Aerial Image Orthorectifying and Mosaicking using PCI-Geomatica (Steps - using a given aerial photograph in Bulle area)

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PCI Geomatica (OrthoEngine)

The steps followed while orthorectifying and mosaicking aerial photographs using PCI geomatica orthoengine software are indicated as follows. The image number used in the processing is **13220** and the **focal length of the camera is 152.52mm.** The aerial photographs were taken in 1993.

The steps are as follows:

1. Scan the aerial photos and save them in your C drive, better if you make a folder called **1993**,
2. Open the **Orthoengine** of PCI Geomatica,
3. From the file menu select New and then,
4. In the project information dialog box of *File name* space provided, write the project name as O*rtho1993* and save it in C*: Geomatica_V91/user* folder. In the name space provided: write *project ortho1993.* In the description space provided: *Orthorectification and Mosaicking,*
5. From the *math models methods* choose Aerial photography and leave the default options in the other spaces as camera type *standard aerial* and exterior orientation *compute form GCPs and Tie points,*
6. Accept and close the dialog box then the *set projection dialog box* will popup,
7. At the top of the dialog box, *at the Output projection boxes* choose others and again click *on user projection* and then choose CH1903+ .Double click on it to choose,
8. In the output pixel spacing put 0.5 in both open spaces,
9. Do the same as step 7 *in the GCP projection boxes* and then click on the button *set GCP projection based on output projection.* Click on accept,
10. The *standard aerial camera calibration information dialog box* pops up, write down the focal length of the camera 152.52mm and 0.014 and 0.001 for principal point of symmetry (PPS).Click on no distortion for both radial lens and decentering distortion,
11. On the Fiducial marks click on *edge_ corner* radio button, and then use the frame shown on the camera calibration report in order to fill the space provided (boxes),

Table 1 contained the Fiducial marks of the flight number 13220 of 1993 aerial photographs obtained from the camera calibration report.

Table 1 Fiducial marks for flight no 13220, year 1993 taken from camera calibration information

Top left	-106	106.002
Top middle	0.000	112.001
Top right	106.000	106.001

Right middle	111.999	0.002
Bottom right	105.998	-106.000
Bottom middle	0.001	-112.005
Bottom left	-105.999	-105.999
Left middle	-111.999	0.001

12. Click on accept. Good time to save your project, save it now,

From the processing steps dropdown list menu choose *input data,*

13. Click on the *yellow folder symbol* and click new file in the open photo dialog box and insert all 4 images one by one from your project folder (folder1993),
14. You need to change the photo orientation of the bulle_3492 and bulle_3493 by 180 degree clock wise as it was turned 180 anti-clockwise direction at the time of scan,
15. Click on the button next to the yellow folder to insert the Fiducial Marks and locate the cursor exactly on the fiducial mark indicated on the photo and then click on Step button. Do the same to all fiducial marks. Finally click on auto fiducial marking button to mark automatically the fiducial marks in all of the 4 images. Click on accept,
16. Check on each photograph that the automated fiducial marks are marked on the right place. The bule_3493 image has some incorrect marks at the *right middle*, *right bottom* and *middle bottom. C*orrect the marks and click on accept,

From the processing steps drop down list menu choose GCP /Tp point collection

First click on the *collect GCPs manually* button and collect the co-ordinates shown in Table 2 and elevation points from national map of Swiss (1:50 000) in reference to the Pixel and Line available in the images. *** *The following latitude and longitude coordinates can be found in all of the 4 photographs and hence try to locate them in each of the photographs****.*

Table 2 Coordinats taken from **carte nationale de la Suisse 1:50 000**

GCP`s		
Elevation	Latitude	Longitude
743	07^{0}04`7.5”E	46^{0}37`20” N
773	0702`30”È	46 37`04” N
737	0703`53” E	4638`00” N
756	0703`36”E	4637`20”N
733	07 06` 45”E	46 37` 45” N
744	07 06` 55” E	46 37`09” N

The steps to be taken in order to collect these points are: look the coordinates points contained in Table 2 one by one from the Swiss national map and find their corresponding pixels and line values on the images (on the screen). You can also collect points (pixel and line values) first on the image and subsequently indicate the corresponding latitude and longitude positions on the map and then fill it in the space provided.

