nasa.gov/

3.1.5.3 Data modify by 3dem

1. Click "3dem" icon on your desktop.



2. A "3DEM Terrain Visualization" window box will appear. Click "File", select "Load Terrain Model".



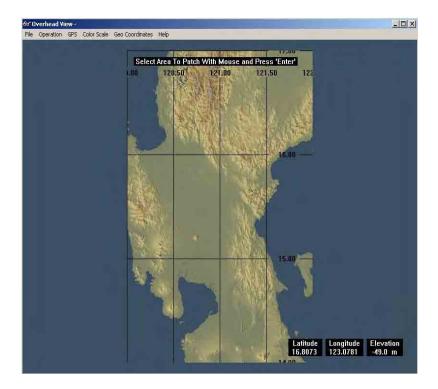
3. A "3DEM File Type" dialog box will appear. Check "SRTM Data (hgt,bil)". Then click "OK".

DE	M File Type	×
	File Type	
	 USGS DEM (dem, tar.gz, tgz, gz) 	C GeoTiff DEM (tif)
	 SRTM Data (hgt, bil) 	C Terrain Matrix (bin, txt)
	C GLOBE Tile (selected from map)	GTOP030 Tile (selected from map)
	 Mars Viking Orbiter (img) 	Mars MOLA (img)
	OK]	Cancel

4. A "Open SRTM Height Data File" dialog box will appear. Click down arrow and browse the folder where the images (e.g. N14E120.hgt) are located. Select all the needed images. Then click "Open".

en SRTM Heig	ht Data File	States and a subscript of the		?
Look in:	SRTM			
	Eurasia			_
My Recent	N14E120.hg			
Documents	N14E120.hg			
12	N15E120.hg			
Desktop	N15E121.hg			
-Statione	N16E120.hg			
		initi I		
My Diacuments				
100				
My Computer				
	1			
My Network	File name:	"N14E120.hgt" "N14E121.hgt"	"N15E120.hat"	Open
Places		Printer State of Concerning State of Concernin		
	Files of type:	SRTM Data (*.hgt, *.bil)	<u> </u>	Cancel

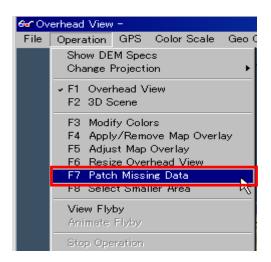
5. A "Overhead View" window box will appear.



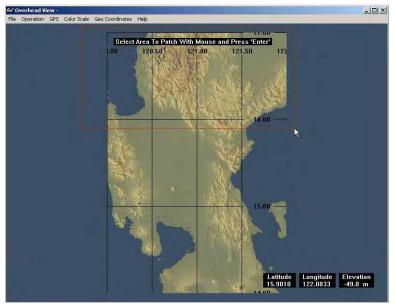
6. .Patch Missing Data

Occasionally it will be necessary to patch missing elevation data points in the digital elevation model. This is particularly true with the SRTM data, which may be sprinkled with obvious holes where elevation values are missing from the terrain grid. These holes can disfigure the 3D images of the terrain, and must be patched.

Click "Operation", select "Patch Missing Data"



7. In the "Overhead View" box, using the pointer arrow draw a box covering portion of the whole image. Hit "Enter" in the keyboard. Press "F7" in each selection. Select several areas until you have selected the rest of the image. The application cannot process the data if the area is done in one selection.



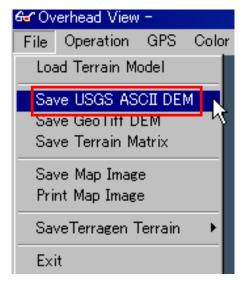
Click "Operation", select "Change Projection". Then click "Convert to UTM Projection".

operation	GPS	Color Scale	Geo Coordinates Help
Show DE	M Spec	55	
Change F	² rojecti	ion	Convert to UTM Projection
TH BUN		final l	And the second second
	Show DE Change F	Show DEM Sper Change Project	Show DEM Specs Change Projection + F1 Overhead View

9. .Click "WGS84". Then click "OK".

Cho	hoose UTM Ellipsoid								
	۲	0	0	0					
	WGS84	WGS72	NAD83	NAD27					
	OK.		(Cancel					

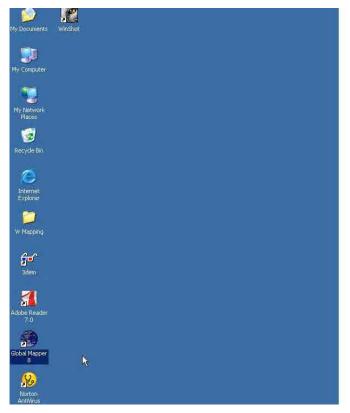
10. .Click "File". Then click "Save USGS ASCII DEM".



11. A "Save USGS ASCII DEM" dialog box will appear. Type the file name (e.g. elmer_srtm.dem) in the "File Name" box. Then click "Save".

Save USGS ASCI	I DEM					<u> ? ×</u>
Save in:	bools_sata		•	* 🖸 🗗		
My Racent Documents Desktop	CartoTest_0 GEOCALC_N Globalmap SRTM winshot mens_srtm.de	AMRIA				
My Documents My Computer My Network Places	File name:	elmer_sitm.dem		2		Save
Places	Save as type:	USGS DEM File (*.de	em)	×	ļ.	Cancel

- 3.1.5.4 Convert Data to ArcGrid by GlobalMapper
 - 1. .Click "Global Mapper" on your desktop.



