GNSS spoofer

Background

Global Navigation Satellite Systems (GNSS) provide position and time to a millions of receivers worldwide. Critical infrastructure, such as power plants, financial services, telecommunications and more are often reliant on GNSS for functioning correctly. The signals emanating from the satellites are weak when they arrive at the GNSS receiver on the ground, and are thus vulnerable to unintentional and intentional interference. A form of intentional interference is spoofing. Spoofing is GNSS signals that intends to fool GNSS receivers into reporting fake positions and time. GNSS spoofing can be done with advanced and expensive GNSS simulators, or by low-cost software-defined radios (SDRs). SDRs are programmable radios which can replicate or generate GNSS signals with openly accessible code form e.g. github.com.

Problem

This thesis proposal is to build a SDR-based GNSS spoofer. The spoofer can be built with inspiration from existing source code, but should include enhanced functionality such as e.g. a purpose-built graphical user interface (GUI), live controlling of position and timing updates, more GNSS constellations and synchronization to current ephemerides and GNSS-time. The spoofer should be built on a foundation of extensive understanding of GNSS's technical and physical principles. Potential use cases for the results of this thesis are e.g. resilience testing of GNSS receivers on aircrafts, road vehicles or ships, or evaluating anti-interference GNSS receivers against spoofing attacks.

Proposed workflow

1. Carry out a literature study of GNSS and spoofing
2. Describe how a GNSS spoofer works using both words and mathematics
3. Build a GNSS spoofer with an SDR, and demonstrate enhanced functionality
4. Synchronization of spoofing time with real GNSS-time
5. Discuss the results and findings, and elaborate on the limitations and alternatives to SDR based GNSS spoofers
6. Summarize results, give conclusions and identify further work

Contact

- Tor Atle Solend (scientist), Tor-Atle.Solend@ffi.no
- Anders Rødningsby (associate professor II), Anders.Rodningsby@ffi.no