In the *auxiliary information* button of the same dialog box, select the concatenated DEM (digital elevation model) from the folder where it is located and uploaded as auxiliary information,

17. Save your project now,
18. Do the same for *Tie point collection*; you can use the same coordinates contained in Table 2 above as the above coordinates are collected on the tie points of the images as well. At least there must be more than 3 tie points on each photograph.

Select from the processing steps dropdown list menu *model calculation* and click on the button to perform bundle adjustment. You may get a response. Try to fulfill the need and run it again. Do it again and again until you get a response that may not protect you to proceed to the next step.

Open the dropdown dialog box again and choose orthogeneration and click on the button,

19. Click on one of the pictures available in the left pan so that the dialog box will be activated,
20. Browse the DEM (given) and put it in the orthogeneration options,
21. Click the radio button (*apply DEM option to all images*) found at the orthogeneration options,
22. Transfer all the photos to the photo processing pan (right pan),
23. Click on the generate orthos, wait for some times until it finishes processing and then click on close,

From the processing steps dropdown list menu choose Mosaic,

24. Click on define mosaic area and then save or create the mosaic area, when a dialog box pops up, click on **don't delete**,
25. Add all the ortho corrected photos from the earlier processes clicking each button one by one,
26. Close the dialog box. Save your project again now,
27. Click on automatic mosaicking button, seat back and relax until mosaicking finishes,
28. Close the dialog box after mosaicking completed, and then closes the **Orthoengine** to start another module of PCI geomatica. Open **focus** from PCI geomatica dropdown list in the program menu. Focus can be used to display and investigate your mosaic image. Zoom out and check for errors in the seamlessly stitched aerial photographs,

29. Is everything correct? If your image looks right (visual observation), you have finished. You can use the rectified images as a map or you can use it for further processing. If the image is not correct, go back and correct your mistakes and run the model again.

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December, 2008

Preparation of files for SLEUTH urban and land use change model (steps): (http://www.ncgia.ucsb.edu/projects/gig/Dnload/download.htm)

1. Ortho rectification and mosaicking the aerial photographs using the PCI-Geomatica,
2. Save the ortho rectified and mosaic files in GeoTIFF file from the PCI-Geomatica,
3. Import the GeoTIFF files one by one to IDRISI in gray color,
4. Use window module of IDRISI and choose the smaller size pic of all (area wise) and use the max and min XY coordinates of that pic as a reference to create same size.
5. Digitize roads, forest and resident areas separately so that it would be possible to create an input file for SLEUTH Model. Give them values for the lines and polygon while digitizing. You will have a vector file as end product.
6. Open Arcinfo and click on conversion tool→ then to raster →-then feature class to raster →then click on input features to import file from IDRISI tutorial folder. You can give an output name and save the converted file in your chosen folder.
7. After converting the vector file to raster, you need to reclassify it using spatial analyst reclassify module. Click on classify button found at the right side of the wizard. Change the 9 classification to 2. Click ok. Then change number 1 and 2 to 100 and give zero for no data values. Click ok to close the wizard.
8. Now the file will have a color back ground, double click on the left side small color box and change it to black color. Do the same for the other and change it to white.
9. Click on conversion tool again and then to raster→-then raster to other multiple formats, →then choose GIF in the raster format space provided below. Save the file in a known folder of your own.
10. You have finished preparing the file to Sleuth model for land use file preparation check a color BGR ortho rectified and mosaic file and classify it using supervised classification module of IDRISI. After developing the signature file, use fisher module of IDRISI to produce the final product. Then open Arcinfo and open the file from the IDRISI folder. Reclassify it with spatial analyst reclassify. Click on conversion tool and convert it to raster →then raster to other multiple formats→ then choose GIF in

the space provided below and then save it in GIF file. You can use the GIF file as an input for SLEUTH model.