2. Click "Open Your Own Data Files".



3. An "Open" dialog box will appear. Select the DEM file (e.g. ems_srtm.dem) that was created. Then click "Open".

en					?
Look in:	tools_sata		•	🔶 🖸 📸 🛲	;
X	3DEM.				
My Recent	GEOCALC_N				
Documents		AMKIA			
12	SRTM				
	winshot				
Desktop	ems_srtm.de	em			
ly Documents					
My Computer					
My computer					
My Network	File name:	ems_srtm.dem		-	Open
Places			Line and P rocessing t		Cancel
	Files of type:	Supported Commonly	Used Types	<u> </u>	Lancel

.Click "Tools" and select "Configure".

🏶 Global Mapper v8.03 - REGISTERED						
<u>F</u> ile <u>E</u> dit Vie <u>w</u>	Tools	<u>S</u> earch	<u>G</u> PS	<u>H</u> elp		
	<u>M</u> eas <u>F</u> eati Path	(<u>G</u> rab-and sure ure Info Profile/ <u>L</u> Shed		Alt+Z Alt+G Alt+M Alt+P Alt+L Alt+L Alt+V Alt+D		
	<u>C</u> ont Conf	Alt+C				

.A "Configuration" dialog box will appear. Set Projection parameters. Click "Add Datum" and set PRS92 datum parameters. Then click "OK".

General	Vector Display	Area St	yles 📔	Line Styles
Point Styles	Vertical Options) Shader	Options	Projection
Projection:			Load Fro	om File
UTM		•	Save T	o Eile
Zone:				01116
51 (120°E-	126° E - Northern H	emisphere)		-
Datum:				
PRS92		-	Add D	atum
Planar Units:				
Distance of the				-
METERS				

Preate New Datum					
Datum Name:	PRS92				
Abbreviation (Optional):	Philippine Plane Coordinatesystem (PPCS) in 1992				
Ellipsoid:	Clarke 1866				
Datum Transformation	Method				
○ 3-parameter (Molodensky) Transformation					
⊙ 7-parameter (Burs	a-Wolfe) Transformation				
Shifts to WGS84 (meter	rs) — Rotation to WGS84 (arc-seconds) —				
X Shift: -127.622	× 3.06762				
Y Shift: -67.2448	Y: -4.90291				
Z Shift: -47.0431	Z: -1.57790				
∟ ⊢Scale Correction to WG	3S84 (parts per million)				
Scale (ppm): -1.06					
	OK Cancel				

UTM (Philippine Plane Coordinate System in 1992) - (644353,990, 1492860.658) 13° 30' 04.26″ N, 124° 20' 01.58″ E 🥢

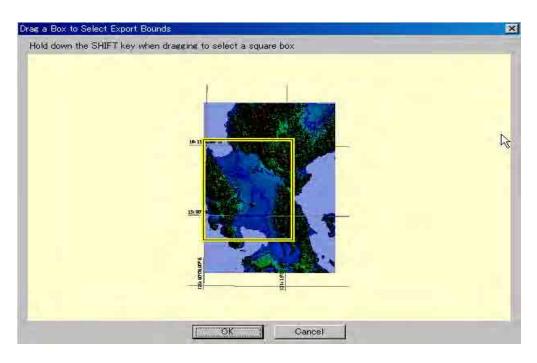
6. Click File", select "Export Raster and Elevation Data". Then click "Export Arc ASCII Grid".

🕃 Global Mapper v8.03 - REGISTERED		
Eile Edit View Tools Search GPS Help		
Open Data File(s). Open Generic <u>A</u> SCII Text File(s). Open All Files in a <u>Directory Tree</u> . Open ECW File from the <u>Web</u> . Open Data File at Fixed Screen Location. Unload All.	C#HO C#HU	🕢 Atlas Shader 💽 🔜 🎬
Create New Map Catalog Eind Data Online Download Online Imagery/Topo Maps (TerraServerUSA/WMS)	10.00
Load Workspace. Save Workspace Save Workspace As.	CHHW CHHS	ANDE
Bun Script		
Capture Screen Contents to Image. Export Global Mapper Backage File.		
Export Raster and Elevation Data		Export Arc ASCII Grid
Export Vector Data		Export BIL/BIL/BOW FILE.

An "Arc ASCII Export Options" dialog box will appear. Click "Export Bounds" tab. Then click "Draw a Box" button.

Arc ASCII Grid Export Options
General Gridding Export Bounds
C All Loaded Data
C All Data Visible On Screen Draw a Box
C Lat/Lon (Degrees)
North 17 119.9375 West
South 14 122 East
 Global Projection (UTM - meters)
North 1810060.91545475 174601.913279863 West
South 1611138.71997276 323793.559891361 East
◯ Corner w/ Size - Global Projection (UTM - meters)
North 1810060.91545475 174601.913279863 West
Width 149191.646611498 Height 198922.195481997
MGRS (Military Grid Reference System) Bounds
Top Left 50 Q RP 14586 84069
51 P UF 93242 46136 Bottom Right
C Crop to Selected Area Feature(s)
Reset to Last Exported Bounds

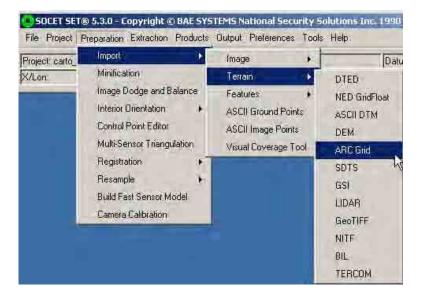
. Draw a box to select the area limit to be exported to Arc ASCII Grid File by SOCETSET.



.Click "OK" in the "Arc ASCII Grid Export Options" and "Save As" dialog box will appear. Type the file name (e.g. emi_srtm.asc) in the "File Name" box. Then click "Save".

iave As					? ×
Save in:	bools_sata			🗢 🖻 💣 📰 •	
My Récent Documents Desktop My Documents	GartoTest_0 GEOCALC_N GEOCALC_N Globalmap SRTM winshot				
My Computer My Network	File name:	emi_srtm.asd			Save
Places	Save as type:	Arc ASCII Grid Files (*.asc)	*	Cancel

3.1.5.5 Loading Arc ASCII Grid File into SOCETSET



1. .Open SOCETSET. Click "Preparation", click "Import", click "Terrain", and select "ARC Grid".

