

Simple Guide to SPEC-debris-barrier Platform GUI - Windows

Installation Instruction

The following procedure is used for installing and performing SPEC-debris analysis and optimal barrier location framework in the SPEC-debris-barrier platform:

- i. Unzip the "SPEC-debris-barrier-platform-GUI-windows.zip" file
- ii. Run the "Python Install and Setup.bat" file to set up the Python. Needs internet connection
 - The "Python Install and Setup.bat" file will automatically install the Python 3.10 64-bit version (taken from <http://www.python.org>). While installing, ensure that the “Add Python 3.xx to PATH (xx is version number)” option is clicked (**Figure A**). If Python (version 3.9 or 3.10) is already installed and the Python file location is added to the PATH, this stage can be skipped

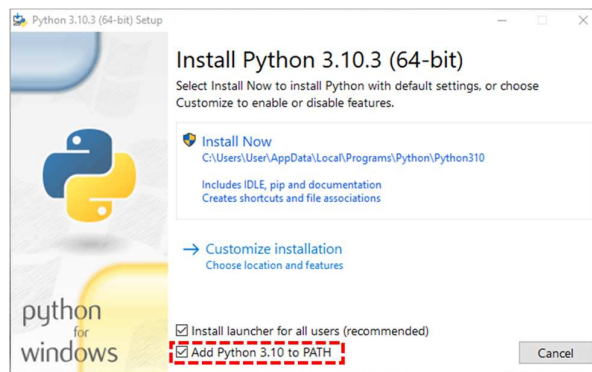


Figure A Selecting the “Add Python 3.xx to PATH” option during the Python3 installation

- The "Python Install and Setup.bat" file will also automatically install all the required libraries needed to run the SPEC-debris-barrier Platform. If Python (version 3.9 or 3.10) is already installed, type the following command in command prompt (cmd):

```
python -m pip install numpy pandas laspy scipy pykridge plotly shapely matplotlib alphashape trimesh scikit-learn python-fcl tripy
```

- iii. Run “SPEC_debris_barrier_GUI.exe” file to run the software

Optional setup instructions

- To create shortcuts to the Desktop or Start Menu, right-click the “SPEC_debris_barrier_GUI.exe” file and press “Create shortcut”. You can change the name of the shortcut to anything. These are the default folder locations for:
 - A. Desktop: “C:\Users\Public\Desktop”
 - B. Start Menu: “C:\Users\UUUU\AppData\Roaming\Microsoft\Windows\Start Menu\Programs” where UUUU is the username of the Windows PC

- Installing a text editor or IDE is highly recommended. Installing Visual Studio code (VS Code) is highly recommended because VS code is a popular code editor that can automatically detect syntax errors on the input JSON file

User Interface Guide

The SPEC-debris-barrier platform has an intuitive and simple graphical user interface (GUI) that allows an engineer experienced in runout analysis and landslide geohazards to interact with the software easily. The software automatically disables and enables the buttons to ensure the user cannot skip an operation stage without clearing the previous step. For example, the platform prevents users from starting the analysis without checking the input file for errors. The platform has two text displays and six buttons, as shown in **Figure B**. The six buttons and their functions are:

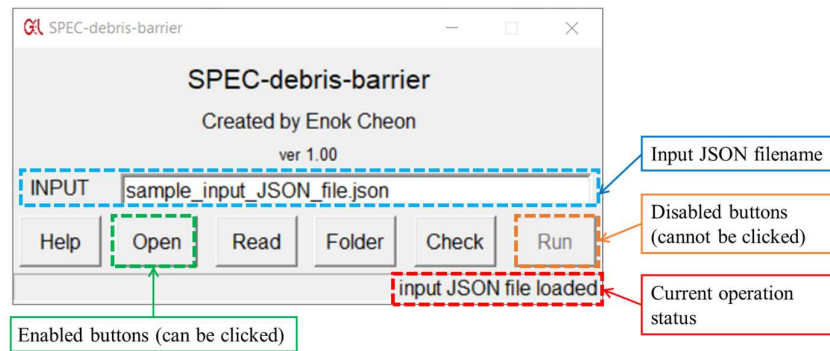


Figure B User interface of SPEC-debris-barrier platform

- (1) Help: opens the user manual (located in the “help” folder),
- (2) Open: opens the file explorer and prompts the user to select the input JSON file,
- (3) Read: opens the input JSON file on a text editor,
- (4) Folder: opens the file explorer to the location of the input JSON file,
- (5) Check: performs a check for any errors in the input JSON file,
- (6) Run: opens a new command prompt (cmd) and start the analysis.