To install SLEUTH Model and CYGWIN in to your computer

Download cygwin from website:

http://www.cygwin.com/

It is better to download the cygwin first and install it from your computer.

Copy **grow .exe** file from the SLEUTH folder directory to Cygwin folder. Put it inside Bin folder directory of Cygwin.
Optional:

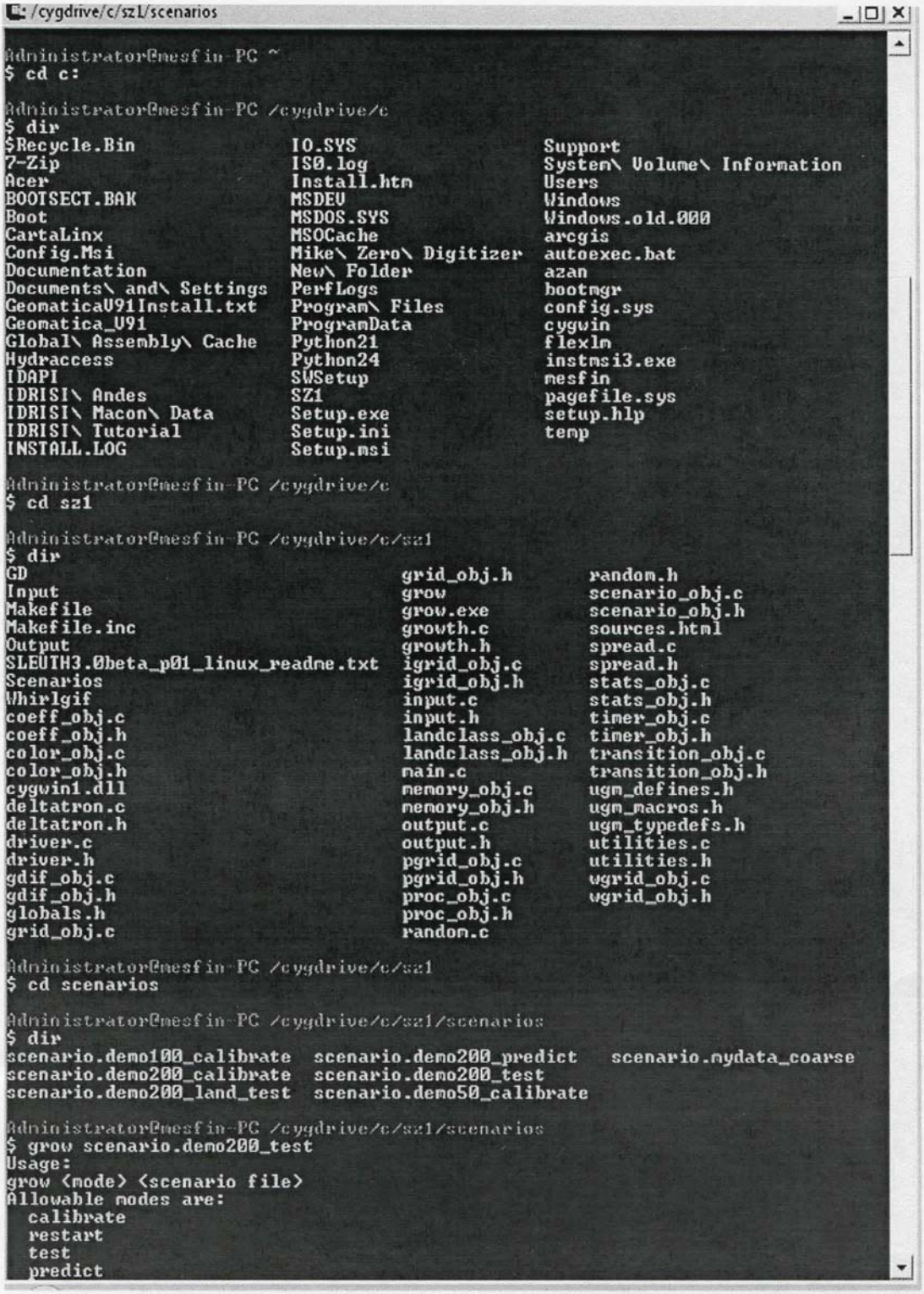
From GD directory, take exe files to bin folder of Cygwin, do the same for the exe files of whirlgif folder

