optimUMTS

Demonstration

Manual Version 2.0

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mobile
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Contents

1 Demonstration version

The demonstration version of **optimUMTS** is a fully implemented version with almost all features enabled.
One important restriction is: the demonstration version works *only* with the accompanying terrain data files `terrain.map` and `terrain.urb`.
The demonstration version of **optimUMTS** can be downloaded for various operating systems from the web-site

`http://www.mobile-connect.de`

2 General remarks to the user-interface

optimUMTS is an interactive program (Section 2.2) where a graphical user interface permits user input and the different types of output data are visualized graphically. See the detailed description (Section 3) of the graphical user interface for more information.

2.1 Command line execution

The command line to execute **optimUMTS** is as follows:

```
optimumts
```

Possibly, the real name of your executable might vary, e.g., the demonstration version is usually distributed with the name `optimumts_demo`.
On a Unix platform **optimUMTS** may output certain status information to the controlling shell until the graphical user interface has been launched. No input is read from this shell. **optimUMTS** forks a new process, so the controlling shell looses control over the job.

2.2 Interactive mode

optimUMTS presents the graphical user interface and waits for further input by the user.

2.3 Input with mouse buttons

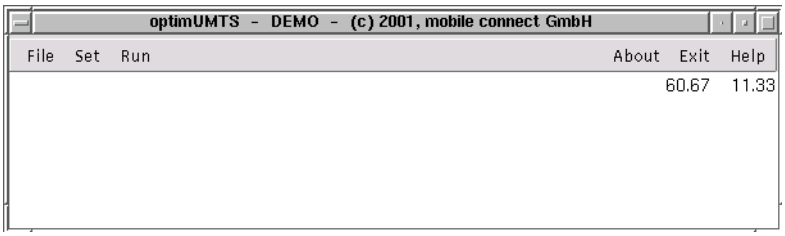
- The *left* mouse button is used to select items in windows.
- The *right* mouse button is used either to abort input or to finish input or to interrupt simulation runs.

2.4 Input with dialog boxes

A dialog box is either presented within an already opened window or it may appear as a new window. Usually, all other menus are disabled until the dialog box has been exited.
All input is checked after the dialog box has been exited through the **[Ok]** button. In some dialog boxes the exit buttons are labeled differently, e.g., **[Load]**, **[Store]**, or **[Apply]** etc. If an invalid entry is detected, the dialog box is reopened and the user is requested to correct the entry.
The button **[Reset]** restores all values to the settings prior to opening the dialog besides those confirmed through an exit button in an subordinary dialog box.
Exiting a dialog box through the **[Cancel]** button alse restores all values to the settings prior to opening the dialog besides those confirmed through an exit button in an subordinary dialog box.
Note that depending on the current window layout, certain dialog boxes may appear hidden behind other windows. This is especially true for requests-for-confirmation which are usually displayed within the main window.

3 User-Interface reference manual

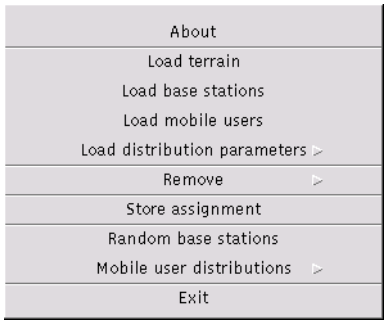
After having started the program, the principal window looks like the following one:



This section describes the menu structure of **optimUMTS** as the entries can be found in the menu bar in left-to-right and top-to-bottom order.

3.1 File

The file menu is mainly used to access data in files, e.g., to load or store data, or to generate random data.



3.1.1 About

Displays Copyright Information (Section 8) in an acknowledge dialog box.