2. .An "ASCII ARC Grid Import" dialog box will appear.

ASCII ARC Grid Impo	rb≪carko_	- [] ×
File Help		
Input ASCII ARC GRID File:	1	1928.
Output DTM File:	1	
Lower-Left/Cellsize Format:	Figiliers	
Select input file		
	_	
		Start -
	_	

3. .Click the Browse button. Locate and select the ASCII file (e.g. emi_srtm.asc) that was created. Then click "Open".

ArcGridImport				? ×
Look in:	🔁 tools_sata	=	🗢 🗈 💣 📰•	
My Recent Documents Desktop My Documents My Computer	CartoTest_(CartoTest_(GOCALC_N SRTM SRTM emi_srtm.as ems_srtm.d txpeng473.	vamria Re em		
My Network	File name:	emi_srtm.asc		Open
Places	Files of type:		2	Cancel

4. .Type a file name (e.g. elmer_dtm.dth) in the "Output DTM File" box. Hit "Enter" in the keyboard. Then click "Start".

Input ASCII ARC GRID File:	emi_srtm.asc "
Output DTM File:	rto_sat2\elmer_dtm.dth
Lower-Left/Cellsize Format:	Redian
Select input file Select output file	
	Start

\

5. Wait till the application process the conversion. Check the bottom box if conversion is successful.



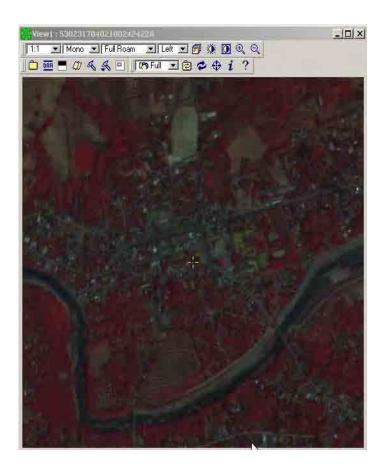
6. .Click "File" and select "Load Images".



7. .An "Image Loader" dialog box will appear. Create a view and select the required images to be used.

Tmage Loader			_101 ×
Left Filter		Rig	ght Filter
	- C	1*	
50000index_all	A Refresh	50000index_all	
53023170402100242422A 53023160502180250541A 53033160304090248431A 53033160602280235471A 53033190602280235561A 53043190502030239362A 70744 cropped 70744 San Carlos	Load	530231704021002424 530231805021802505 530331803040902484 530331806022802354 530331906022802355 530431905020302393 7074-1 cropped 7074-1 San Carlos	41A 31A 71A — 61A 62A
View Control Panel		70781	
View. 1 Current Poin	1 💌 🔄	Create	Destroy
		Stereo Model Manager	Close

8. .The selected image (e.g. 53023170402100242422A) will be displayed in the view box created.



9. Click "Extraction", click "Terrain", and select "Interactive Edit".

SOCET SET® 5.3.0 - Copyright		D BAE SYSTEMS Nat		tional Security Solution		
File Project	Preparation	Extraction	Products	Output	Preferences	Tools Help
Project: carto_sat2.prj		Terrain		Automatic Extraction		
X/Lon: 233281,442		Feature •		Interactive Edit		
	-	ClearF	lite		1	1

10. An "elmer_dtm – Interactive Terrain Edit" dialog box will appear. Click the "Open DTM" icon.

Image: Copen DTM Image: Copen DTM	2
according to the second s	-
Creating backup Terrain file loaded	

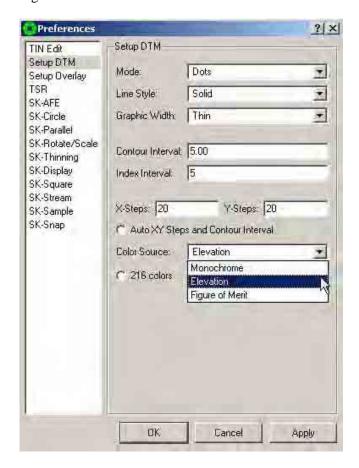
11. . A "Select a DTM" dialog box will appear. Select the dtm file (e.g. elmer_dtm). Then Click the "OK'.

carto_sat2_em	าร
elmer_dtm test	
1031	
lmer_dtm	

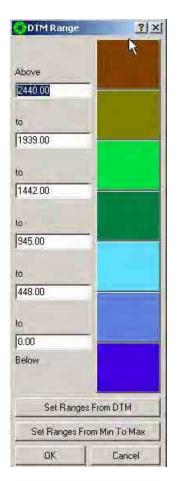
12. .Click "Setup DTM Graphis" icon in the "elmer_dtm – Interactive Terrain Edit" dialog box.



13. A "Preferences" dialog box will appear. Select "Elevation" in the "Color Source" box. Set "5" for "Contour Interval", "5" for index Interval". Set "20" for "X-Steps and "20" for "Y-Steps". Then click "Edit Ranges" Edit Ranges button.

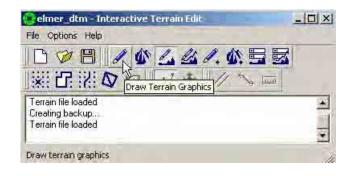


14. A "DTM Range" dialog box will appear. Set the elevation range boxes and the corresponding color for each range. Then click "OK".

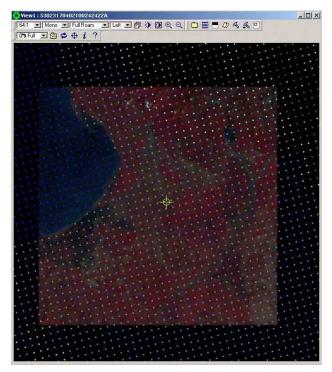


15. Click

"Draw Terrain Graphics" icon.