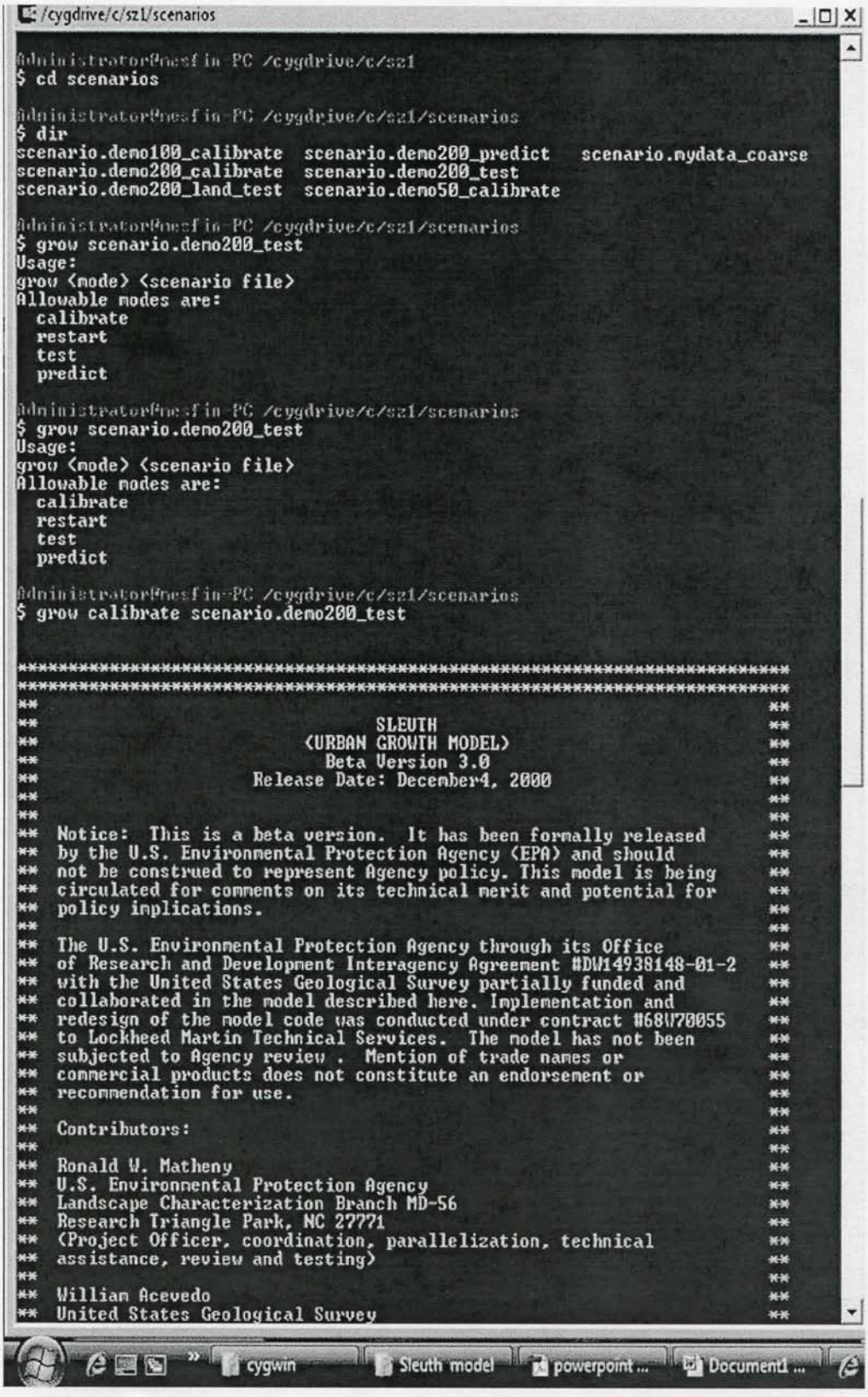
Copy the following file and paste it in Cygwin batch file (edit the batch file similar as shown below, if your SLEUTH folder is located in C drive):

```
@echo off

C:

chdir C:\cygwin\bin

set PATH=${PATH};.

set LD_LIBRARY_PATH=c:\cygwin\bin

bash --login -i
```

