

Advanced Lidar processing Using the RVT and LiVT Toolboxes (beta) – a quick guide

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Course Materials designed by Rebecca Bennett, December 2014

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Aims

The aim of this lab is familiarise yourself with two bespoke toolkits that have been developed to help create specialist lidar visualisations for archaeological interpretation.

The two toolkits that we will look at are the Relief Visualisation Toolkit, developed by Klemen Zakšek and Krištof Oštir, and the Lidar Visualisation Toolkit (LiVT), developed by Dr Ralf Hesse and provided free by Archaeolandscapes Europe.

The toolkits are in beta and so are to be used with caution but provides a powerful interfaces for creating a number of lidar visualisations. They do not fully integrate with QGIS (unlike the plugins) but create images that can be easily imported to your map view.

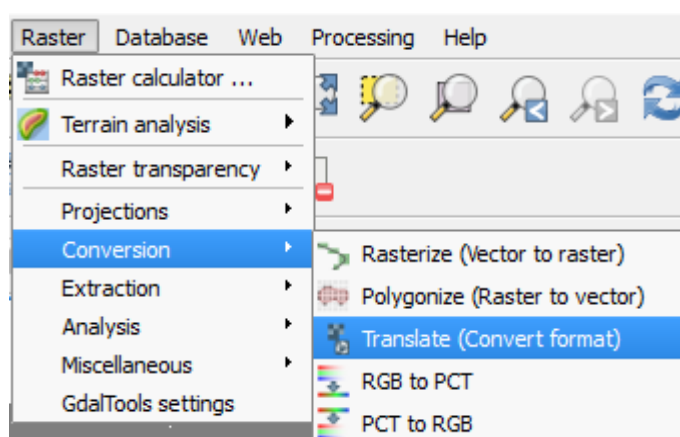
In this guide we will cover

- exporting your data to the correct formats (.tif for use in RVT / .bil format for use in LiVT (using lastools)
- Using RVT for creating a range of visualisations
- Processing in LiVT
- Bringing your RVT / LiVT created models in to QGIS

