



AdapLin Tool Plugin for QGIS 3.34 User Guide (v. 0.4)

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<https://github.com/LPG-Uerj/AdapLinQGIS>

March 17, 2025

Introduction

The AdapLin Tool is an adaptive, interactive, assisting tool for roads vector mapping. It is based on dynamic programming and was developed as a plugin for the QGIS software. AdapLin is intended to optimize the vector mapping of roads, based on features present on a georeferenced image. In terms of workflow, after setting up a project and starting AdapLin on QGIS software, the operator clicks on the first vertex of the focused road on the QGIS map canvas. Such vertex is a reference coordinate for the process that follows. Considering the cursor position and the underlain image, AdapLin Tool shows a preview for such road segment. That preview encompasses the reference vertex, two vertices automatically suggested by a dynamic programming procedure, followed by the current cursor position. The preview is adaptive once it changes in real time according to cursor position. If the operator clicks on it, preview points are incorporated to the road polyline into the shapefile buffer. Then, the last vertex measured by the user turns to be the next reference vertex for the preview. During AdapLin operation, the optimization process is carried out by a dynamic programming approach based on a graph. Shape and spectral features, extracted from the image, are combined to choose the minimal cost path.

AdapLin Tool was created for the master's degree dissertation of Marcel Emanuelli Rotunno (2017) submitted to the Post-Graduation Program on Computational Sciences at Rio de Janeiro State University (UERJ). That research aimed at attending demands of road cartographic production of the Brazilian Institute of Geography and Statistics (IBGE). This software is available under GNU/GPL licence to anyone who desires improving roads mapping experience. This tutorial was produced and revised by the undergraduate student Thiago Ferraccioli Siqueira Lemos, under the guidance of Professor Guilherme Lucio Abelha Mota at UERJ. It brings installation guidelines and operation details of the AdapLin Tool.

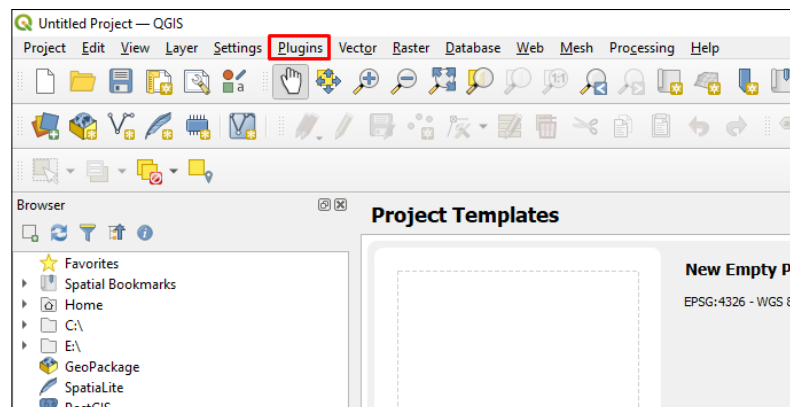
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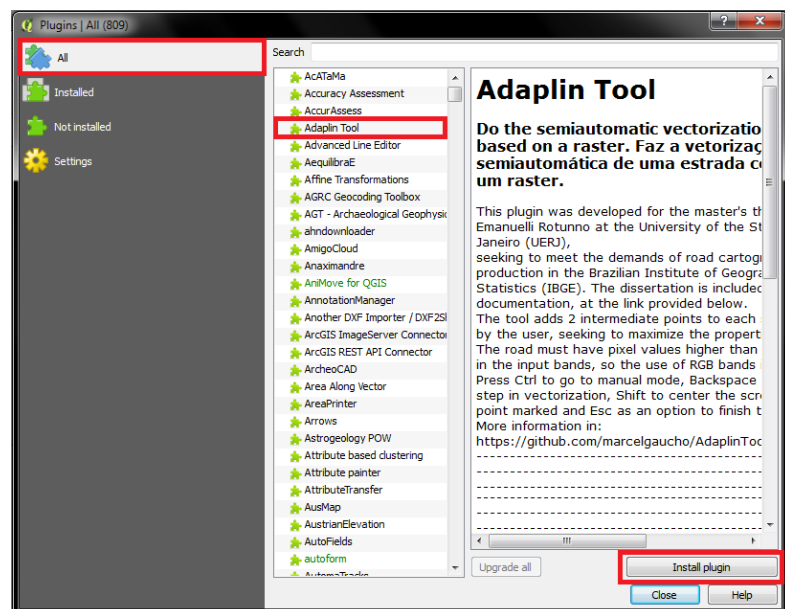
I Installing AdapLin

