AutoRAS1Du Module

User's Manual

(Version 1.0)

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Introduction

A python module/package, ***Py2HecRas***, which is created based on the HEC-RAS API (RAS507.HECRASController and RAS507.HECRASGeometry), includes several functions that can automate a HEC-RAS 1D unsteady flow simulation:

1) ***Py2HecRas_1DU_Flow()*:** create a 1D unsteady flow data file based on the given HEC-RAS geometry data and boundary data (upstream streamflow data and downstream friction slope which are stored in separate CSV files for each reach);

2) ***Py2HecRas_1DU_Geo()*:** modify the Manning's n (given multiply factor) in the original geometry file and create a new geometry file with new Manning's n;

3) ***Py2HecRas_1DU_Plan()*:** create a HEC-RAS 1D unsteady flow plan file based on a template list in the script;

4) ***Py2HecRas_1DU_Project()*:** modify the original HEC-RAS project file;

5) ***Py2HecRas_1DU_Run()*:** run HEC-RAS 1D unsteady flow analysis and extract unsteady results (WSE, flow, average velocity of flow in main channel, and average velocity of flow in total cross section) from the HEC-RAS HDF file, and save as separate CSV files.

The sketch flowchart for the module code is shown in Figure 1.

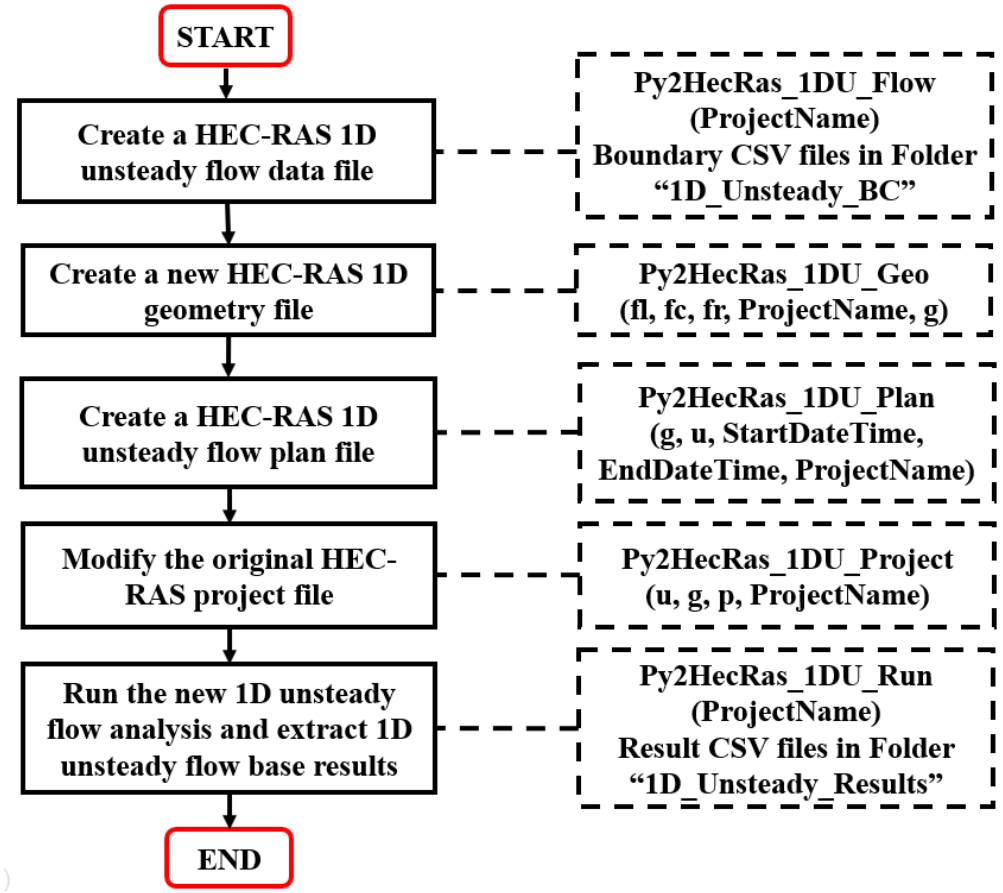

Figure 1. Flowchart for automating HEC-RAS 1D unsteady flow simulations using Python.

The sketch data structure of a HEC-RAS plan HDF5 file for the datasets of flow, water surface elevation, average velocity of flow in main channel, and average velocity of flow in total cross section is shown in Figure 2.