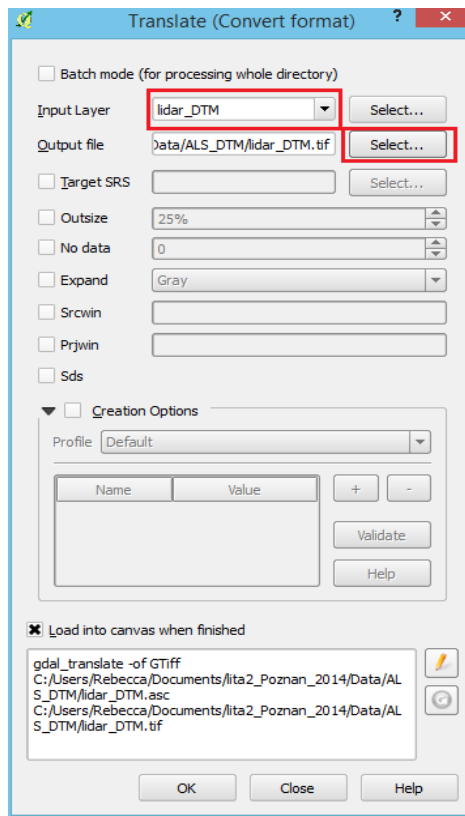
Using RVT

Task 1 – Exporting your data to .tif

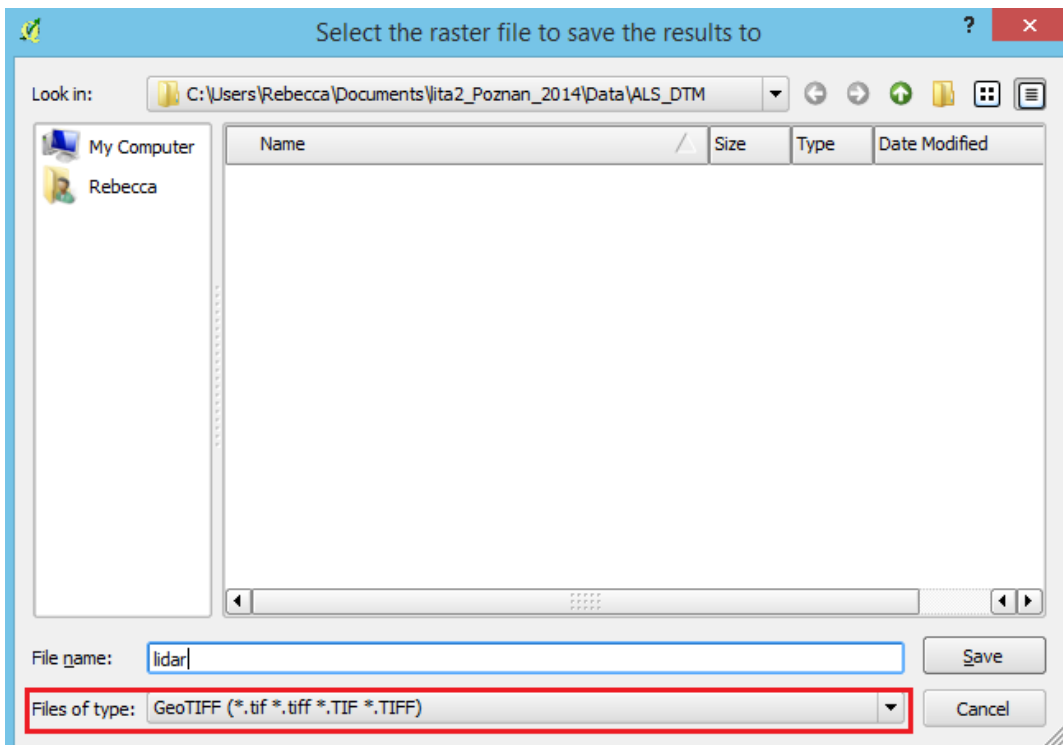
1. In QGIS open your lidar DTM lidar.asc
2. Go to Raster > Conversion > Translate (Convert Format)



3. In “Input layer” pick your lidar DTM tile. Beside “output layer” click “Select”



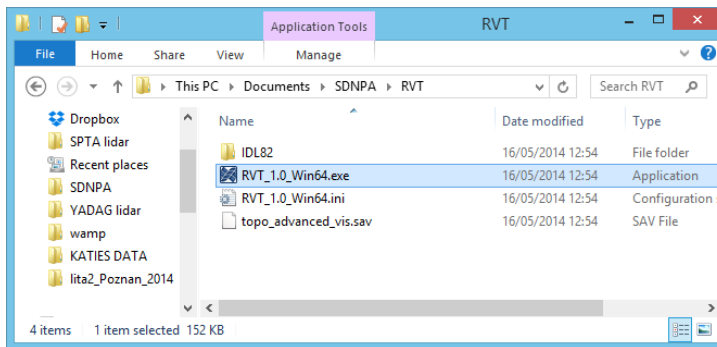
4. Name your raster and select Geotiff for the output format. Click Save



5. The tool will automatically load the converted file into QGIS (and will ask for the CRS). Once loaded, the tool will produce a pop-up to tell you that the processing is done.

Task 2 – Using RVT

1. Download RVT from
2. Open RVT, by navigating to the folder where you saved it and double clicking the RVT_1.0_Win64.exe file. When the IDL pop-up opens click to continue running the programme.



