dMIMO Simulator

Description

System simulator for the dMIMO project, using generated channels from ns-3 simulator and components from Sionna.

The core simulator library is located in the "**dmimo**" folder, the "**sims**" folder contains the top-level simulation scripts for baseline and SU-MIMO scenarios. Channel coefficients generated from ns-3 simulator are stored in the "**ns3**" folder, and simulation results are saved in the "**results**" folder.

Additional documentation can be found in the "**docs**" folder, including description of core component modules and instruction for setting up the Sionna simulator on Linux systems.

Getting started

Setup Git SSH command from Linux terminal (see https://code.vt.edu/help/user/ssh).

```
export GIT_SSH_COMMAND="ssh -i ~/.ssh/id_ed25519"
```

Clone the **main** branch of this repository.

```
cd <workspace_dir>
git clone git@code.vt.edu:yiliang/dmimosim
cd dmimosim
```

Convert the ns-3 channel data to the optimized format (See the section below for generating the ns-3 channel data). The conversion step is needed only once for each generated channel folder.

```
cd ns3
python convert_ns3_channels.py <ns3_output_folder> <channels_folder>
```

Activate the Anaconda environment.

```
conda activate sionna
```

Run the simulation scripts.

```
cd ../sims
python sim_baseline.py
python sim_mu_mimo.py
```

Finally, check the simulation results in the "results/" folder.

Channel data generation

Build the ns-3 system simulator, see the instructions from the ns-3 System Simulator.

```
git clone git@code.vt.edu:dmimo/ns3-system-simulation.git VT_dmimo_ns3
cd VT_dmimo_ns3
git checkout end-to-end
mkdir build
cd build/
cmake -DCMAKE_BUILD_TYPE=Release -DNS3_WARNINGS_AS_ERRORS=OFF ..
make -j4 scratch_dMIMO_channel_extraction_main
```

Generate the dMIMO channel data including MIMO channel coefficients and propagation losses.

```
cd VT_dmimo_ns3/scratch/dMIMO_channel_extraction/
python main.py --seed 3007 --scenario V2V-Urban --small_scale_fading --num_subframes 50 \
 --squad1_speed_km_h=3.0 --squad2_speed_km_h=3.0 --intra_sq1_rw_speed_km_h=0.3 \
 --intra_sq2_rw_speed_km_h=0.3 --buildings_file 1narrow.txt
```

Development

The "**main**" branch is the latest development branch, while the "**release**" branches will be the latest stable version.

Python modules should follow the PEP 8 Style Guide for Python Code.