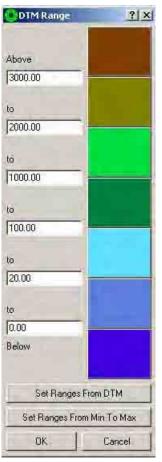
16. The mode (dots) selected in the "Preferences" dialog box will be displayed on the image.



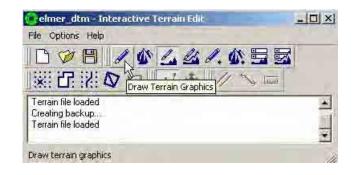
17. Select "Continuous Contours" in the mode box. Then click "Edit Ranges".

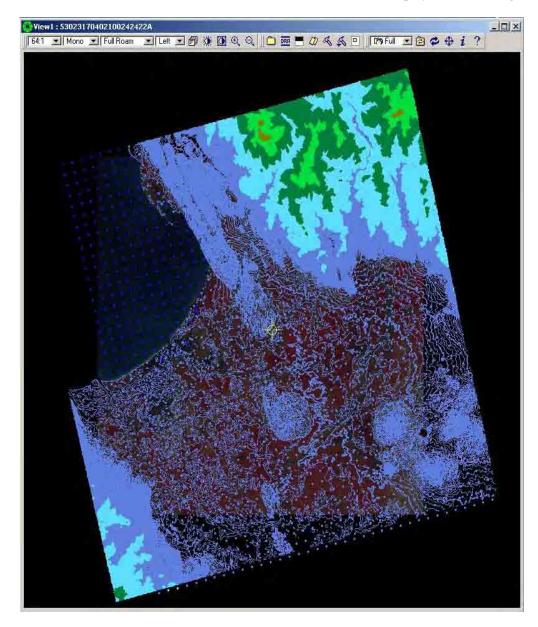
TIN Edit	Setup DTM	
Setup D'M Setup D'verlay TSR SK-AFE SK-Circle SK-Parallel SK-Rotate/Scale SK-Thinning SK-Display SK-Display SK-Stream SK-Stream SK-Sample	Mode: Line Style: Graphic Width: Contour Interval Index Interval: X-Steps: 20	Continuous Contours
SK-Snap	 Color Source: Color Source: Color Source: 	s and Contour Interval. Elevation
	ок	Cancel Apply

 A "DTM Range" dialog box will appear. Set the elevation range boxes and the corresponding color for each range. Then click "OK".



19. Click "Draw Terrain Graphics" icon.

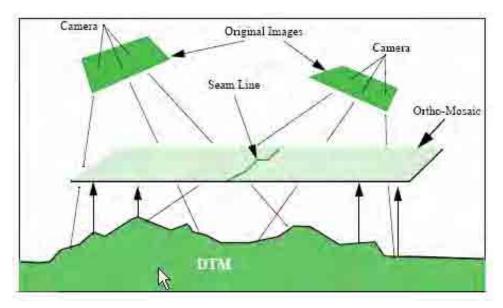




20. The contours and the dots will be displayed on the image.

3.1.6 Orthomosaicking

In SOCET SET, a mosaic is an orthogonally corrected image produced (resampled) from one or more input images. An orthographic projection (parallel to Z axis) is used to project object space (ground space) to the output mosaic space. The mosaic process corrects the input images for all distortions due to camera geometry, terrain relief, radiometric adjustments, and radiometric seam feathering. The output image represents what you would see if you were looking straight down at the ground from an infinite distance above.



Its typical inputs include one or more controlled (triangulated) images or orthocorrected images, a Digital Terrain Model (DTM) file, a feature database of seam polygons, and an output boundary.

Many of the inputs are optional and there are several options for radiometric balancing and feathering.

Mosaic can be run in batch or through the user interface. It permits making mosaics a "sheet at a time" from multiple images or single images as well as very large mosaic files. The options for joining the images include polygonal joining, most nadir joining, radiometric joining, and order of input (precedence). The most nadir option minimizes errors due to relief displacement since it uses the most orthogonal regions of each input image.

Mosaic has the unique capability to automatically balance the multiple input images for systematic differences caused by vignetting and hot spots as well as histogram enhancements. This is critical when mosaicking images of varying radiometric quality.

Mosaic is N bands in, N bands out and up to 2 byte in, 2 byte out. It will automatically generate a mosaic with the number of bands and bytes equal to the number of bands and bytes (up to 2) in the input imagery.

Mosaic permits the input of different types of images from different types of sensors and at different Ground Sample Distances (GSD). Since you can choose

the output pixel size or ground sample distance, you can quickly create an overview of your mosaic for quality checking and refining your inputs.

The following is a list of options/capabilities:

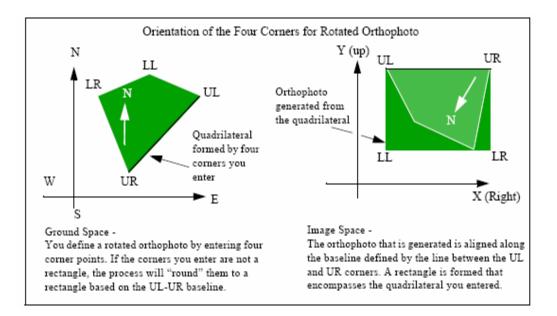
- Outputs any ground sample distance (pixel size).
- Constructs seamlines with "nearest nadir," "radiometric," or "input order (precedence)," methods. Can also use a feature file containing seam polygons (a polygon region for each input image).
- Crops the output on polygonal boundaries.
- Creates an output boundary of 2 or 4 points at any rotation angle.
- Re-samples images with nearest neighbor, bilinear, or bicubic methods.
- Can work without a DTM, using a single elevation for the correction surface.
- Inputs controlled images or orthophotos or mosaics.
- Automatically balances the images during mosaicking.
- Feathers imagery along the seams to reduce seam visibility.
- Combines black and white or color images from different sensor types and resolutions.
- Uses any project coordinate system including geographic.
- Can cut the output mosaic into rectangular "sheets"

Shape and Orientation of the Orthophoto

There are two ways you can specify the shape and size of the output orthophoto.

