3D Spectrum Sensing Map via Drone Mounted Receiver

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Rationale

With wireless networking becoming more and more widespread, the need for troubleshooting and survey techniques are growing. This project seeks to develop and test a low-cost, easy to use approach to signal mapping. The applications of this project are fourfold. Firstly, this approach will allow for the identification of signal leakage beyond designated broadcasting bands. Secondly, this approach will allow an optimization of signal output based on nearby topography. Thirdly and fourthly, this approach will allow for ease of troubleshooting, as well as general diagnostics.

Project Objective

Create a 3D signal quality map using a drone as a mobile receiver carrier. This will be accomplished through the use of a 3DR Solo drone (receiver carrier), mobile Android device (signal recorder), and Octave (graphical program with custom written interpolation algorithms).

Procedure

Drone Flight Path:

1. Determine area and height range where flight/data collection will occur
2. Open MissionPlanner
3. Place waypoints in a designated path in the area
4. Link drone via wireless connection (UDP 14550; Port 500)
5. Export mission plan to drone

Data Collection:

1. Turn on Android device
2. Connect device to network being tested
3. Open “Network Signal Strength Info” app
4. Mount device to gimbal of the drone
5. Retreat to safe distance (~50m, varies by drone)
6. Initiate flight plan via MissionPlanner
7. Once flight is complete, drone will land and be ready for retrieval

Risk and Safety

There will be negligible risk. The primary risk source is the drone, but it is automated and carries out the flight plan only when no humans are present.

Data Analysis

Signal data is logged in a .csv file, generated by the app. The program Octave is used to read the data from the file and place it into three dimensional space. A custom written interpolation algorithm uses the nearest neighbor node signal strength theory to fill in the space where no data is collected. All of this data is then placed onto a 3D graph.

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