3.1.2 Load terrain

Loads the terrain data from a file that can be mapped to memory allowing for optimized access of large terrain data. The file name extension must be `map`. See the terrain map file format (Section 6.4) for a formal description of the terrain map file content.
The file name is entered through the file select dialog (Section 4.1). The selected file name is maintained and will be presented in a subsequent load command as initial dialog value.
A terrain is drawn as a greyish filled rectangle. The corresponding clutter data is drawn as a black rectangle. Note that the building clutter is automatically loaded using the same file name but replacing the extension with `urb`.
If any of the files cannot be read, an error message is shown. Once a terrain data file has been loaded, it can be removed through the Remove (Section 3.1.6) menu entry. Any base stations or mobile users—possibly being loaded previously—are removed.

3.1.3 Load base stations

Loads the base station data from a file. The current base stations are replaced by the new base stations. See the base station file format (Section 6.3) for a formal description of the base station file content.
The file name is entered through the file select dialog (Section 4.1). The selected file name is maintained and will be presented in a subsequent load command as initial dialog value.

3.1.4 Load mobile users

Loads the mobile user data from a file. The current mobile users are replaced by the new mobile users. See the mobile user file format (Section 6.1) for a formal description of the mobile user file content.
The file name is entered through the file select dialog (Section 4.1). The selected file name is maintained and will be presented in a subsequent load command as initial dialog value.

3.1.5 Load distribution parameters

Loads the mobile user distribution parameters from a file. The current mobile users are not changed. The new parameters take effect whenever the next mobile user distribution is generated. See the mobile user distribution file format (Section 6.2) for a formal description of the mobile user distribution file content.
The file name is entered through the file select dialog (Section 4.1). The selected file name is maintained and will be presented in a subsequent load command as initial dialog value.
If mobile user distribution parameters are available, the corresponding region for which the parameters are defined is drawn as a yellow rectangle. Once a mobile user distribution parameter file has been loaded, it can be removed through the Remove (Section 3.1.6) menu entry.

3.1.6 Remove

- **Rx Distribution:** Removes the currently loaded mobile user distribution parameter data. No data is changed on disk.
- **Terrain:** Removes the currently loaded terrain and building clutter data. No data is changed on disk.

3.1.7 Store assignment

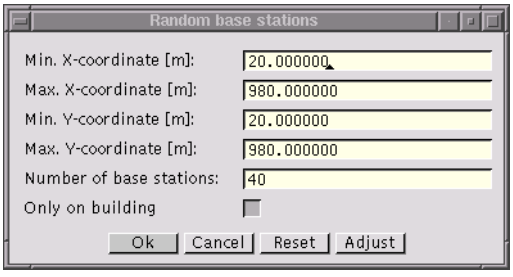
Stores the complete assignment to a file. The file name is entered through the file select dialog (Section 4.1). The selected file name is maintained and will be presented in a subsequent store command as initial dialog value.

3.1.8 Enter key

Asks for a key value to provide access to all features of the program. This menu might not be present in all demonstration versions.

3.1.9 Random base stations

Generates a random distribution of base station locations.



- **Min. X-coordinate [m]:**

  Sets the minimum x-coordinate of the region where the base stations are to be placed randomly. The value is entered in [m].

- **Max. X-coordinate [m]:**

  Sets the maximum x-coordinate of the region where the base stations are to be placed randomly. The value is entered in [m].

- **Min. Y-coordinate [m]:**

  Sets the minimum y-coordinate of the region where the base stations are to be placed randomly. The value is entered in [m].

- **Max. Y-coordinate [m]:**

  Sets the maximum y-coordinate of the region where the base stations are to be placed randomly. The value is entered in [m].

- **Number of base stations:**

  Sets the number of base stations to be generated in the random distribution. The value must be greater than one.

- **Only on building:**

  Selects whether the base stations should be generated only on top of building blocks or whether they can be located in free areas as well. The option is only available when terrain data (Section 3.1.2) are loaded.

  Note that until the height of the base station antenna has not been changed through the base station dialog (Section 3.2.6) the height during simulation is set to the values specified in the heights settings (Section 3.2.1).