- 1. You can specify a rectangular orthophoto by entering the locations of two opposite corners (upper-right and lower-left). This approach also yields a rectangle oriented along lines of north-south and east-west.
- 2. You can create a rotated orthophoto by entering all four corners of the output boundary.

This permits you to output Mosaics that are rotated with respect to the project coordinate system north-south lines. You might use this capability, for example, to generate orthophotos that follow transportation routes. When you define the four corners of such a quadrilateral, the definitions of the corners can be confusing. The following figure illustrates the convention. The key point to remember is that the corners (UL, UR, LL, LR) are defined with respect to output image space, not ground space. Note that the generated mosaic will be a rectangle, regardless of the shape of the quadrilateral that you enter.

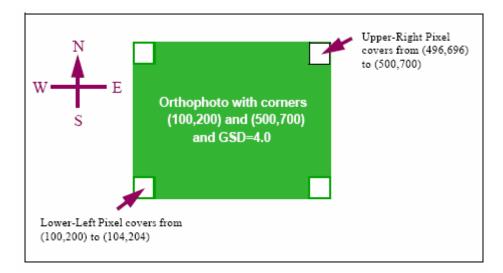


matter how you choose the shape, you may specify an orthophoto boundary that exceeds the extent of the input image(s). In this case, the orthophoto imagery is set to black where no input imagery is available.

Corner Point Definition

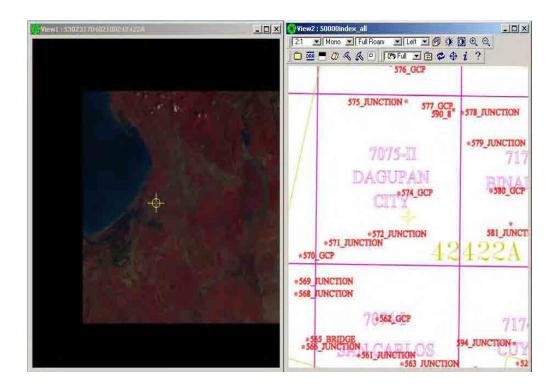
In two-corner boundary mode, the lower-left corner you enter is the "origin" of the corner definition. Orthophoto will always use the value you enter as the lower left corner of the lowerleft pixel of the orthophoto and the other corners will be an exact multiple of pixels (GSD intervals) from this corner. The corner locations represent the outer edges of the orthophoto pixels. For example, if you have a ground sample distance of 4 meters and the lower left corner is (100, 200) then the lower-left pixel extends from (100, 200) to (104, 204). And if the upper-right corner is (500, 700) then the upper-right pixel extends from (496, 696) to (500, 700). The size of this orthophoto is 400 x 500 meters, and the number of pixels is 100×125 .

A consequence of this convention is that you can create abutting orthophotos by entering the same values for adjacent edges. For example, if your first orthophoto has a lower left corner of (100, 200) and an upper-right corner of (500, 700) then the abutting orthophoto of the same size to the right (east) will have corners of (500, 200) and (900,700). The abutting orthophoto to the north (of the same size) will have corners (100,700) and (500, 1200).



No

- 3.1.6.1 Orthomosaicking using one image
 - 1. Open "SOCETSET" and load "Project". Then load the satellite image (e.g. 53023170402100242422A) to be mosaic and the index image (e.g. 50000index_all) to be used to locate approximately the limit of the area to be processed.



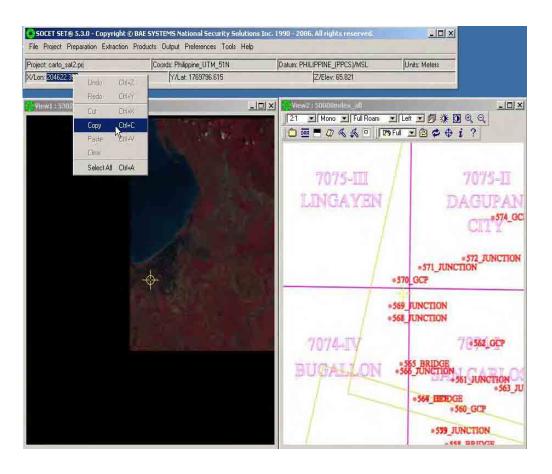
2. Click "Product", click "Mosaic" and select "Mosaic.

File Project Preparation Extraction	Products Output Preferences Tools	Help
Projecti caito_sat2.prj X/Lon: 233270.266	Orthophoto Generation Multi-Spectral Image Sharpening Change Detection	Datum
1	Mosaic	Mosaic
64:1 💌 Mono 💌 Full Roam	Perspective Scene	Seamline Editor

art Setup Input 0	utput Options	
	Task	
	C Create Multiple Sheets	
	Create Entire Mosaic	
	C Create Seams Only	
elcome to Mosaic.		

3. A "Mosaic" dialog box will appear. Click "Setup" tab.

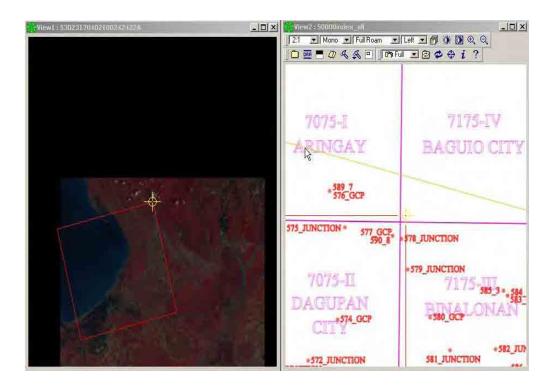
4. Using the 50000_index image, move cursor to the point at lower left corner of the map sheet (e.g. 7075-II Dagupan City) limit to determine the lower left coordinates. Highlight the X/Lon (e.g. 204622.352), click right mouse button and select copy.