3. You will be asked for your DTM in geotiff format. Navigate to the file you just converted using QGIS.
4. The RVT interface will now open, with all the visualisation options. Select the options you require (remembering to tailor the parameters if required). When you are happy with your selection and parameters click "Start"

Relief Visualization Toolbox, ver 1.0

Input file: C:\Users\Rebecca\Documents\lita2_Poznan_2014\Data\ALS_DTM\litar.tif
 Size (cols, rows): 1000 x 1000
 Resolution (x, y): 1.0, 1.0
 Data range (min, max): -9999.00, 156.08

Vertical exaggeration factor (used in all methods) (min=-10., max=10.):

Select visualization method(s) and corresponding parameter(s):

Analytical hillshading Sun azimuth [deg.]: Sun elevation angle [deg.]:

Hillshading from multiple directions Number of directions: Sun elevation angle [deg.]:

PCA of hillshading Number of components to save: Set other parameters in the box above.

Slope gradient No parameters required.

Simple local relief model Radius for trend assessment [pixels]:

Sky-View Factor Number of search directions: Remove noise
 Search radius [pixels]: level of noise removal:

Anisotropic Sky-View Factor Level of anisotropy: Main direction of anisotropy [deg.]:
 Set other parameters in the box of the Sky-View Factor method (above).

Openness - Positive Set parameters in the box of the Sky-View Factor method (above).

Openness - Negative Set parameters in the box of the Sky-View Factor method (above).

5. Alter the tool parameters for each visualisation and click go. On older computers (with smaller RAM) you may need to select only one visualisation at a time. The new visualisations will be created in the same folder as your input DTM.tif. Navigate to this folder (in windows explorer) and you will see the new files and the processing log.txt which records all the parameters used to process the data.

Name	Date	Type
lidar_DTM - Copy.asc	20/07/2014 18:50	ASC
lidar_DTM.asc	20/07/2014 18:50	ASC
lidar_DTM.asc.aux - Copy.xml	20/07/2014 18:59	XML
lidar_DTM.asc.aux.xml	20/07/2014 18:59	XML
lidar_DTM.tif	29/07/2014 09:13	Lifan
lidar_DTM_HS_A315_H35.tif	29/07/2014 09:15	Lifan
lidar_DTM_HS_A315_H35_8bit.tif	29/07/2014 09:15	Lifan
lidar_DTM_MULTI-HS_D16_H35.tif	29/07/2014 09:15	Lifan
lidar_DTM_MULTI-HS_D16_H35_RGB.tif	29/07/2014 09:15	Lifan
lidar_DTM_OPEN-NEG_R10_D16.tif	29/07/2014 09:16	Lifan
lidar_DTM_OPEN-NEG_R10_D16_8bit.tif	29/07/2014 09:16	Lifan
lidar_DTM_OPEN-POS_R10_D16.tif	29/07/2014 09:16	Lifan
lidar_DTM_OPEN-POS_R10_D16_8bit.tif	29/07/2014 09:16	Lifan
lidar_DTM_PCA_D16_H35.tif	29/07/2014 09:15	Lifan
lidar_DTM_PCA_D16_H35_RGB.tif	29/07/2014 09:15	Lifan
lidar_DTM_process_log_2014-07-29_09-15-29.txt	29/07/2014 09:16	Text
lidar_DTM_SLOPE.tif	29/07/2014 09:15	Lifan
lidar_DTM_SLOPE_8bit.tif	29/07/2014 09:15	Lifan
lidar_DTM_SLRM_R20.tif	29/07/2014 09:15	Lifan
lidar_DTM_SLRM_R20_8bit.tif	29/07/2014 09:15	Lifan
lidar_DTM_SVF_R10_D16.tif	29/07/2014 09:16	Lifan
lidar_DTM_SVF_R10_D16_8bit.tif	29/07/2014 09:16	Lifan
lidar_DTM_SVF-A_R10_D16_A315_Allow.tif	29/07/2014 09:16	Lifan