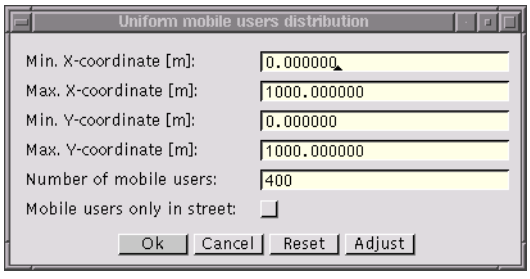
- **[Adjust]**

  The **[Adjust]** button automatically adjusts the coordinates of the region to the underlying terrain data. The button is only available when terrain data (Section 3.1.2) are loaded.

3.1.10 Random mobile users

Generates a random distribution of mobile user locations.

- **Uniform mobile users**:



  – **Min. X-coordinate [m]:**

    Sets the minimum x-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

  – **Max. X-coordinate [m]:**

    Sets the maximum x-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

– **Min. Y-coordinate [m]:**

Sets the minimum y-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

– **Max. Y-coordinate [m]:**

Sets the maximum y-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

– **Number of mobile users:**

Sets the number of mobile users to be generated in the random distribution. The value must be greater than zero.

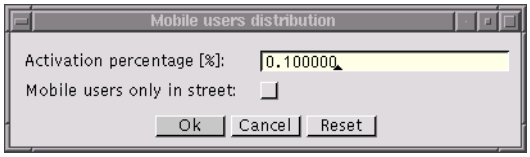
– **Mobile users only in street:**

Selects whether the mobile users should be generated only within street or whether they can be located inside of buildings as well. The option is only available when terrain data (Section 3.1.2) are loaded.

– **[Adjust]**

The **[Adjust]** button automatically adjusts the coordinates of the region to the underlying terrain data. The option is only available when terrain data (Section 3.1.2) are loaded.

- **Distributed mobile users:**



– **Activation factor [%]:**

Sets the percentage of mobile users that should be activated during the generation of mobile users and according to the distribution parameters.

– **Mobile users only in street:**

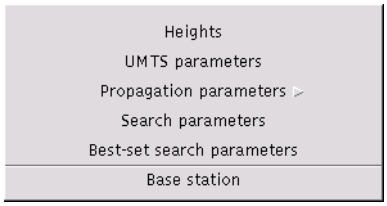
Selects whether the mobile users should be generated only within street or whether they can be located inside of buildings as well.

3.1.11 Exit

Exits **optimUMTS** immediately.

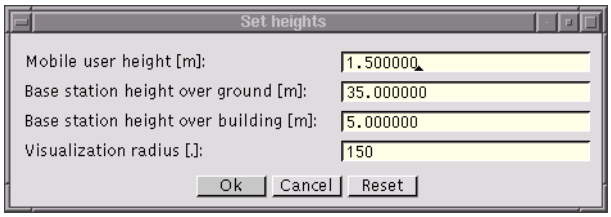
3.2 Set

The menu set is used to configure all settings of **optimUMTS** during an interactive session.



3.2.1 Heights

Sets mobile user and base station parameters which are implicitly used during the generation of random distributions and data visualization.



- **Mobile user height [m]:**

  Sets the height of the mobile users. The value is entered in [m] and must greater than zero.

- **Base station height over ground [m]:**

  Sets the height of the base station antennae over ground, i.e., the height of those base station antennae which are not encountered on top of a building. The value is used for base station antennae which do not have a particular height specified, i.e., their height value is 0 m after random generation. The value is entered in [m] and must greater than zero.

