Parallel Calibration of pSLEUTH

Resource and document of pSLEUTH

Source for download pSLEUTH and pRPL: http://www.geog.ucsb.edu/~guan/pRPL/

The latest version of pSLEUTH in CAGIS (we resolve the memory issue in the original version): **http://**

Calibration of pSLEUTH

The pSLEUTH calibrate a set of coefficients of a sequence of growth rules in the simulation. The best fit of the calibration coefficients will be selected for the prediction. There are five parameters: diffusion, bread, spread, road gravity, and slope. The range of coefficients is from 1 to 100 for each parameter.

In pSLEUTH, brute force method is used to simulate the land cover change for each combination of coefficients. The workflow of our parallel calibration of pSLEUTH is as follow:

1. Based on the initial and step values specified, a Shell script generates all the combinations of coefficients.

2. According to the CPUs available in the cluster, all the combinations of coefficients will be evenly divided into a set of configuration files in configuration folder.

3. Set up the work folder structure in computing cluster. Create work folders as many as available CPUs in the master node.

4. Using submission Shell script, reserve multiple CPUs. For each CPU, copy an individual configuration file, including a set of combinations of coefficients, into a corresponding work folder in master node.

5. Each computing node will run the model with the configuration file.

6 After all computing modes finish their jobs, a shell script will collect results from each work folder.

Run the Calibration Process of pSLEUTH

Step 1: Set up pRPL tool, so unzip the pRPL.zip under your directory.
Before we start, use command "make clean" to clean all the compiled files.

1. Compile the program
   - cd /home/yourname/pRPL
   - make # create the library file – libprp.a

- make demo # build a demo file - pAspect

2. Test pRPL (If there is no error, further test the code as below.)
   - cd /home/yourname/pRPL
   - mpirun –np 4 ./pAspect ./data/usa_nw.dem ./data/usa_nw.asp 0.008333 111120 1

Step 2: If the demo program is running successfully, configure pSLEUTH.
Suppose pRPL is already set up, and it is in the directory /home/yourname/pRPL, and you unzip the pSLEUTH.zip to the directory /home/yourname/pSLEUTH.

1. Modified the file "mk.sleuth"
   MPI_LIB=/apps/sys/openmpi-1.5.4/rhel6_u2-x86_64/gnu/include/
   PRPL_LIB=../../pRPL/
   SRCS_WO_HDRS = main_sleuth_wp.cpp
2. In **src/main_sleuth_wp.cpp**, specify how many combinations of will be estimated in one single CPU
3. In the globalSet.h, disable the MPI by commenting "`#define USE_MPI`"
4. Compile the pSLEUTH software
   - cd /home/yourname/pSLEUTH/src
   - make –f mk.sleuth depend # scan the dependency relations among the codes
   - make –f mk.sleuth # compile the software
5. Set up the myScen.scen file. Specify the number of Monte Carlo iterations and the start year and end year of calibration.

Step 3: Compress the pSLEUTH and pRPL folders in to model.zip

Step 4: Set up the initial, interval and stop values of coefficients of five parameters in *parameters.sh*, and run it to generate a file *calibration.txt* including all the combinations of coefficients.

Step 5: Run the Shell script *divideConfig.sh* to separate *calibration.txt* into sub configuration files based on the number of available CPUs into folder calibration_conf.

Step 6: Modify the paths in *run1.sh.*

Step 7: Specify the number of nodes and CPUs in *submitAll.sh*, and qsub this shell script to run the model.

Step 8: Use *resultCollect.sh* to collect the result from all work folders.