To ensure the tool operation, it is necessary that the QGIS software be installed in your computer, in the version 3.16. After downloading and updating it, follow the steps bellow to perform AdapLin Tool installation:

1. Initialize QGIS;
2. Access the Plugins menu, select **Plugins** > **Manage and Install Plugins...** and wait for loading to complete;



3. On the left side bar, select **All**;
4. Search for **AdapLin Tool** in the plugin list;
5. Select the **AdapLin Tool** and click on; **Install plugin**.



AdapLin Tool plugin is now installed and ready for usage. Proceed to the next section to see how to use it.

2 Using AdapLin on QGIS

Figure 1 presents an overview of the AdapLin Tool plugin usage workflow throughout a QGIS Project.

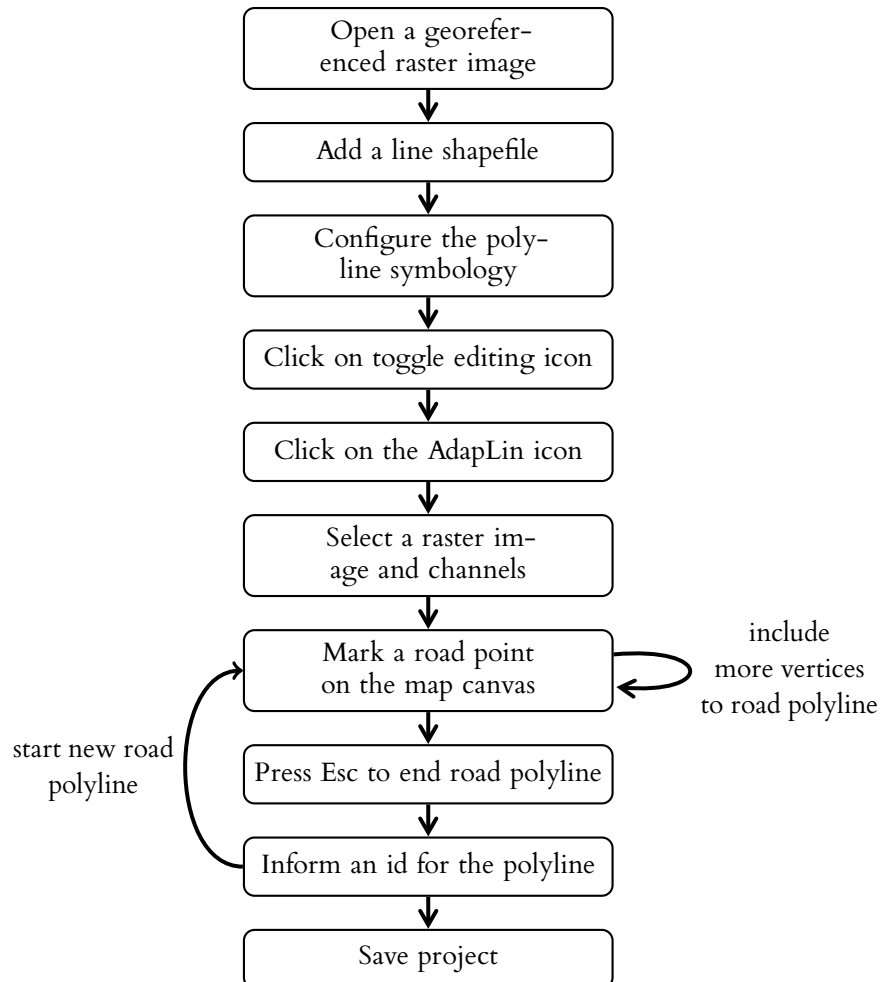


Figure 1: AdapLin Tool plugin workflow

A more detailed description of the AdapLin Tool plugin usage procedure is presented in the remainder of this section.