- **Base station height over building [m]:**

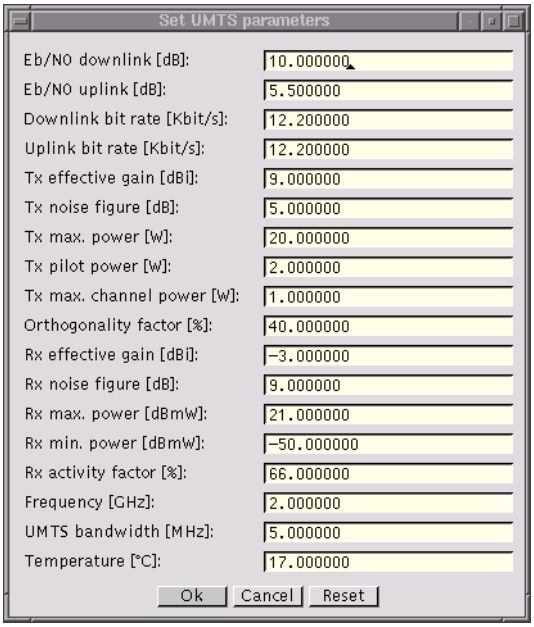
  Sets the height of the base station antennae over the building, i.e., the height of those base station antennae which are encountered on top of a building. The value is used for base station antennae which do not have a particular height specified, i.e., their height value is 0 m after random generation. The value is entered in [m] and must greater than zero.

- **Visualization radius [.]:**

  Sets the radius that is used to visualize data (Section 3.3.4). The value is entered in points respective to the underlying terrain and clutter grid. The value must be greater than zero.

3.2.2 UMTS parameters

Sets the UMTS system parameters which cannot be set individually per mobile user or base station in the demonstration version.



- **Eb/N0 downlink [dB]:**

  Sets the objetive Eb/N0 value of the downlink connection. The value is entered in [dB].

- **Eb/N0 uplink [dB]:**

  Sets the objetive Eb/N0 value of the uplink connection. The value is entered in [dB].

- **Downlink bit rate [Kbit/s]:**

  Sets the bit rate of the downlink connection. The value is entered in [Kbit/s] and must be positive.

- **Uplink bit rate [Kbit/s]:**

  Sets the bit rate of the uplink connection. The value is entered in [Kbit/s] and must be positive.

- **Tx effective gain [dBi]:**

  Sets the effective gain, i.e., the sum of antenna gain and loss of alimentation cable etc., of the base station antennae. The value is entered in [dBi].

- **Tx noise figure [dB]:**

  Sets the noise figure of the base station antennae. The value is entered in [dB].

- **Tx max. power [W]:**

  Sets the maximum transmitting power of the base station antennae. The value is entered in [W] and must be positive.

- **Tx pilot power [W]:**

  Sets the pilot power of the base station antennae. The value is entered in [W] and must be positive.

- **Tx max. channel power [W]:**

  Sets the maximum channel power of the base station antennae, i.e., the power that the base station can send to one mobile user. The value is entered in [W] and must be positive.

- **Orthogonality factor [%]:**

  Sets the orthogonality factor of the codes used in data transmission. The value must be greater than 0 but less than or equal to 1.

- **Rx effective gain [dBi]:**

  Sets the effective gain, i.e. the sum of antenna gain and body loss etc., of the mobile user antenna. The value is entered in [dBi].

- **Rx noise figure [dB]:**

  Sets the noise figure of the mobile user antenna. The value is entered in [dB].

- **Rx max. power [dBmW]:**

  Sets the maximum transmitting power of the mobile user antenna. The value is entered in [dBmW].

- **Rx min. power [dBmW]:**

  Sets the minimum transmitting power of the mobile user antenna. The value is entered in [dBmW].

- **Rx activity factor [%]:**

  Sets the activity factor of the mobile user. The value must be greater than 0 but less than or equal to 1.

- **Frequency [GHz]:**

  Sets the base frequency of the UMTS network. The value is entered in [GHz] and must be greater than 0.

- **UMTS bandwidth [MHz]:**

  Sets the bandwidth of a connection of the UMTS network. The value is entered in [MHz] and must be greater than 0.

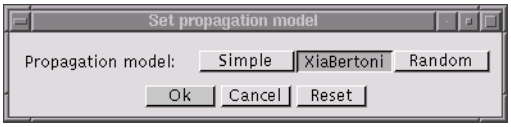
- **Temperature [^{o}C]:**

  Sets the ambient temperature for the thermal noise calculations. The value is entered in [^{o}C] (degree celcius) and must be greater than the absolute zero temperature.

3.2.3 Propagation parameters

Sets the parameters for the different propagation models.

