Karlsruhe Institute of Technology

GNU Radio
THE FREE & OPEN SOFTWARE RADIO ECOSYSTEM

Google Summer of Code 2016

The Inspector (gr-inspector)

A Signal Analysis Toolbox for GNU Radio

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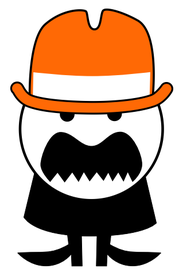


Introduction

The Inspector is an out-of-tree module for GNU Radio. The goal was to develop a **signal analysis toolbox** with the following real-time capabilities:

- Automatic detection of continuous signals
- Automatic signal extraction
- OFDM parameter estimation and synchronization
- GUI feedback

This project was initiated as a Google Summer of Code project and developed in cooperation with the Communications Engineering Lab of the Karlsruhe Institue of Technology.

Components

Signal Detector is able to perform energy detection on a continuous input signal.

Inspector GUI visualizes the detected signal edges. Users can select signals manually and feed-back results from analysis blocks.

Signal Separator uses FIR filters for every detected/selected input signal to mix, filter and decimate this signal out of the input spectrum. Output is a message of vectors with samples of all signals.

Signal Extractor passes one signal from the Separator output as complex stream. The input samples can be resampled to satisfy a constant output sample rate.

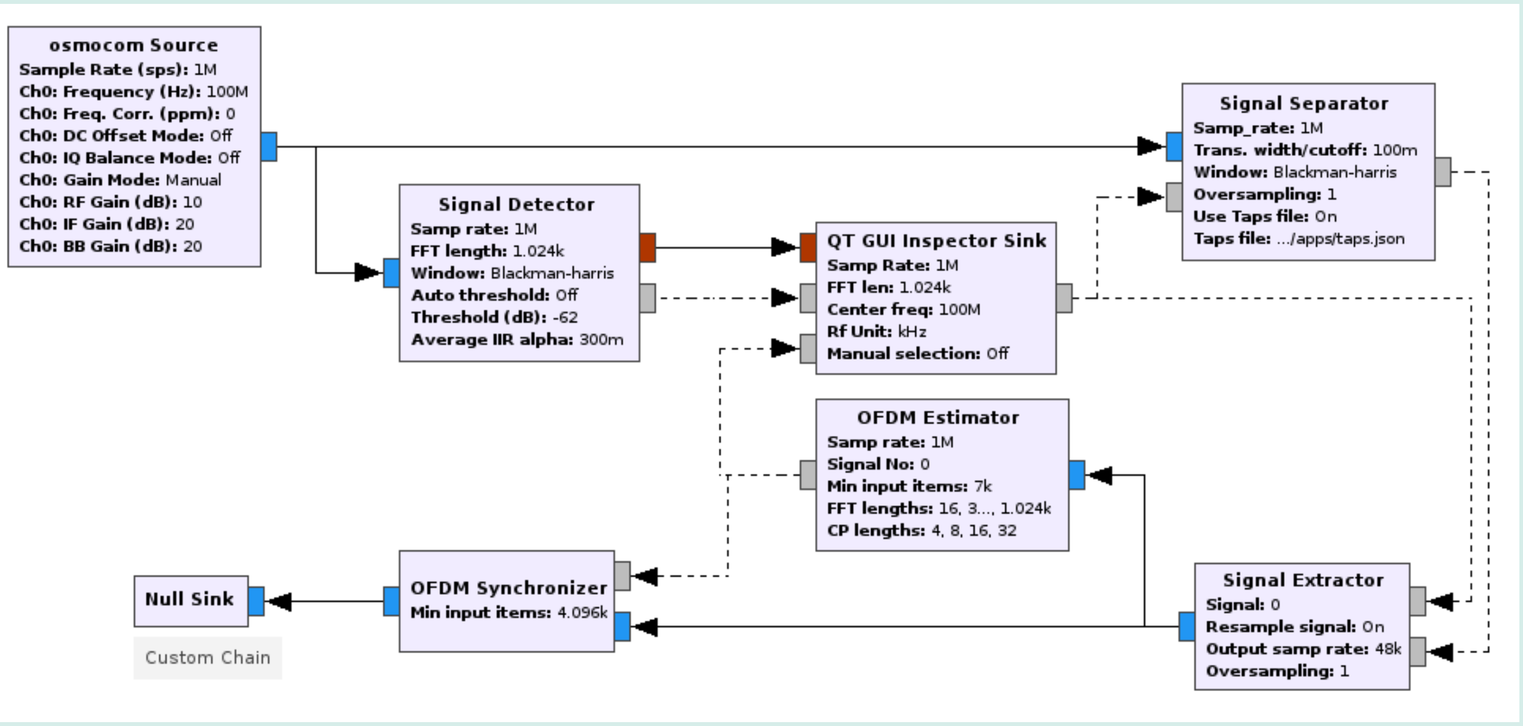
OFDM Estimator is able to estimate the OFDM parameters subcarrier spacing, symbol time, FFT lenght and CP length.

OFDM Synchronizer performs a frequency synchronization of the OFDM signal and stream tags are inserted at OFDM symbol beginnings.

AMC Functionality is available through additional blocks developed by Christopher Richardson (ESA SOCIS student).

Flowgraph

The toolbox was developed with the following main flowgraph in mind.



- Signal Extractor block assures the possibility to add **custom chains** for each signal
- Analysis blocks can **feedback results** to GUI block

GUI

- Displays input spectrum with **markers for detected signals**
- **Info text** next to each signal (center frequency, bandwidth and analysis results)
- Each signal can be filtered and processed in **own chain(s)**
- Signals can be selected manually

Applications

- Spectrum monitoring
- Explore real-world signals
- Access to radio for beginners
- Live (FM) demodulation
- Batch processing of signals

Contact

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