

NFF Developer's Toolbox Quick Start Guide

The NanoRacks Feather Frame (NFF) developer's toolbox is a small collection of helpful resources to assist payload developers in creating their NanoLab experiments. Included in the toolbox are a couple files of sample code for a NanoLab experiment, and a Windows executable program that simulates the flight behavior of the NFF with additional documentation for its use and an accompanying data file.

The sample code in the `nff-sample.ino` file is written in the Arduino programming language and is a helpful starting place for developers in creating their own flight code. The example code provides all the needed functionality to properly connect to the NFF and continually receive and parse its data packets. All of the example specific portions of the code are clearly marked in the comments, and can either be replaced with the appropriate operations for the developer's experiment and uploaded to an Arduino microcontroller, or be easily ported to another C-based programming language and used on another microcontroller.

The sample code in the `nff-sample.py` file is written in python and has some specific instructions for running it on a Raspberry Pi Zero. Similar to the other sample code it can be easily modified to work on any device that can run python programs, and all of the example specific portions are clearly marked as such.

The `nff-sim.py` is the python source code for the simulator and is only included in case there are issues running the `nff-sim.exe` file that is in the simulator folder. To run the `nff-sim.py`, the `nff-packets.txt` file must be in the same folder, you must have python 2.7 installed, and you must have the `pyserial` library installed on your machine. The `nff-sim.exe` is a 32 bit Windows executable program built from the python source code and is designed to emulate the interface between the NFF and NanoLab experiments. The simulator connects to one or more serial devices provided by the user and then sends data packets corresponding to a nominal flight onboard the NFF. This simulator is meant to serve as a development tool for designing and testing NanoLab experiments. The following instructions will help get you started:

1. Navigate to the Simulator folder of the `nff-toolbox.zip`.
2. Consult the `README.md` for detailed instructions on usage and troubleshooting.
3. Connect your serial device to your computer and note the COM port.
4. Run the `nff-sim.exe` program and provide the COM port.

```
*****
**      Welcome to the NFF simulator      **
**      NanoRacks LLC                    **
**      Consult the ReadMe.md for        **
**      use instructions                  **
*****

Enter the ports to connect to: COM15

Successfully connected to: COM15

Press <enter> to start the simulation!
```

5. Press 'enter' to start the simulation. Once running, press 'q' at any time to quit, 'p' to pause, and the left and right arrow keys to speed up or slow down the simulation.

```
NFF simulation running..

Connected to: COM15

Sending packet: @,16.36,59.099586,0.114969,-0.019202,0.081412,32.787533,0.000000,0.000000,0.000256,0.000061,-0.000513,-0.000500,0.001768,-0.003889,1,0,0,0,0,0

Flight state: none reached
Experiment time: 16.36 sec
Altitude: 59.099586 ft
Velocity:
  x-axis: 0.114969 ft/sec
  y-axis: -0.019202 ft/sec
  z-axis: 0.081412 ft/sec
Acceleration:
  magnitude: 32.787533 ft/sec^2
  not-used: 0.000000
  not-used: 0.000000
Attitude:
  x-axis: 0.000256 radians
  y-axis: 0.000061 radians
  z-axis: -0.000513 radians
Angular velocity:
  x-axis: -0.000500 radians/sec
  y-axis: 0.001768 radians/sec
  z-axis: -0.003889 radians/sec
Liftoff warning: true
RCS warning: false
Escape warning: false
Chute warning: false
Landing warning: false
Fault warning: false

Simulation progress: [# ] 2%

Current speed: x1
Press <- to slow down sim or -> to speed up sim

Press <q> at any time to quit or <p> to pause
```