

## OSU GENETIs Antenna Evolutionary Loop:

### Prerequisites:

Ubuntu

XFtd

AraSim (and all AraSim prerequisites)

### Installation:

1. Unzip the package `current_antenna_evo_build.zip`. Inside, move the directory `XF_Loop` to the desired location.
2. Compile the .cpp files located in `XF_Loop/Evolutionary_Loop` and `XF_Loop/Evolutionary_Loop/data` as .exe files. All .cpp files must be compiled using C++11 libraries. The compiled files should be: `gensData.exe`, `roulette_algorithm.exe` in the main directory, and `fitnessFunction.exe`. Please note that either `fitnessFunction_ARA.cpp` or `fitnessFunction_XF.cpp` should be compiled to `fitnessFunction.exe`, not both. The fitness function appended with `_ARA` is in the case that you are running loops using AraSim; the function appended `_XF` should only be used if AraSim is not being used.
3. Edit `XF_Loop.sh`, located in `XF_Loop/Evolutionary_Loop`. At the top of the file various variables are defined; the two that must be changed between every local installation are `XFexec` and `AraSimExec`. Change these to the file path where `XFtd` and `AraSim` are installed on your machine.
4. Edit `simulationPECmacroskeleton.txt`, located in `XF_Loop/Evolutionary_Loop/data`. At the top of the file, the path to `XF_Loop/Evolutionary_Loop/` must be adjusted for every local installation.
5. The antenna loop should now be correctly installed. Customization can now be done – a variety of options are available, but require changes to multiple programs. Remember to recompile any .cpp files that are updated.
  - a. Change population sizes. In order to do this, the variable `NPOP` must be adjusted across each of these files – `roulette_algorithm.cpp`, `fitnessFunction.cpp`, `simulationPECmacroskeleton.txt`, `XFintoARA.py`, and `XF_Loop.sh`.
  - b. Change number of generations to run for. This can be changed in `XF_Loop.sh`, by editing the variable `TotalGens` in the header.
  - c. Change initial seeding or mutability. This can be changed simply by editing `roulette_algorithm.cpp`. Simply adjust the mutability factors or the initial mean and standard deviation for each gene in the global variables declared in the header.
  - d. Change frequencies. This can be changed in `roulette_algorithm.cpp` by adjusting the frequency minimum, maximum, and step defined in the global variables declared in the header. If changing the number of frequencies, adjustments also need to be made to `simulationPECmacroskeleton.txt` (variable `freqCoefficients`) and `XFintoARA.py` (variable `frequency_number`). Please note that the current build of AraSim will crash for anything other than the default number of frequencies and step size.

#### Execution:

1. Using the Ubuntu terminal, navigate to `~/XF_Loop/Evolutionary_Loop`.
2. Execute the shell script using the command `./XF_Loop.sh`
3. When prompted, press enter.
4. Import the relevant scripts into the XF project from `~/XF_Loop/xmacros`
5. Execute the macro `simulation_PEC`.
6. When the simulations are all finished executing, execute the macro output.
7. Close XF, and return to the Ubuntu terminal. Press enter when prompted.
8. The loop should repeat. This will continue for a set number of generations.