After AdapLin installation, its icon become available on the QGIS toolbar.

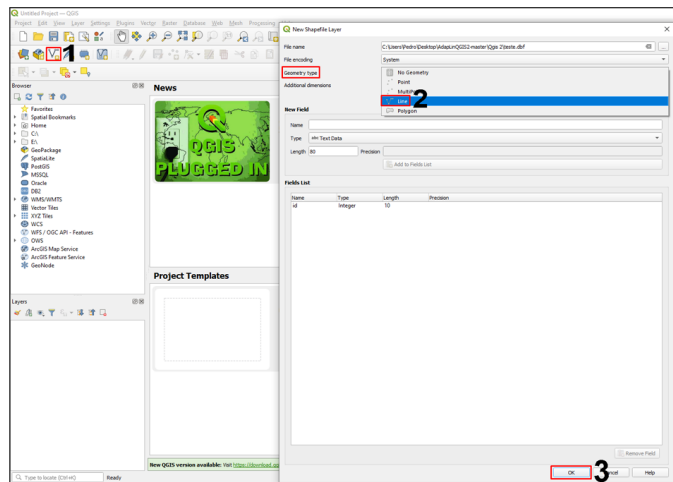



The procedure described in the following lines supposes that user is creating a QGIS project from the scratch. But, anyway, a non-beginner user can easily adapt it for taking benefits of AdapLin Tool on already existing projects.

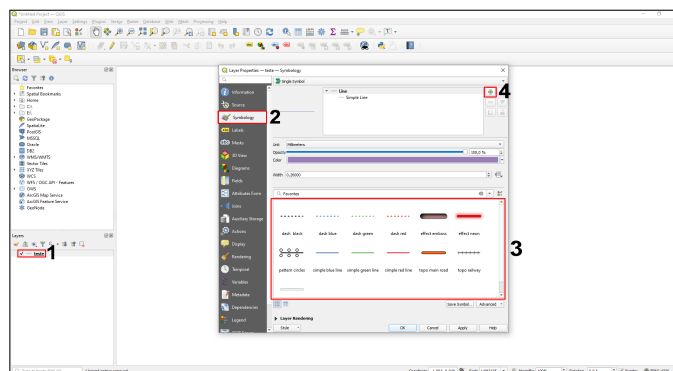
For the correct use of such QGIS plugin on a new project, do follow

the steps below:


1. Open a georeferenced raster image to be used for vectorization in the new project, by clicking on the Add Raster Layer button  or selecting **Layer** > **Add Layer** > **Add Raster Layer**;
2. Create a new shapefile layer for the project. For that, select **Layer** > **Create Layer** > **New Shapefile Layer** or click on the New Shapefile Layer button . Then select the **Line** option and click on **OK**¹;

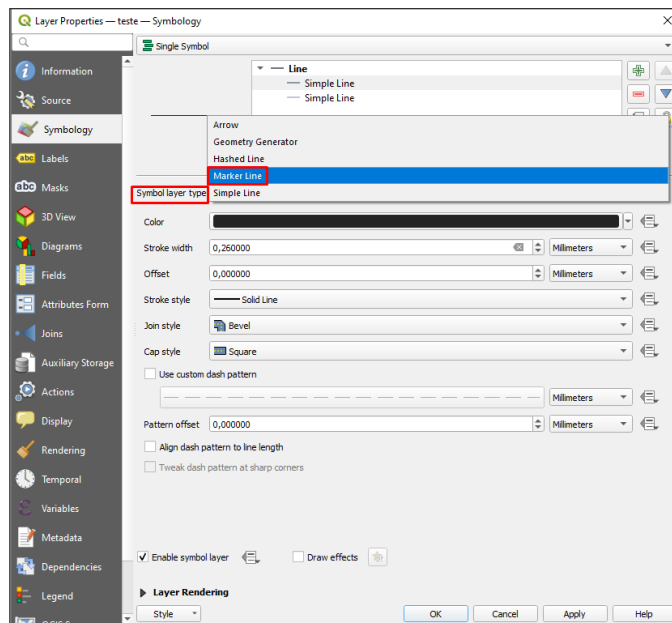


3. At this step, QGIS will require saving the shapefile. Then, select a name and destination folder for the file and click on the **Save** button;
4. Double click on the desired Shapefile in the legend interface, by default the legend interface is in bottom left corner. Afterwords, a pop-up window will appear. On such pop-up click **Symbology** in the side menu. Choose the style of the line among the options, then click on the  button;