5. Paste the value in the "X/Long. LL" box of the "Mosaic" dialog box. Repeat step, this time copy Y/Lat and paste it in "Y/Lat" box.

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elcome to Mosaic.			
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6. Move cursor to upper right corner of the map sheet (e.g. 7075-II Dagupan city) to determine the coordinates. Highlight X/Lon, click right mouse button and select copy.



7. Paste the value in the X/Long. UR box of the "Mosaic" dialog box. Repeat step, this time copy Y/Lat and paste it in Y/Lat box.

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lcome to Mo:	saic.					

8. A polygon will be created.

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	-572 JUNCTION	582_JUN 581_JUNCTION

9. Click "Input" tab, select the needed satellite image in the "Available" image box and click arrow. Select the DTM file (e.g. elmer_dtm.dth) in the "Available" DTM box and click arrow.

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T Images (gre	en)			
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🗂 Sheets (yel			F Auto Draw	
elcome to Mosaic. support files specified				

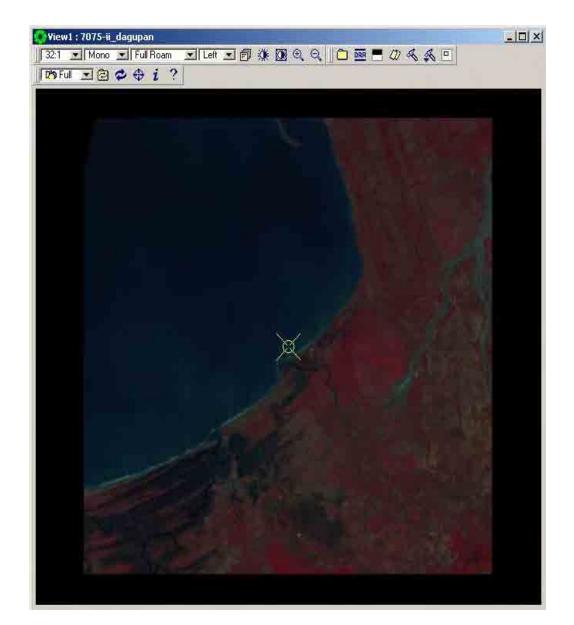
10. Click "Output" tab, check "World File". Set "TIFF Tiled" in "Format. Set "2.5" in "GSD" (Image Resolution). Type output file name (e.g. 7075-II_dagupan) in the "Output Mosaic File" box. Locate and select project file (e.g. carto_sat) same as the one created in the "Create Project".

tart Setup Input Output Options	
Sheets Available Selected	Options ✓ World File □ Ortho Into File Location: carto_sat Format TIFF Tiled GSD 2.5 Lines: 11249 Samples: 11215 Output Mosaic File: 1075-ii_dagupar Output ASCII Sheet File seam
Calculate Sheets Old Prefix.	>_59 >_59>

11. Click "Options" tab, check "Most Nadir". Set width to "100". Check "Seam Feathering", "Seam Smoothing", "Auto Minify", "Construct GeoTIFF Tags" and "Bilinear". Then click "Start".

Mosaic Method		Mosaic Options
Most Nadir	© Off ∩ Default ∩ Custom	🔽 Seam Feathering
🔴 Most Nadir Narrow Overlap	Percent Skip:	Width: 100
C Most Nadir With DTM	Number of Tiles	🔽 Seam Smoothing
C Input Order	Mean	🔽 Auto Minify
C Radiometric	Std Deviation	Auto Load Imagery
Vertex Spacing. 5	Max Contrast Ratio:	Construct GeoTIFF Tags
Constraining Width 200	Min Contrast Ratio	F Process TIN DTM as Grid
🗘 Seam Polygons	Max Gray Shift:	Trim Edges
7174 Wcuyapo	Max Percent Adjust:	Fill Voids
T Centerline	F Eolor Match	Background Color. Black 💌
	Target Colors	Processes: 1
Slip Polygon	Intensity	Interpolation Method
	- Defaults Compute	Bilinear
		Nearest Neighbor
		C Bicubic (Fleming)

12. After processing, create a view window and load the image (e.g. 7075-II_dagupan)



- 3.1.6.2 Orthomosaicking using two images
 - 1. Click "Products", select "Mosaic", and click "Seamline Editor".



2. A "Seamline Editor" dialog box will appear. Click the "New" icon.

Seamline Editor <elmer></elmer>	
File Help	
- New (Ctrl+N) N & ∽ S6 5	/ /. 8 2
Seam Polygons	
Polygon ID Image	
Completed drawing all features Feature number 1 accepted Drawing Completed drawing all features Please extract a seamline polygon Drawing Completed drawing all features Feature number 2 accepted Drawing	-

3. A "Select a FDB" dialog box will appear. Type desired name (e.g. elmer). Then click "OK".

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7174-IV cuyapo ed	litor
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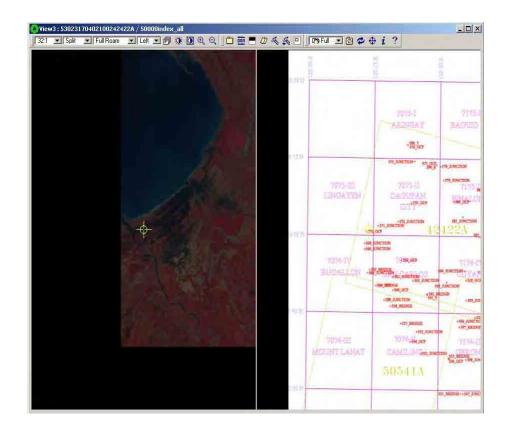
4. Put mouse arrow inside the "Seam Polygons" box and click right mouse button. Click the "Add" button.