The SPEC-debris-barrier platform also features a simple checking function for the input JavaScript Object Notation (JSON) file. A pop-up window displays the error message if any error is detected during the check, as shown in **Figure C**. The error message provides a source of error and suggests suitable corrections.

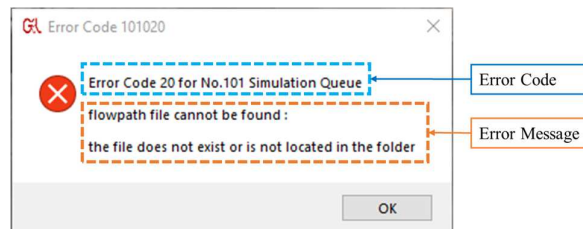


Figure C Example of an error message pop-up window in the SPEC-debris-barrier platform

Instructions for Running Analyses

- i. Starting up the “SPEC_debris_barrier_GUI.exe”
- ii. Select the input JSON file (**Figure D**)
 - a) Double-click the “Open” button. All other buttons except “Help” are disabled; hence, the user cannot proceed without selecting an input JSON file (**Figure D(a)**)
 - b) Navigate through the file explorer and select the input JSON file
 - c) If successful, the input JSON filename will appear in the INPUT text box, and the “input JSON file loaded” text will appear on operation status. The “Read” and “Folder” buttons would be enabled (**Figure D(b)**)
 - d) The user can change the input JSON file by selecting a new input JSON file by repeating steps (a) to (c)

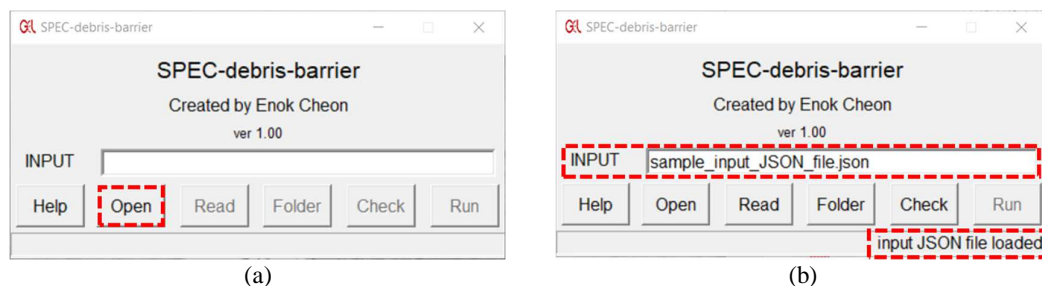


Figure D Loading input file: (a) opening input JSON file, and (b) successful loading of an input JSON file

- iii. Viewing input JSON file (if required)
 - a) Double-click the “Read” button to open a text editor, such as VS code, and display the input JSON file. The user can read and edit the input file
 - b) Double-click the “Folder” button opens the folder where the input JSON file is located, allowing easy access to input and output files
- iv. Checking input JSON file
 - a) Double-click the “Check” button to check for potential errors in the input JSON file
 - b) If an error is detected, an error message will pop up, as shown in **Figure C**, and prompt the user to fix the sources of error. Use the “Read” button or the text editor to modify the input JSON file
 - c) If no error is detected, a pop-up window will inquire whether the user wants to proceed to start the analyses, as shown in **Figure E**. To start the analysis, click the “Yes” button. If the user wishes to perform the analyses later, click the “No” button
 - d) If the check did not find any errors in the input JSON file, the “Run” button is enabled

