

NeXtlook
A Real-Time Quick-Look Processor for NeXtRAD

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June 12, 2017

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Abstract

NeXtlook is a quicklook processor for generating range-time-intensity and range-Doppler plots of NeXtRAD datasets. Multithreading is supported for pulse-compression, but Doppler-processing is currently only supported when using a single thread.

Chapter 1

Installation

This chapter documents the installation process for the NeXtlook processor.

1.1 Prerequisites

1.1.1 FFTw

Download the latest version of FFTw from their website ensuring that the version number is 3.3.6 or higher. This version introduced thread-safe planners which are vital. Extract the files in an arbitrary location, enter the extracted folder and run the following commands,

```
./configure --enable-threads
make -j
sudo make install
```

If any problems occur I suggest using the following command to perform a clean before retrying,

```
make distclean
```

The extracted folder can now be deleted.

1.1.2 Misc.

```
sudo apt install cmake
sudo apt install git
sudo apt install libopencv-dev
sudo apt install libboost-all-dev
```

1.2 NeXtlook

At the time of writing, the NeXtlook source code is located at <https://github.com/darrynjordan/nextlook>. The source can be downloaded as a zip folder or cloned from the repo,

```
git clone https://github.com/darrynjordan/nextlook.git
```

Within the cloned folder, create a new folder to hold the built executable and run Cmake,

```
mkdir build  
cd build  
cmake ..
```

If no errors have occurred, the executable can be compiled and run as follows,

```
make -j  
./nextlook
```

Chapter 2

Usage

2.1 Experiment Configuration

On first run, the program will probably complain about not finding the binary dataset. Do not panic. Within the root folder there should be a textfile called **experiment.ini** which contains all experiment parameters. This is where the path to the binary dataset and reference waveform, and other options must be configured.

2.1.1 Example Parameter File

```
[config]
debug_mode = false

[dataset]
data_filename = ../12_12_2016_14_48_59_adc1data.dat
n_cmplx_samples_range_line = 2048
n_range_lines = 30000
ref_filename = ../Ref_PL_Xband_MPALNA_3us.dat
n_cmplx_samples_ref = 297
n_cmplx_samples_padded = 2048;

[processing]
n_threads = 1;
doppler_enabled = true
doppler_cpi = 256
range_window = UNIFORM
doppler_window = UNIFORM

[visualisation]
update_rate = 1024
```

```
doppler_colour_map = 1
rti_colour_map = 2
histogram_equalization = 1
slow = 0
threshold = 50
```

2.1.2 Parameter Description

config

- **debug-mode** provides additional information through the command line during processing.

dataset

- **data-filename** the path to the binary dataset to be processed.
- **n-cmplx-samples-range-line** number of complex samples in each range line.
- **n-range-lines** total number of range lines to process.
- **ref-filename** the path to the binary reference to be processed.
- **n-cmplx-samples-ref** the number of complex samples in the reference waveform.
- **n-cmplx-samples-padded** determines the number of complex samples each range line must be zero padded to.

processing

- **n-threads** the number of threads which will be launched for pulse compression.
- **doppler-enabled** toggles Doppler processing.
- **doppler-cpi** number of range bins used for each Doppler plot.
- **range-window** tapering function applied to each range line.
- **doppler-window** tapering function applied to each Doppler line.

visualisation

- **update-rate** number of range lines to be processed before a plot update occurs.
- **doppler-colour-map** [0 - 11] index of colour map to be applied to range-Doppler plot.

- **rti-colour-map** [0 - 11] index of colour map to be applied to RTI plot.
- **histogram-equalization** [0 - 1] toggles histogram equalisation for both plots.
- **slow** [0 - 500] number of milliseconds processing delay between each plot update.
- **threshold** [0 - 255] apply threshold to both plots.

Chapter 3

Results

Once processing is complete, plots will be saved in a folder corresponding to the name of the processed dataset.

```
../results/*dataset_filename*/*plot_title*.jpg
```