

GNU Radio Presentation

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My Background

- Obtained Novice license in 1953
- Degree in Electrical Engineering from Ga Tech
- Career in real-time computer programming
- Introduced to GNU Radio in 2019

What is GNU Radio?

- GNU Radio is a free and open-source software development toolkit that provides digital signal processing (DSP) blocks to implement software radios.
- There are over 550 functional blocks to do things like modeling a noisy and fading transmission, performing QPSK encoding and decoding, complex math functions, etc.
- A graphical user interface (GUI) supports easy creation of “flowgraphs” to connect the blocks into a complete executable program.

Why do a simulation?

- Rapid and easy construction of a concept design
- Testing of the design with built-in tools
- Revision and retest cycle is easy and quick
- Until moving into the real world, no hardware is required.

Let's build a radio

- Except for an RF front end, which can be as inexpensive as \$20, everything is done in software.
- A dial tone generator is a simple example
 - Tones are 350Hz and 440Hz added together
 - We want a volume control

Simulating the VWS SDR

- RF in => IQ out
- Not many available SDR devices receive HF (most start about 50MHz)
- I used a FunCube Pro Plus which covers 150kHz to 240MHz and 420MHz to 1.9GHz (and I have one!)
- An alternative is a Ham It Up feeding a Pluto, B200mini, or RTLSDR
 - The Ham It Up adds 125MHz to allow receiving in VHF band
 - i.e. 7MHz input gives 132MHz output

SSB Receiver

- There are three methods of demodulating SSB:
 - Filter
 - Phasing
 - Weaver (the “Third Method”)

What's Next?

- I propose three options for making a SSB receiver:
 - Quisk – rules based; Windows oriented; older GUI software; will become obsolete soon without a major revision
 - GQRX – Soapy based plus Hamlib; handles many SDR devices and is actively maintained
 - GNU Radio flowgraph – can be customized to users layout
- These are not exclusive choices. They can be done in parallel.

GNU Radio References

GNU Radio Wiki https://wiki.gnuradio.org/index.php/Main_Page

Installing GNU Radio <https://wiki.gnuradio.org/index.php?title=InstallingGR>

Tutorials <https://wiki.gnuradio.org/index.php?title=Tutorials>

Single Sideband transceiver

https://wiki.gnuradio.org/index.php?title=Simulation_example:_Single_Sideband_transceiver

Barry's git repo for VWS SDR <https://github.com/duggabe/gr-VWS-Project>