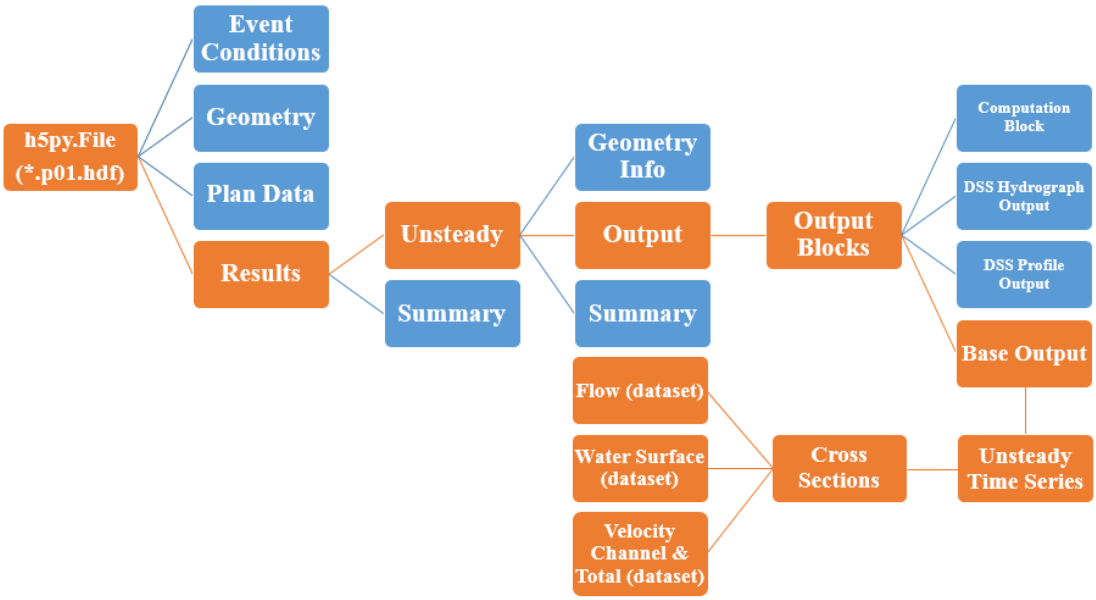

Figure 2. Sketch data structure of HDF5 file for base results of a plan file in HEC-RAS.

Table 1. Summary.