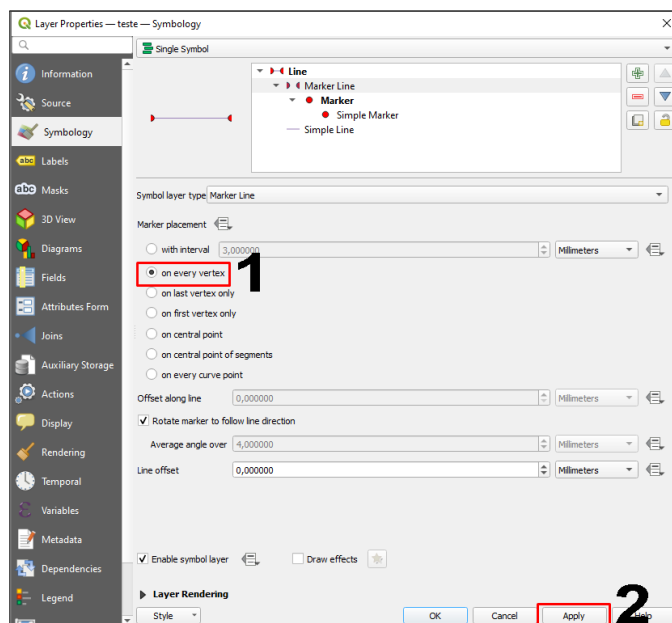




5. Choose the symbol layer type as **Marker Line** in the combo box;

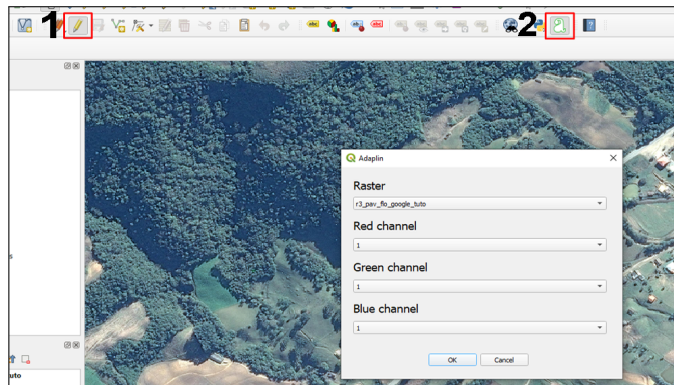
¹ Alternatively, an already existing shapefile can be included to the QGIS project through the Layer Menu, selecting **Layer** > **Add Layer** > **Add Vector Layer**, or clicking on the **Add Vector Layer** button .




6. Check the Marker placement as **every vertex**. Click on **Apply** button, then click **OK**;

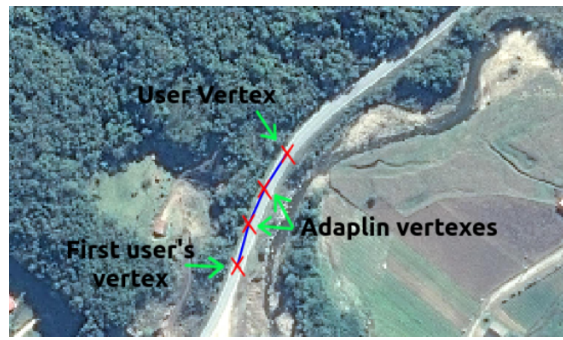


7. Select the shapefile in the legend interface then click on the Toggle Editing button  on QGIS toolbar. Then, AdapLin will be allowed to be switched on;
8. So, click on the AdapLin button  on QGIS plugin toolbar to start AdapLin Tool;