To run the Cygwin use dose prompt orders such as for chnaing the directory: cd c:..
To list the directory simply write DIR
To execute the scenario files you need to change the directory first to the scenarios by writing on the **prompt% CD scenarios**

You can look at the following examples


/cygdrive/c/sz1/scenarios
Administrator@mesfin-PC ~
$ cd c:
Administrator@mesfin-PC /cygdrive/c
$ dir
$Recycle.Bin IO.SYS Support
7-Zip IS0.log System\ Volume\ Information
Acer Install.htm Users
BOOTSECT.BAK MSDEV Windows
Boot MSDOS.SYS Windows.old.000
CartaLinx MSOCache arcgis
Config.Msi Mike\ Zero\ Digitizer autoexec.bat
Documentation New\ Folder azan
Documents\ and\ Settings PerfLogs bootmgr
GeomaticaV91Install.txt Program\ Files config.sys
Geomatica_V91 ProgramData cygwin
Global\ Assembly\ Cache Python21 flexlm
Hydraccess Python24 instmsi3.exe
IDAPI SWSetup mesfin
IDRISI\ Andes SZ1 pagefile.sys
IDRISI\ Macon\ Data Setup.exe setup.hlp
IDRISI\ Tutorial Setup.ini temp
INSTALL.LOG Setup.msi
Administrator@mesfin-PC /cygdrive/c
$ cd sz1
Administrator@mesfin-PC /cygdrive/c/sz1
$ dir
GD grid_obj.h random.h
Input grow scenario_obj.c
Makefile grow.exe scenario_obj.h
Makefile.inc growth.c sources.html
Output growth.h spread.c
SLEUTH3.0beta_p01_linux_readme.txt igrid_obj.c spread.h
Scenarios igrid_obj.h stats_obj.c
Whirlgif input.c stats_obj.h
coeff_obj.c input.h timer_obj.c
coeff_obj.h landclass_obj.c timer_obj.h
color_obj.c landclass_obj.h transition_obj.c
color_obj.h main.c transition_obj.h
cygwin1.dll memory_obj.c ugm_defines.h
deltatron.c memory_obj.h ugm_macros.h
deltatron.h output.c ugm_typedefs.h
driver.c output.h utilities.c
driver.h pgrid_obj.c utilities.h
gdif_obj.c pgrid_obj.h ugrid_obj.c
gdif_obj.h proc_obj.c ugrid_obj.h
globals.h proc_obj.h
grid_obj.c random.c
Administrator@mesfin-PC /cygdrive/c/sz1
$ cd scenarios
Administrator@mesfin-PC /cygdrive/c/sz1/scenarios
$ dir
scenario.demo100_calibrate scenario.demo200_predict scenario.nydata_coarse
scenario.demo200_calibrate scenario.demo200_test
scenario.demo200_land_test scenario.demo50_calibrate
Administrator@mesfin-PC /cygdrive/c/sz1/scenarios
$ grow scenario.demo200_test
Usage:
grow <mode> <scenario file>
Allowable modes are:
calibrate
restart
test
predict