Seamline Editor <elmer></elmer>	
File Help	
Image Image	2
Completed drawing all features Feature number 1 accepted Drawing Completed drawing all features Please extract a seamline polygon Drawing Completed drawing all features Feature number 2 accepted Drawing Completed drawing all features Saving feature database	<u>×</u>

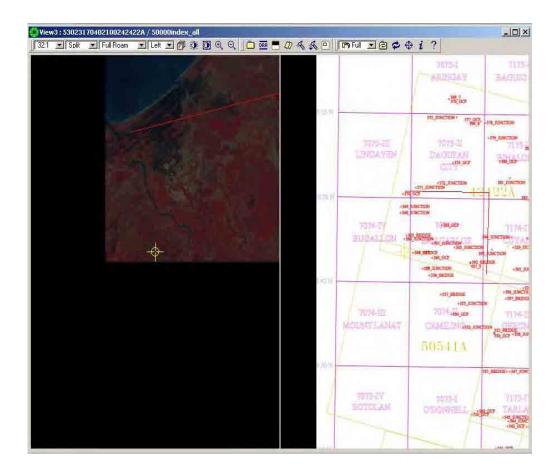
5. A "Select An Image" dialog box will appear. Select the required image (e.g. 53023170402100242422A.sup). Then click "OK".

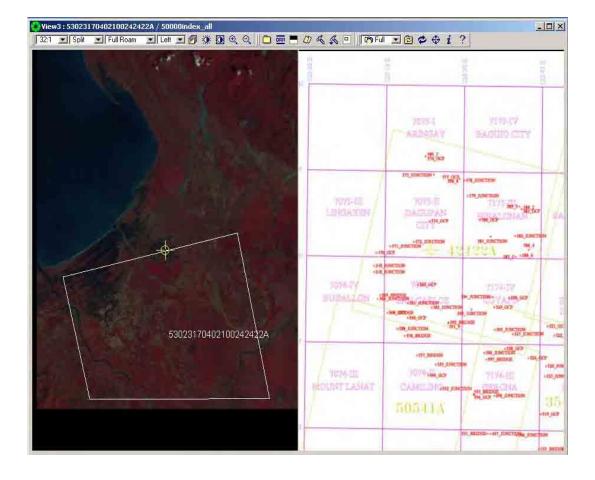


6. The selected image will be displayed in the view window. Split the view window showing the selected image on one side and load the index image on the other side.



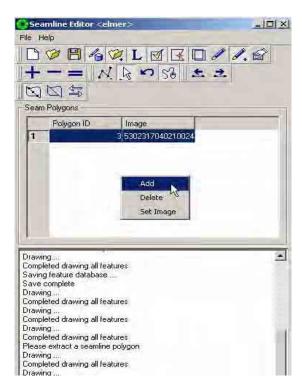
7. Hit "F3" in the keyboard and start digitizing the corners of the polygon covering the area limit of the image included in the map sheet (e.g. 7074-I_San Carlos). The index image will serve as the basis in determining the approximate position of the corners of the polygon that will cover the image limit.





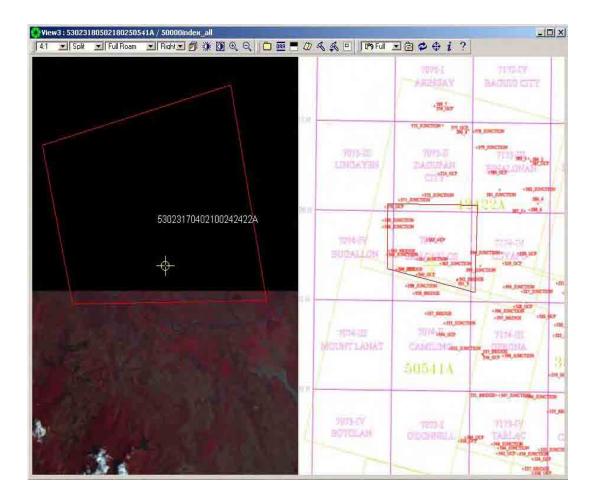
8. Click right mouse button to close the polygon. Hit "F3" again to stop the digitizing process.

9. Since the map sheet (e.g. 7074-I_San Carlos) is covered by two images, we must select the next image. Put mouse arrow inside the "Seam Polygons" box and click right mouse button. Click the "Add" button.



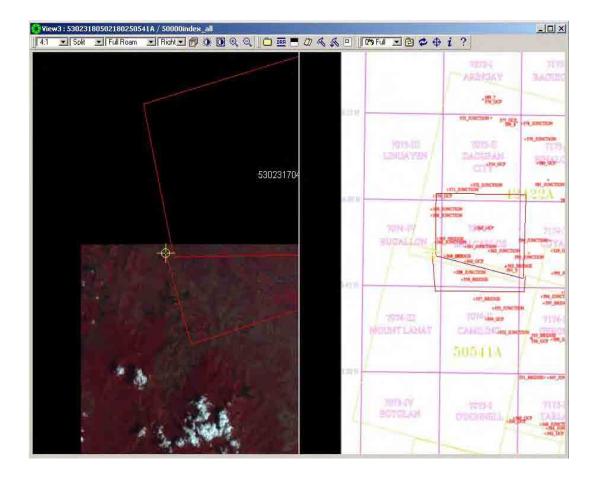
10. In the "Select An Image" dialog box, select the next image (e.g. 53023180502180250541A). Then click "OK".

