"Control the Power" User Guide

Contents

1 What is Control the Power?

Control the Power is a program used by transmitting towers to adjust power of transmission based on measured strength and quality of a signal.

2 Abbreviations

- BTS - Base Tranceiver Station

- MS - Mobile Station

- DL/UL - Downlink/Uplink

- S0/N1 - Current or Neighboring BTS with id number

- MS000 - Mobile Station Identity

3 Features

The program has 5 extra features implemented. User is able to switch between following options:

1. Two modes of operation: 'PCA1', which provides all the basic features, and 'PCA2', which offers some extra options.

   PCA 1- Option

It considers average of last 4 values for each device; responding INC (instruction to increase power) or DEC (instruction to decrease power). If one value is missing it repeats previous value. If more than one value is missing it supplies '-95'.

Parameters: Downlink or Uplink (DL/UL), Current or Neighboring BTS (S0/N1),Mobile Station Identity (MS000), Signal Strength (measurement value in dB).

PCA 2- Options

The options of PCA2 is advanced version of the first algorithm (PCA1), giving extra flexibility to adjust the number of input values that average is based on. User can set this window value in range 1 to 8. This advanced protocol uses more elaborate and accurate methods for counting the average. It assings appropriate weight parameter to each of the last inputs. Last improvement over PCA1 is the consideration of signal quality; it holds off power decrease in case of low quality.

2. There are two methods of accepting input:

    - From input files.

    - From interactive mode.

3. Users can adjust following parameters in a configuration file:

    - Target value of power level between -55 to -85.

    - Hysteresis value for this target between 1 to 10

    - Each of them has to be integers

4. Handover Algorithm

This algorithm analizes data from naighboring cells and compares it with current average of signals powers for given device. If it finds a beter cell it recomends the handover. User can turn on and off the Hangover Algorithm in the configuration file.

5. Graphic representation of collected data.

This tool creates the graphs of signal power over time separatelly for each device. The are saved in programs main directory under a name e.g. "Graph for MS000.png". User can turn on and off the graphics in the configuration file. It should be used with less that 50 entries per device. For bigger graphs please purchase bussines edition.

4 Configuration

By default, Control the Power operates in PCA1 mode. In order to use the advanced mode:

- place an input file within the program's directory in the format described below;

- adjust settings in 'configuration.txt' (see instructions within the file) .

Regardless of the mode, the program may be configured to accept input either from a file or interactive mode. In both cases, the input must be provided line by line, in the following format:

[UL/DL (for uplink/downlink)] [S0/NO (for current/neighboring BTS)] [MS* ID] [signal strength**]

* MS must be uppercase!
** must be an integer
e.g.

```
DL S0 MS776 -66
```

Output is printed to shell/command prompt int the following format:

[UL/DL [S0/NO] [MS ID] [NCH/INC/DEC (for No Change/Increase/Decrease)] [increase/decrease value in dB] e.g.

```
DL S0 MS776 INC 2
```

5 Interacting with the program

Input example for interactive mode:

```
Provide current measurements:
UL S0 MS776 -65
```

Expected Output Example:

```
>>> runfile('/home/firdevs/group project1.py', wdir='/home/firdevs')

Provide current measurements:
UL S0 MS776 -65
UL S0 MS776 NCH
```

6 Interacting with the configuration.txt file

In order to change advance options one can use configuration.txt file. Before making any changes to this file, please create a backup.

1. In line 6 one can choose to read input form files or from interactive mode.

2. In line 9 one must provide correct file name from which input is to be read. In case of reading from interactive mode this field is irrelevant.

3. In line 13 one can choose between basic and advanced algorithm.

4. If PCA2 was chosen then:

   (a) In line 16 one can specify number of last measurements being taken into account during calculation.

   (b) In line 19 one can specify number of times when missing value is replaced by previous entry. After this time next missing values are replaced by '-95'.

   (c) If PCA1 was chosen this fields are ignored.

5. In line 22 one can specify a target value.

6. In line 25 one can specify hysteresis for target value in which PCA1 stops making adjustments. PCA2 in this range continues to make adjustments, but uses smaller step - only by 1 dB.

Example of Configuration File for accepting input from user

```
# WARNING! Before changing anything make a backup of this file.
# Only use recomended values for making changes.
#
#
# Enter 'file' to read input from files or 'shell' to use interactive mode.
readinput = shell
#
# Provide full file name or leave empty if using shell mode.
file_name = sampleInput.txt
# Keep this file in the same directory as main program.
#
# Choose 'PCA1' for basic algorithm or 'PCA2' for advance algorithm
algorithm = PCA1
#
# Choose range from 1 to 8 for 'PCA2' or leave defaults for 'PCA1'
window = defaults
#
# Choose range from 1 to 3 for 'PCA2' or leave defaults for 'PCA1'
recovered_as_previous = defaults
#
# Enter the target value as an integer between -55 to -85
target = -75
#
# Enter hysteresis value as an integer between 1 to 10
hysteresis = 5
#
#
```

```
Python 3.5.2 (default, Nov 17 2016, 17:05:23)
[GCC 5.4.0 20160609] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> runfile('/home/firdevs/group project1.py', wdir='/home/firdevs')
DL S0 MS222 NCH
UL S0 MS222 NCH
DL S0 MS111 NCH
UL S0 MS111 NCH
UL S0 MS222 NCH
DL S0 MS222 NCH
UL S0 MS111 NCH
DL S0 MS111 NCH
UL S0 MS222 NCH
DL S0 MS222 NCH
UL S0 MS111 NCH
DL S0 MS111 NCH
DL S0 MS222 NCH
UL S0 MS111 NCH
DL S0 MS111 NCH
UL S0 MS222 NCH
UL S0 MS222 NCH
DL S0 MS222 NCH
UL S0 MS111 NCH
DL S0 MS111 NCH
DL S0 MS222 DEC 1
UL S0 MS111 DEC 4
DL S0 MS111 DEC 4
UL S0 MS222 INC 1
UL S0 MS222 INC 7
DL S0 MS222 DEC 1
UL S0 MS111 DEC 4
DL S0 MS111 DEC 4
UL S0 MS222 INC 8
DL S0 MS222 INC 1
DL S0 MS111 DEC 4
UL S0 MS111 DEC 4
```

Expected Output when the program gets inputs from the file.