/cygdrive/c/sz1/scenarios
Administrator@nesfin-PC /cygdrive/c/sz1
$ cd scenarios
Administrator@nesfin-PC /cygdrive/c/sz1/scenarios
$ dir
scenario.demo100_calibrate scenario.demo200_predict scenario.mydata_coarse
scenario.demo200_calibrate scenario.demo200_test
scenario.demo200_land_test scenario.demo50_calibrate
Administrator@nesfin-PC /cygdrive/c/sz1/scenarios
$ grow scenario.demo200_test
Usage:
grow <mode> <scenario file>
Allowable modes are:
calibrate
restart
test
predict
Administrator@nesfin-PC /cygdrive/c/sz1/scenarios
$ grow scenario.demo200_test
Usage:
grow <mode> <scenario file>
Allowable modes are:
calibrate
restart
test
predict
Administrator@nesfin-PC /cygdrive/c/sz1/scenarios
$ grow calibrate scenario.demo200_test
SLEUTH
(URBAN GROWTH MODEL)
Beta Version 3.0
Release Date: December4, 2000
Notice: This is a beta version. It has been formally released by the U.S. Environmental Protection Agency (EPA) and should not be construed to represent Agency policy. This model is being circulated for comments on its technical merit and potential for policy implications.
The U.S. Environmental Protection Agency through its Office of Research and Development Interagency Agreement #DW14938148-01-2 with the United States Geological Survey partially funded and collaborated in the model described here. Implementation and redesign of the model code was conducted under contract #68W70055 to Lockheed Martin Technical Services. The model has not been subjected to Agency review . Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.
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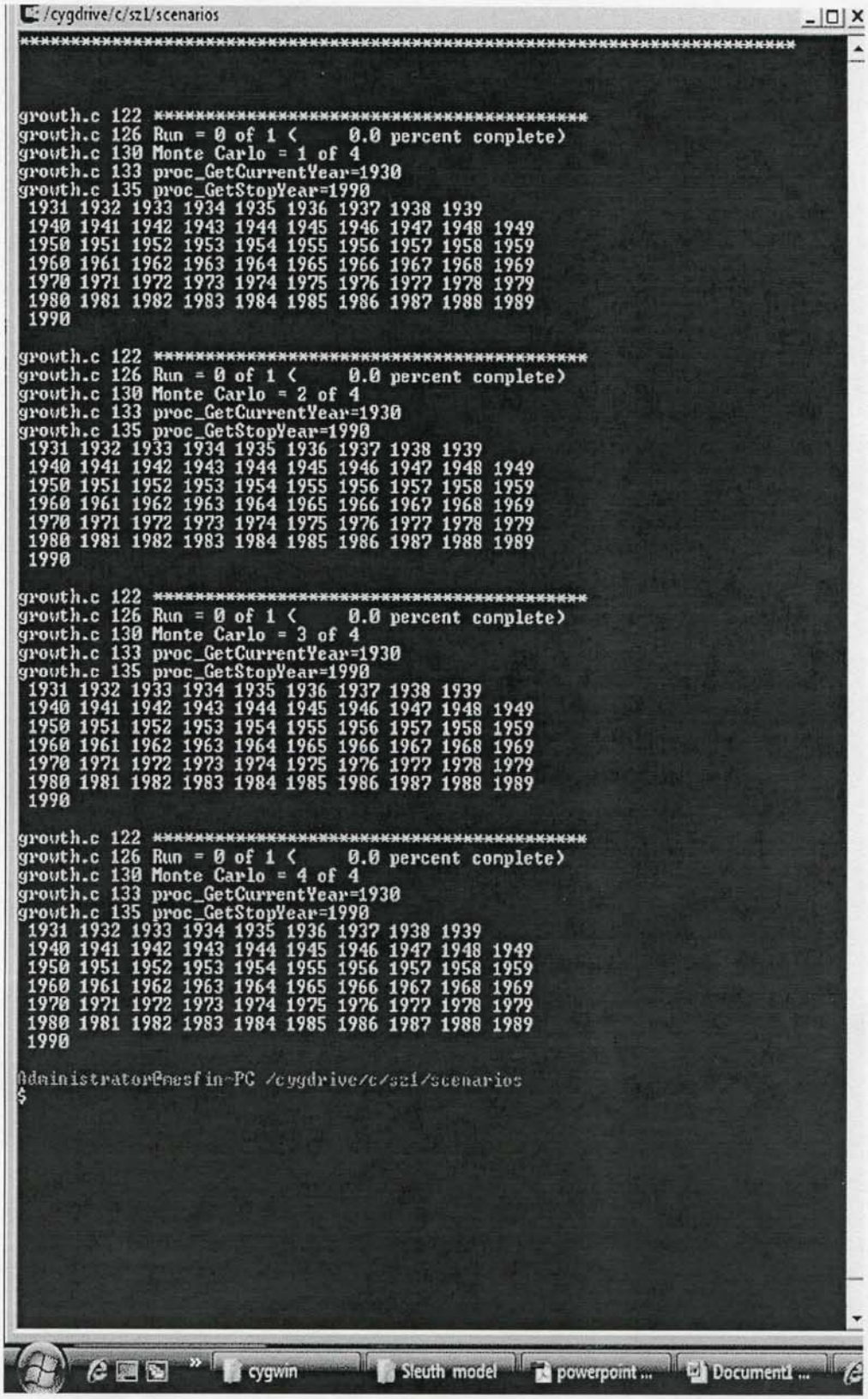
cygwin
Sleuth model
powerpoint ...
Document1 ...