6. Open this file to see the parameters used.

```

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Processing metadata - Relief Visualization Toolbox (standalone version 1.0)
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# Metadata of the input file
Input filename:
C:\Users\Rebecca\Documents\lita2_Poznan_2014\Data\ALS_DTM\lidar_DTM.tif
Number of columns: 2000
Number of rows: 2000
Number of bands: 1
Resolution (x, y): 0.5, 0.5

# Warnings

# Selected visualization parameter
Vertical exaggeration factor: 1.00000

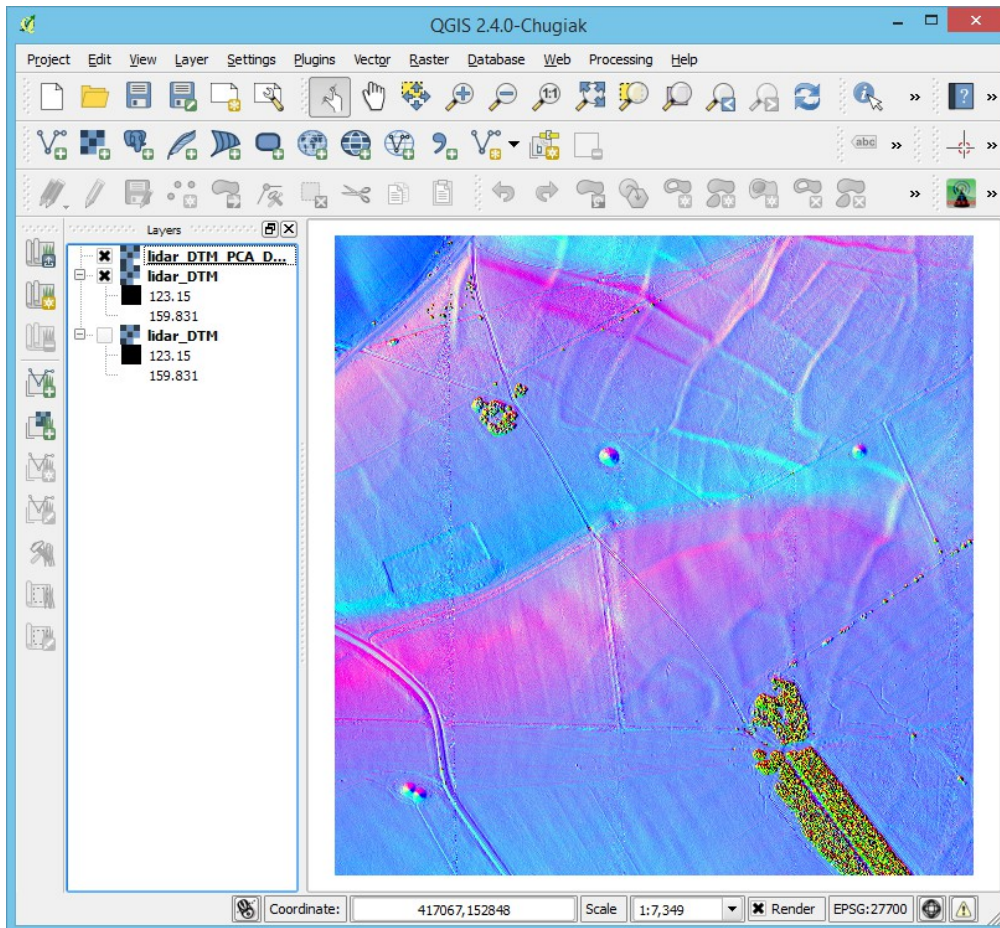
# The following visualizations have been performed:

Analytical hillshading -----
Sun azimuth [deg.]: 315.000
Sun elevation angle [deg.]: 35.0000
>> Output file 1 (without results manipulation):
C:\Users\Rebecca\Documents\lita2_Poznan_2014\Data\ALS_DTM\lidar_DTM_HS_A315_H35.t
>> Output file 2 (linear histogram stretch between 0 and 1 for 8-bit output):
C:\Users\Rebecca\Documents\lita2_Poznan_2014\Data\ALS_DTM\lidar_DTM_HS_A315_8

```

Task 3 – Viewing the model

1. All the models created using RVT can be opened in QGIS
2. Open QGIS. Add the model (Add raster)



What do you notice about the Simple Local Relief model?