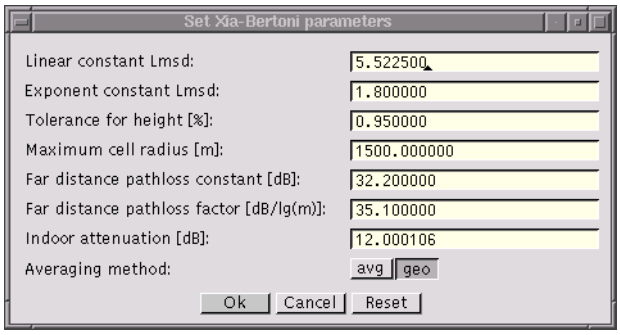
- **Set model:**



  Selects one of the available propagation models.

- **Xia-Bertoni parameters:**

  Sets the parameters for the simplified Xia-Bertoni propagation model.



  – **Linear constant Lmsd:**

    Sets the linear constant used in the formula of the multi-screen diffraction pathloss computation in the simplified Xia-Bertoni propagation model.

  – **Exponent constant Lmsd:**

    Sets the exponent constant used in the formula of the multi-screen diffraction pathloss computation in the simplified Xia-Bertoni propagation model.

  – **Tolerance for height [%]:**

    Sets the tolerance for the heights of the base station antennae which is used to distinguish the three cases of the Xia-Bertoni propagation model. The value must be greater than 0 but less than or equal to 1.

- **Maximum cell radius [m]:**

  Sets the maximum cell radius to where to apply the simplified Xia-Bertoni propagation model. If the distance between base station and mobile user is greater than the specified value, the simple propagation model is applied.

- **Far distance pathloss constant [dB]:**

  Sets the constant used in the formula for the simple propagation model. The value is entered in [dB]. The simple model is applied if the distance between base station and mobile user is greater than the maximum cell radius.

- **Far distance pathloss factor [dB/log(m)]:**

  Sets the factor used in the formula for the simple propagation model. The value is entered in [dB/log(m)]. The simple model is applied if the distance between base station and mobile user is greater than the maximum cell radius.

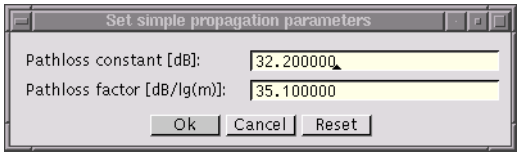
- **Indoor attenuation [dB]:**

  Sets the constant added to the pathloss when the mobile user is encountered inside of a building block.

- **Averaging method:**

  Selects the averaging method to be used in the simplified Xia-Bertoni propagation model. The choices are: arithmetic averaging (avg) or geometric averaging (geo).

- **Simple parameters:**



  - **Pathloss constant [dB]:**

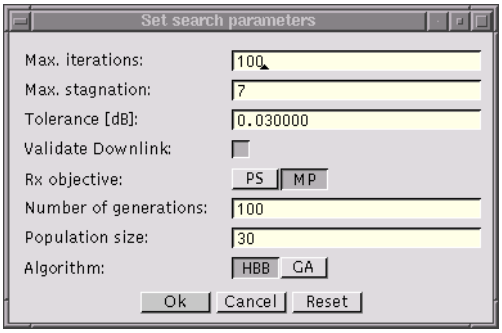
    Sets the constant used in the formula for the simple propagation model. The value is entered in [dB].

  - **Pathloss factor [dB/log(m)]:**

    Sets the factor used in the formula for the simple propagation model. The value is entered in [dB/log(m)].

3.2.4 Search parameters

Sets the parameters of the search algorithms. The one dialog is used both for the heuristic branch-and-bound algorithm as well as for the genetic algorithm.



- **Max. iterations:**

Sets the maximum number of iterations allowed in the iterative power assignment algorithm. Usually very few (less than 5) iterations are necessary, so the default value of 100 is just a security means not to iterate excessively. The value must be greater than zero.