/cygdrive/c/sz1/scenarios
growth.c 122 **
growth.c 126 Run = 0 of 1 (0.0 percent complete)
growth.c 130 Monte Carlo = 1 of 4
growth.c 133 proc_GetCurrentYear=1930
growth.c 135 proc_GetStopYear=1990
1931 1932 1933 1934 1935 1936 1937 1938 1939
1940 1941 1942 1943 1944 1945 1946 1947 1948 1949
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959
1960 1961 1962 1963 1964 1965 1966 1967 1968 1969
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989
1990
growth.c 122 **
growth.c 126 Run = 0 of 1 (0.0 percent complete)
growth.c 130 Monte Carlo = 2 of 4
growth.c 133 proc_GetCurrentYear=1930
growth.c 135 proc_GetStopYear=1990
1931 1932 1933 1934 1935 1936 1937 1938 1939
1940 1941 1942 1943 1944 1945 1946 1947 1948 1949
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959
1960 1961 1962 1963 1964 1965 1966 1967 1968 1969
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989
1990
growth.c 122 **
growth.c 126 Run = 0 of 1 (0.0 percent complete)
growth.c 130 Monte Carlo = 3 of 4
growth.c 133 proc_GetCurrentYear=1930
growth.c 135 proc_GetStopYear=1990
1931 1932 1933 1934 1935 1936 1937 1938 1939
1940 1941 1942 1943 1944 1945 1946 1947 1948 1949
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959
1960 1961 1962 1963 1964 1965 1966 1967 1968 1969
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989
1990
growth.c 122 **
growth.c 126 Run = 0 of 1 (0.0 percent complete)
growth.c 130 Monte Carlo = 4 of 4
growth.c 133 proc_GetCurrentYear=1930
growth.c 135 proc_GetStopYear=1990
1931 1932 1933 1934 1935 1936 1937 1938 1939
1940 1941 1942 1943 1944 1945 1946 1947 1948 1949
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959
1960 1961 1962 1963 1964 1965 1966 1967 1968 1969
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989
1990
Administrator@nesfin-PC /cygdrive/c/sz1/scenarios
$
cygwin
Sleuth model
powerpoint ...
Document1 ...

2. **Download** SLEUTH **model from web site:**

http://www.ncgia.ucsb.edu/projects/gig/Dnload/download.htm

After downloading SLEUTH, → unzip the files being in Cygwin dos interface.

2.1. Decompressing the file:

To decompress the downloaded file from **a dos** command line interface:

Prompt% gunzip SLEUTH3.0beta.tar.gz

Prompt% tar xvf SLEUTH3.0beta.tar

Usage:

Prompt% grow <mode> <scenario file>

Allowable modes are:

- calibrate
- restart
- test
- predict

Execute a test run:

(From the Scenarios directory)

Prompt% ../grow test scenario.demo200_test

Data will be written to the screen showing the progress.