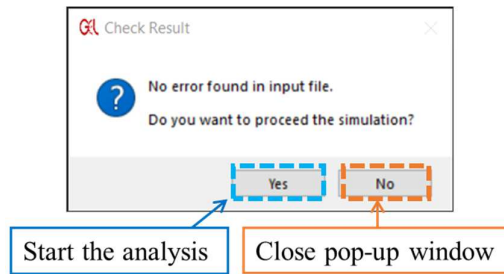


Figure E Pop-up window after checking to inquire whether to proceed to the analyses

- v. Perform analyses
 - a) Click the “Run” button to perform analyses
 - b) A new command prompt (cmd) will be opened. The cmd will display the completion of a particular stage in the analysis. Additionally, the SPEC-debris analysis progress will be tracked by showing the following: simulation time, computation time, and expected remaining computation time (**Figure F**)
 - c) If the user wants to terminate the analyses before completion, press the “CTRL” button, then the “C” button (“CTRL + C”). The cmd displays “user terminated early” to indicate early termination of the analyses (**Figure F**)
 - e) When the analyses are complete, the cmd will display a message: “Press any key to continue . . .” Press any key to close the cmd (**Figure F**)
 - f) When the cmd is closed, a pop-up window opens, messaging the termination of the analyses (**Figure G(a)**), and “simulation complete” text will be displayed on operation status (**Figure G(b)**)

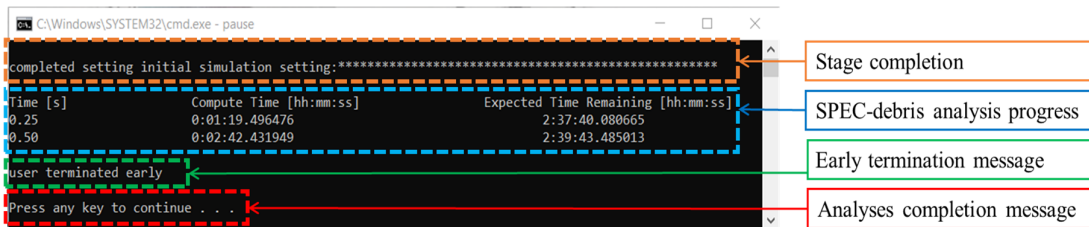


Figure F Command prompt (cmd) analyses progress message

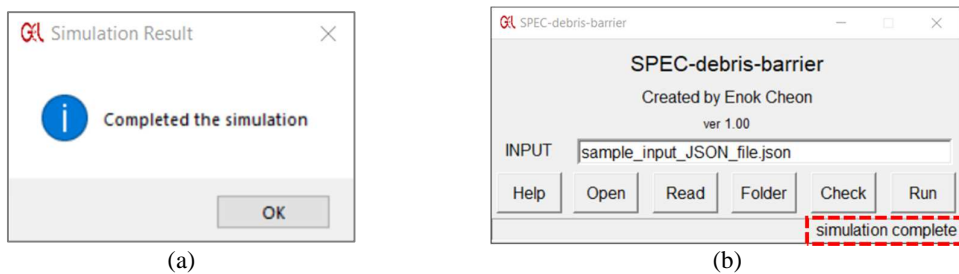


Figure G Analyses completion message on: (a) pop-up window and (b) operation status

- vi. Accessing the output files
 - a) The output files are generated when the analyses are complete. Use the “Folder” button to quickly open the folder where the input and output files are located
 - b) Output JSON files summarize the input data and the analysis results
 - c) Output csv files contain computed parameters in tabulated format
 - d) Output HTML files are the interactive plots and animations, which can be viewed by opening the files through internet browsers, such as Google Chrome or Microsoft Edge

Writing JSON input and Interactive Outputs

Refer to the Ph.D. Thesis "A New Simulation Model for Optimal Location Selection and Performance Evaluation of Barriers as Mitigation Against Debris Flow" by Enok Cheon (2022) as the User manual. A pdf copy of the PhD thesis is provided in the “help” folder in the "SPEC-debris-barrier-platform-GUI-windows.zip" file

- Chapters 2 and 3 cover the theory
- Chapter 4 shows the Software GUI, features, and instructions
- Appendix A gives instruction for creating the input JSON file