Karlsruhe Institute of Technology

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The Inspector (gr-inspector)

A Signal Analysis Toolbox for GNU Radio

Sebastian Müller, Karlsruhe Institute of Technology

Introduction

The Inspector is an out-of-tree module for GNU Radio. The target 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 developed during **Google Summer of Code** 2016 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 The GUI block 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.

AMC Block The complete AMC functionality was developed by Christopher Richardson during ESA Summer of Code in Space.

OFDM Estimator Estimates OFDM parameters subcarrier spacing, symbol time, FFT lenght and CP length.

OFDM Synchronizer After performed estimation, the signal can be frequency synchronized and stream tags can be inserted at OFDM symbol beginnings.

Flowgraph

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

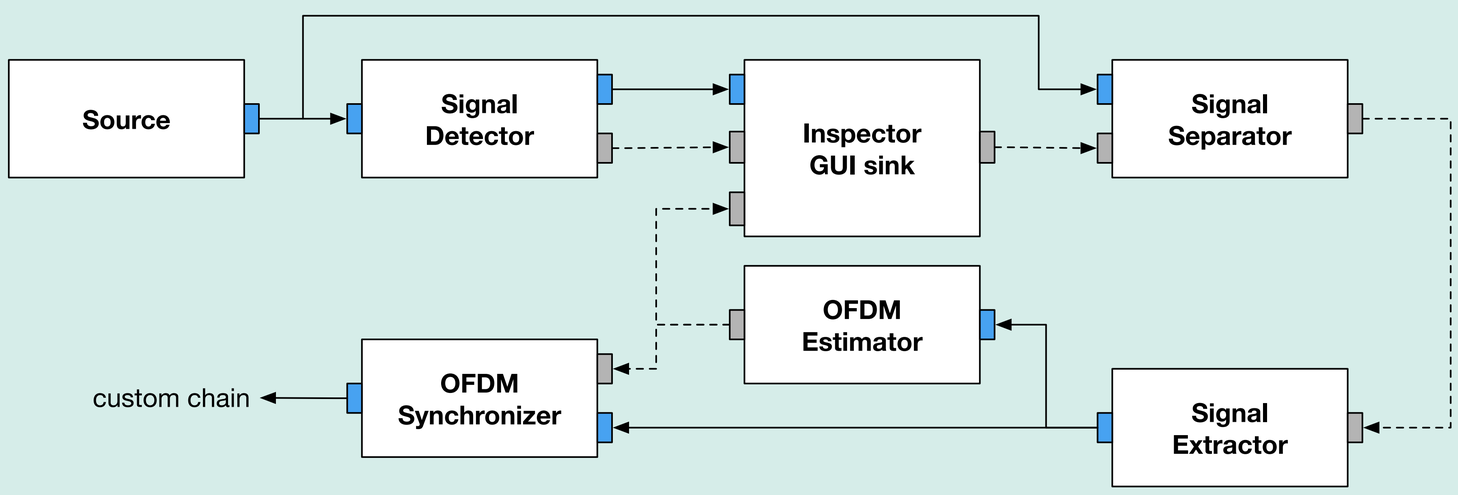

Figure: Example flowgraph

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

GUI

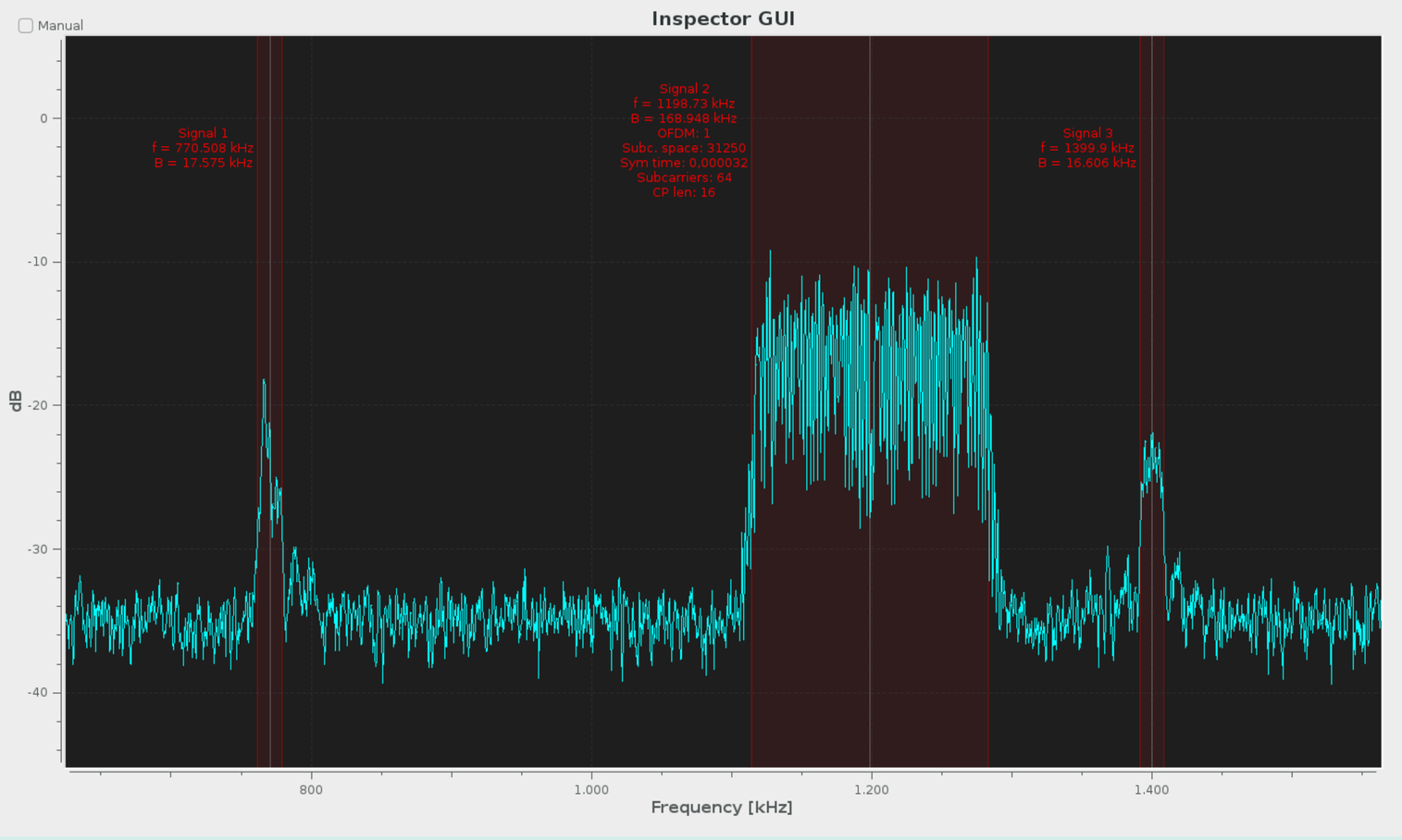

Figure: Inspector GUI

- 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 an **own chain**

Applications

- Spectrum monitoring
- Explore real-world signals
- Live (FM) demodulation
- Rapid prototyping
- Live FM demodulation
- Spectrum monitoring
- Live signal processing

Contact

Maintainer of this module:

Sebastian Müller
Karlsruhe Intitute of Technology
gsenpo@gmail.com