

Instructions:

- 1) This model was written in NetLogo, version 6.0, but runs in the latest version available. You can download NetLogo for free at the following website:
<https://ccl.northwestern.edu/netlogo/download.shtml>

2) Interface parameters:

Green boxes:

- a) *Map-resolution-km* and *patch-size-km*: refer to the side of the cells in the map. Map-resolution-km should be the resolution of the DEM map imported, and patch-size-km is the resolution wanted for the model.
- b) *Snow-line*: Identifies a threshold above which the land is covered in snow, which cannot be walked on.
- c) *Limit-ticks*: Helps to stop simulations when the hiker gets stuck (in mountains' cul-de-sac, or on peninsula). At that limit, the hiker dies and the simulation stops.
- d) *Optimization*: Affects the choices made by the hiker to find the best route between two points.
- e) *Switchbacks*: When switched ON, this allows the hiker to move further from the goal to avoid obstacles and minimize cost.
- f) *Viewshed-threshold*: This is a percentage of the map resolution. It affects the cells that are visible from the hiker's perspective. Increasing the value helps the hiker consider walking to cells that are obscured by mountains (to represent hiking up small saddles).
- g) *Outputs?*: When switched ON, the model creates a CSV file with the path created.
- h) *Lost-outputs?*: When switched ON, the model creates outputs even when the hiker gets lost and dies. When OFF (but Outputs? in ON), only the successful routes are recorded in CSV.
- i) *Mode*: This affects the setup of the simulation. Different parameters are linked to the different modes. as shown below that parameter box.
 - i) In *Manual* mode, press SETUP first. When the setup is complete, click on "Create context" and choose the point to create (hiker or goal). Click on the desired location on the map for each, and unclick "Create context".
 - ii) In *Repeat* mode, enter the coordinates of the start and end points desired BEFORE pressing SETUP.
 - iii) In *Import* mode, enter the order of the sites you want to used from the shapefile (e.g., first and fifth sites of the shapefile) in the iter-start and iter-end boxes, respectively. If the shapefile has site labels, enter the name of that attribute column in the "shp-var" box.
 - iv) In *Start-radius* mode, enter the coordinates of the central point in the start-x and start-y boxes of Repeat mode, and enter the distance at which you want to place the goal in the "radius-km" box.

Beige boxes:

- j) Coord-start and coord-end give the coordinates of the start and end points (useful to enter the correct coordinates in the Repeat mode boxes).
- k) Path and path slope show the evolution of the path chosen

- l) Crow-fly records the Euclidean distance between the start and end points
- m) Distance walked (km) records the distance walked using the least-cost path
- n) Time passed (hours) records the time required to walk between the two points
- o) Speed divides the distance by the time passed to show walking speed in km/h

3) To run this model:

- a) To run using the sample data, you will need to download the whole folder named LCP_maps.
- b) To run this model with your own data, you can use your own DEM (in ASCII format) and site shapefiles.
 - i) These need to be placed in the LCP_maps folder. That folder needs to remain with the model code.
 - ii) The DEM must be named 'DEM.asc' and the shapefile 'Sites.shp'.
 - iii) Make sure that the N/A of the DEM have values (-9999)
 - iv) The DEM resolution and elevation values should be in meters.
 - v) Make a note of the DEM resolution to enter in the NetLogo model's "map-resolution-km" input box.
 - vi) If you use a point shapefile, it should be in the same projection as the DEM.
 - vii) If your shapefile points have names/labels, note the name of that variable. You can enter it in the "shp-var" input box, so that the output records those.

4) Interesting ideas:

- a) Change the patch-size-km to see how different resolution affect the created paths between two points.
- b) Enter the coordinates you want in the boxes for Repeat mode, and vary optimization to see how the hiker's decision affect the path created.
- c) Change the elevation of the snow-line to make parts of the map inaccessible.