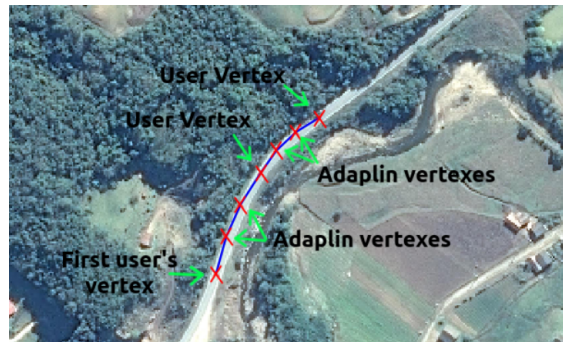


9. Select among one of the raster image attached to the project;
10. Then, choose image channels to assemble image composite to be considered during AdapLin Tool operation. For instance, image bands 1, 2 and 3 can be referred to the AdapLin channels red, green and blue. It must be stressed that user defined composite model is considered during the tool operation that follows for producing the polyline preview;
11. Then, click on the **OK** button.

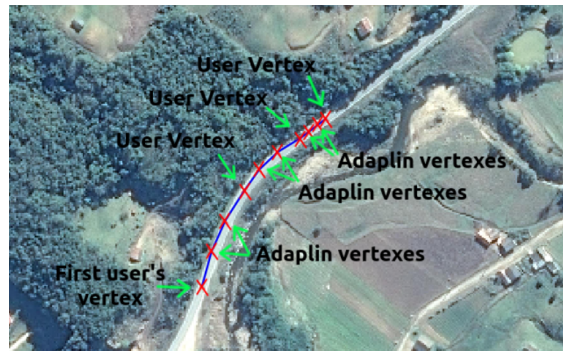
The mouse cursor will now be set to a target shape . To begin vectorization, user may click with the main mouse button on the first road's coordinate on the map canvas. This will add the initial vertex of the road polyline.



(a) Step one



(b) Step two



(c) Step three

Figure 2: AdapLin usage and automatic insertion of vertexes

From now on, vectorization will start following mouse cursor, adapting to the road path on the underlying raster image. If the user clicks with the main button on any coordinate of the QGIS MapCanvas, a segment containing two AdapLin vertexes (the same in the preview) and the one where user clicked on is included to the polyline. Figure 2a illustrates the vectorization process after the first segment be plotted by the operator. It brings the first user vertex followed by two vertexes automatically included by the AdapLin tool and the final user vertex. As can be noticed in Figures 2b and 2c, in the normal tool mode, for each new vertex indicated by the user, two vertexes are included by AdapLin.

User should place all user vertices in sequence until the road is completely vectorized. The operator must press the **ESC** key to end current feature editing when vectorization is finished. Then, user must inform an id number for such feature. Press toggle editing button to finish the vectorization operation. Please don't forget to save current shapefile afterwards.

3 Tool Shortcuts

- **Esc** end vectorization;
- Mouse wheel to adjust image zooming;
- **Ctrl** deactivate and reactivate automatic insertion of vertices provided by AdapLin ²;
- **-** delete the last vertex added;
- **↑** Press Shift to center the image on the last feature added.

4 Known bugs

These are some bugs that may happen during AdapLin operation. They're going to be adjusted in later versions:

- When Backspace is pressed, a pop-up will show, warning that no feature was selected. Note that, even then, the shortcut function is preserved.
- Do not delete the Shapefile layer during AdapLin operation. It may cause QGIS to crash.

² when AdapLin is inactive, manual vectorization takes place, being only user provided vertices included to the polyline.

5 Sample results obtained with AdapLin plugin



Figure 3: Test image n° 1 before vectorization



Figure 4: Project containing test image n° 1 after vectorization



Figure 5: Test image n° 2 before vectorization



Figure 6: Project containing test image n° 2 after vectorization

References

- Rotunno, M. E. (2017). Toolbox adaplin para qgis: uma ferramenta de programação dinâmica para a extração semiautomática de estradas. Master's thesis, Rio de Janeiro State University, Post-graduation program in Computational Sciences, Rio de Janeiro, Brazil. Portuguese only.
- Rotunno, M. E. and G. L. A. Mota (2018, jun.). Método semiautomático para restituição interativa de estradas. *Revista Brasileira de Cartografia* 70(2), 555–581.
- Rotunno, M. E. and G. L. A. Mota (November 2017). Avaliação da restituição semiautomática de estradas produzida através do plugin Adaplin no software QGIS. In *Anais do XXVII Congresso Brasileiro de*

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