3D-CHAStar source code description and numerical case test

Description:

* Source code is implemented via Python 3.9 and does not rely on third-party software

* Test case terrain functions are shown in the paper (https://onlinelibrary.wiley.com/doi/abs/10.1111/mice.12350)

* Running instructions

1. Run ***generate_terrain.py*** and ***generate_heuristic.py*** sequentially to generate two text files of terrain and heuristic cost. "***generate_terrain***" module will also output a 3D terrain schematic, as shown in Figure 1 below.

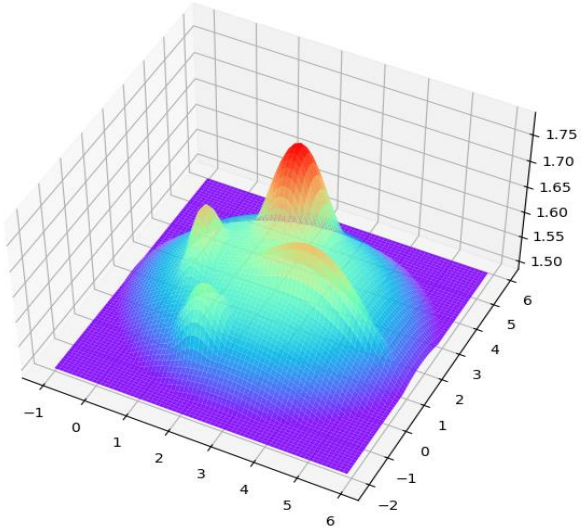

Figure 1 Numerical case topographic map

2. Run ***3D-CHAStar.py*** main module, the program automatically generates the horizontal and vertical alignment shape, such as Figure 2. In addition, the program automatically outputs the horizontal intersection coordinates file (points.txt), the traversal points mileage file (bpd_lens.txt) and the slope file (slopes.txt).

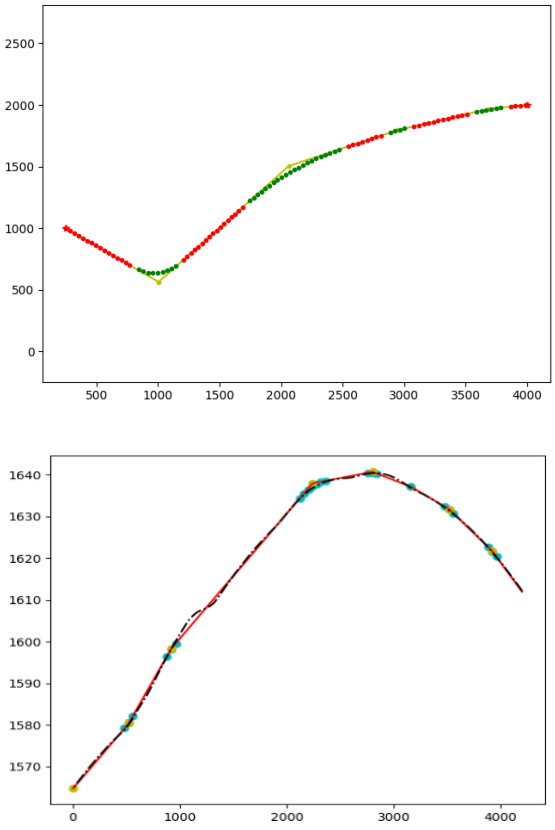

Figure 2 Generated 3D alignment

*Description of other modules

get_cross_section_info.py: Get fill, cut and corresponding cost information. See Figure 3.

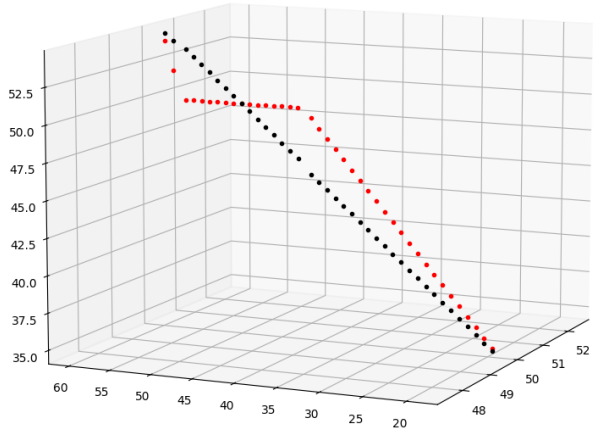

Figure 3 Cross_section calculation module

tool_functions.py: Get the coordinates, hash and estimated cost of a new node