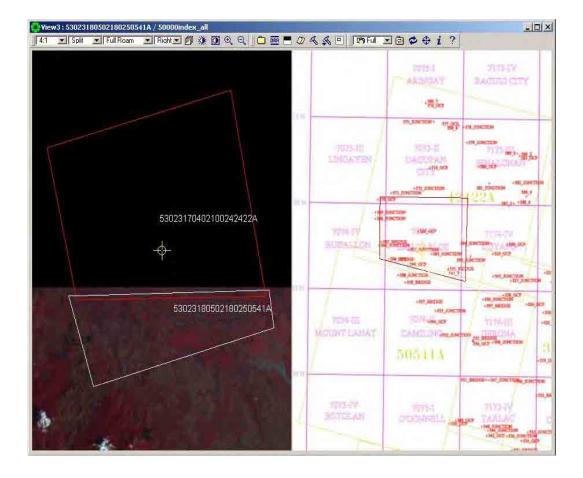




11. The selected mage will be displayed in the view window.

12. Hit "F3" in the keyboard and start digitizing the corners of the polygon covering the area limit of the other image included in the map sheet (e.g. 7074-i_San Carlos). The index image will be the basis in determining the approximate position of the corners of the polygon that will cover the image limit.





13. Click right mouse button to close the polygon. Hit "F3" again to stop the digitizing process.

14. Click "Save" icon.

ile Help		
Image: Seam Polygo Polygo 1 2	<u>жц</u> 15 — т	

15. Click "Products", select "Mosaic" and click "Mosaic.

File Project Preparation Extraction	Products Output Preferences Tools	Help
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set 60502) Duzšna∔) & 50000000	NINESOID N	Mosaic
it 🖭 Full Roam 🖭 Right 👥 👩	Perspective Scene Terrain Analysis	Seamine Editor

16. A "Mosaic" dialog box will appear. Click "Setup" tab. Click down arrow and select "Seams" in the "Update From" box.

Mosaic <carl< th=""><th>to_sat2.prj></th><th></th><th></th></carl<>	to_sat2.prj>		
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- Output Bound	fary		
	● LL - UR	C Four Corners	Calculate
X/Long: UL	204622.352	UR 233892.674	Draw Polygon
Y/Lat	1799066.936	1799066.938	Update From:
X/Long: LL	204622.352	LR 233892.674	Input Images 👱 Update
Y/Lat:	1769796.615	1769796.615	
-Sheet Setup-			Seams
Units-	Size	Over Edge	-Number of Sheets 4
1.	Coordinates Y		Y FILTO MBR
Welcome to Mos	aic.		
			Start Start At

17. Click "Input" tab. Select the needed images (e.g. 53023170402100242422A and 53023180502180250541A), click the arrow to transfer it to the "Selected" box. Select the created DTM (e.g. elmer_dtm.dth), click the arrow to transfer it to the "Selected" box.

Images	put Options	DTMs	
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🖵 Dtms 🛛 (blue	»)		Draw
🗂 Sheets (yell) (wc		T Auto Draw
elcome to Mosaic.			

18. Click "Output" tab, check "World File". Set "TIFF Tiled" in "Format. Set "2.5" in "GSD" (Image Resolution). Type output file name (e.g. 7074-I San Carlos) in the "Output Mosaic File" box. Locate and select project file (e.g. carto_sat) same as the one created in the "Create Project".

itart Setup Input Output Options		
Available Selected	Options Vold File Outho Info File Location: Carto_sat Format: TIFF Tiled GSD: 2.5 Lines: 12636 Samples: 12851 Output Mosaic File: 1074-1 San Carlos Dutput Seam File Seam Dutput ASCII Sheet File:	
Old Prefix: Story		

19. Click "Options" tab. Check "Seam Polygons", browse and locate the seam polygon file (e.g. elmer). Set width to "100". Check "Seam Feathering", "Seam Smoothing", "Auto Minify", "Construct GeoTIFF Tags" and "Bilinear". Then click "Start".

Mosaic Method	- Dynamic Range Adjust	- Mosaic Options
Most Nadir Most Nadir Narrow Överlap Most Nadir With DTM Input Order Radiometric Vertex Spacing Eonstraining Width. 200 Seam Polygons elmer Centerline	Off Default Custom Percent Skip: Number of Tiles Mean Std Deviation Max Contrast Ratio Min Contrast Ratio Min Contrast Ratio Max Gray Shift: Max Percent Adjust:	Image: Seam Feathering Width: 100 Image: Seam Smoothing Image: Seam Smoothing
Clip Polygon	Color Match Target Colors: Intensity Defaults Compute	Processes: 1

20. After processing, Click "Project", select "Load Images".

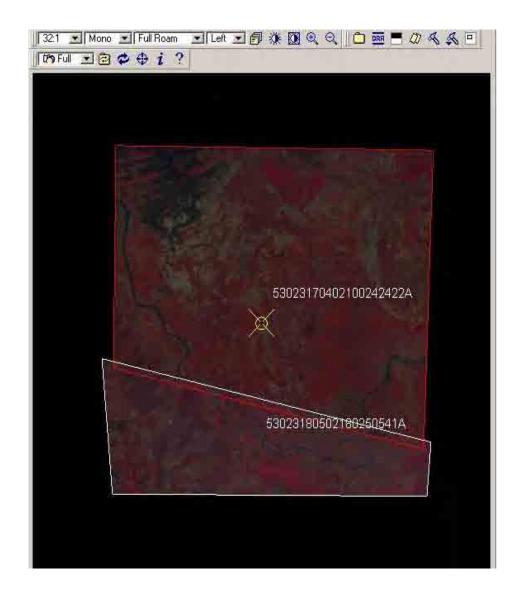


21. Create new view window. Select the image (e.g. 7074-I San Carlos) that was processed, Then click "Load".



3.1.7 Product

The mosaic image will be displayed in the image view window.



4. SPOT Image Index Map