Using LiVT

In order to create a Local Relief Model (as published in Hesse 2010) we will also need to use the LiVT.

Task 1 – Exporting your data to .bil

Currently LiVT beta can only handle data in a limited range of formats, of which the best to use is .bil. We can export to .bil from LAStools. [\(You can export a .bil from QGIS but this format is imperfect and will be rejected by LiVT – RBennett 29/7/14\)](#)

1. Use lasgrid to convert your lidar.asc into a bil. Make sure you select the correct step size ()

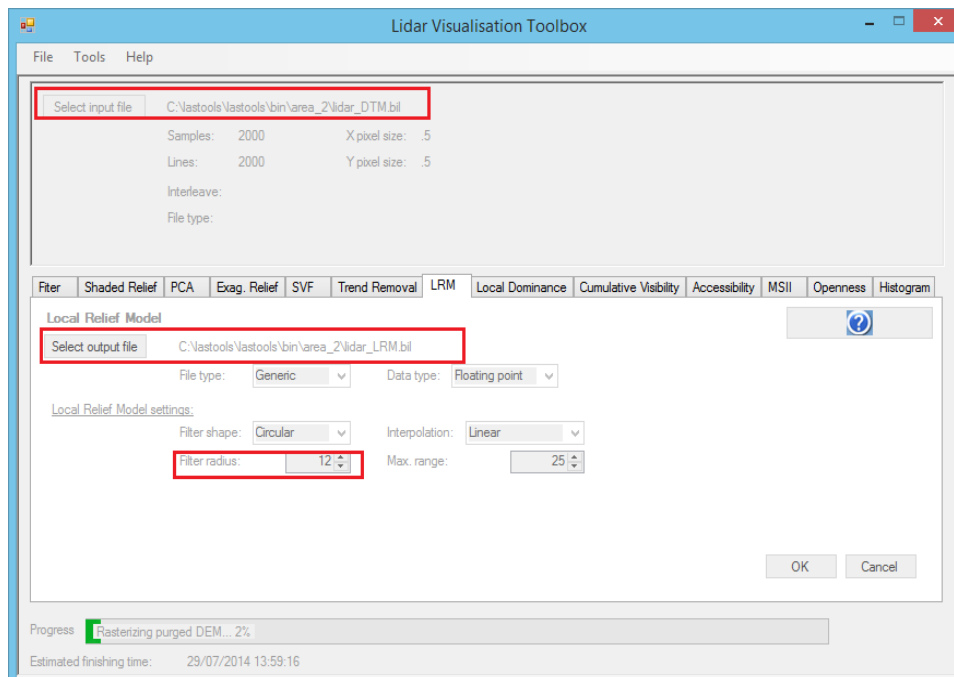
Using the command line: `lasgrid -i "filepath/to/lidar.asc" -step 0.5 -elevation -lowest -obil`

Using the lasgrid GUI: Navigate to your lidar.asc > Pick the correct stepsize for the resolution of your DTM > Run the tool

2. LAStools will create three files (.bil, .blw and .bil.hdr) in the same location as your DTM .asc

Task 2 – Using LiVT

1. Open LiVT. The basic interface for LiVT contains a range of visualisations in tabs along. Each visualisation has parameters to define the process. We will make the Local Relief Model as an example so open the LRM tab
2. In the top part of the window import the DTM .bil file you exported from LAStools. In the LRM tab, select an output location and filename and adjust the parameters. Click OK. BE PATIENT! – the LRM involves a number of processing steps and can take some time to compute.



Task 3 – Viewing the model

1. Open QGIS. Add the LRM.bil (Add raster)
2. Edit the raster properties to improve the view of the model.