Installation

Application

Example 1

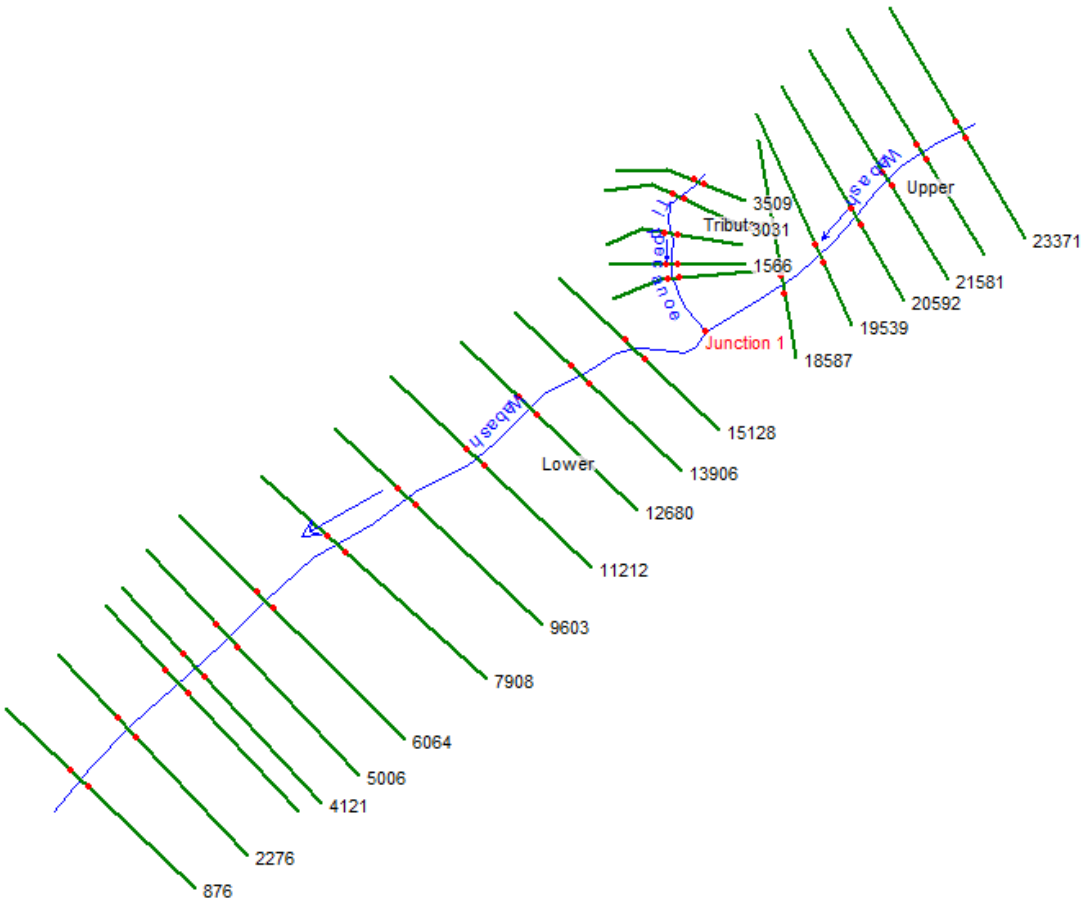

Figure 3. River network of HEC-RAS model-1.

Example 2

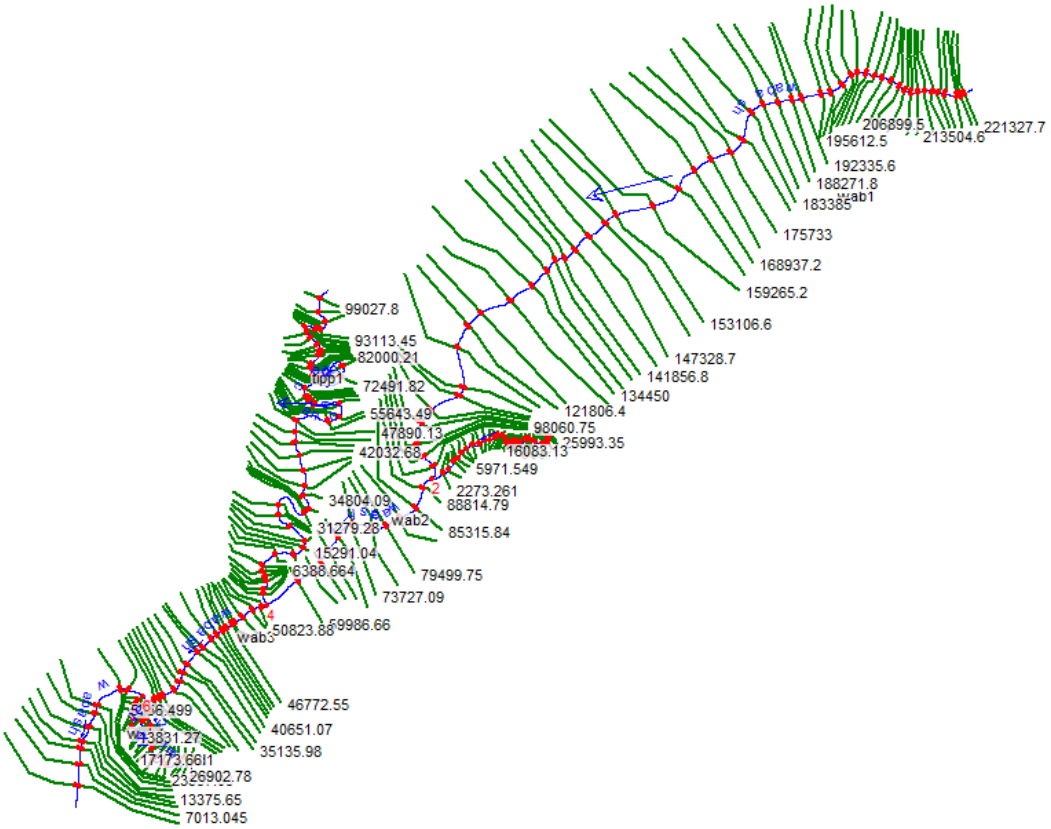

Figure 4. River network of HEC-RAS model-1.

```
>>> import AutoRAS1Du as ARu

>>> # Create a 1D unsteady flow data file based on given boundary data
>>> ARu.Py2HecRas_1DU_Flow(ProjectName="WabashAndTributarie")

>>> # Create a HEC-RAS 1D unsteady flow plan file
>>> ARu.Py2HecRas_1DU_Plan(g=1,u=1,
                           StartDateTime="2008-01-21 00:00",
                           EndDateTime="2008-02-21 00:00",
                           ProjectName="WabashAndTributarie")

>>> # Run HEC-RAS 1D unsteady flow analysis and get results (WSE, flow, velocity)
>>> ARu.Py2HecRas_1DU_Run(ProjectName="WabashAndTributarie")
```

Issues of Current Version

1) Name the boundary data files (CSV): "BC_RiverID_ReachID".csv in the Folder "1D_Unsteady_BC".

2) Results named as "Variable of ProjectName".csv are stored in the Folder "1D_Unsteady_Results"

References