- **Max. stagnation:**

  Sets a termination criterium for the heuristic branch-and-bound search algorithm, the larger the value the longer the time it takes to search a possibly better solution. A value of 0 switches to the optimal search algorithm, which may result in long run times. The value must be positive and less than 32.

- **Tolerance [dB]:**

  Sets the acceptable tolerance for the iterative power assignment algorithm, the smaller the value the more iterations are performed. The value is entered in [dB].

- **Heuristic:**

  Selects one of the available heuristics for the heuristic branch-and-bound algorithm. The feature may not be available in all demonstration versions.

- **Validate Downlink:**

  Sets whether the downlink should be considered in the simulation. If it is not set, only the uplink connection is simulated.

- **Rx objective:**

  Selects which mobile user objective should be optimized. The possibilities include maximum power sum (PS) where the overall power of all mobile users is minimized and maximum power (MP) where the maximum power among all mobile users is minimized.

- **Number of generations:**

  Sets the number of generations to be simulated using the genetic algorithm. The value must be greater than zero.

- **Population size:**

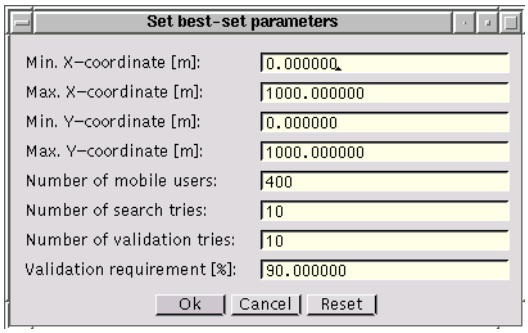
  Sets the size of the population to be used in the genetic algorithm. The value must be greater than zero.

- **Algorithm:**

  Selects the optimization algorithm. The possibilites are a heuristic branch-and-bound algorithm (HBB) or a genetic algorithm (GA).

3.2.5 Best-set search parameters

Sets the parameters of the search algorithm for the best base station set taking into account various random distributions of mobile users (snapshots).
Depending whether there are parameters for the mobile user distribution available, one of the following two dialogs is presented.
If there are *no* mobile user distribution parameters loaded (Section 3.1.5) the dialog looks like:



- **Min. X-coordinate [m]:**

  Sets the minimum x-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

- **Max. X-coordinate [m]:**

  Sets the maximum x-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

- **Min. Y-coordinate [m]:**

  Sets the minimum y-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

- **Max. Y-coordinate [m]:**

  Sets the maximum y-coordinate of the region where the mobile users are to be placed randomly. The value is entered in [m].

- **Number of mobile users:**

  Sets the number of mobile users to be generated in the random distribution. The value must be greater than zero.

- **Number of search tries:**

  Sets the number of search tries which should be performed during the best-set search algorithm. The value must be greater than zero.

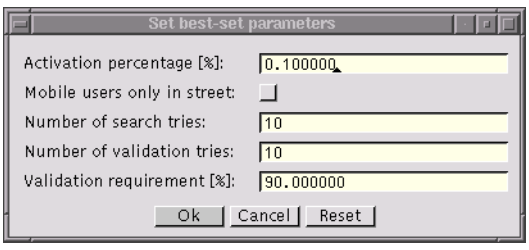
- **Number of validation tries:**

  Sets the number of validation tries which should be performed during the best-set search algorithm. The value must be greater than zero.

- **Validation requirement [%]:**

  Sets the percentage of the validation tries that must be matched in order to consider the best-set being valid. The value must be greater than 0 and less than or equal to 1.

If there are mobile user distribution parameters loaded (Section 3.1.5) the dialog looks like:



- **Activation factor [%]:**

  Sets the percentage of mobile users that should be activated during the generation of mobile users and according to the distribution parameters.

- **Number of mobile users:**

  Sets the number of mobile users to be generated in the random distribution. The value must be greater than zero.

- **Number of search tries:**

  Sets the number of search tries which should be performed during the best-set search algorithm. The value must be greater than zero.

- **Number of validation tries:**

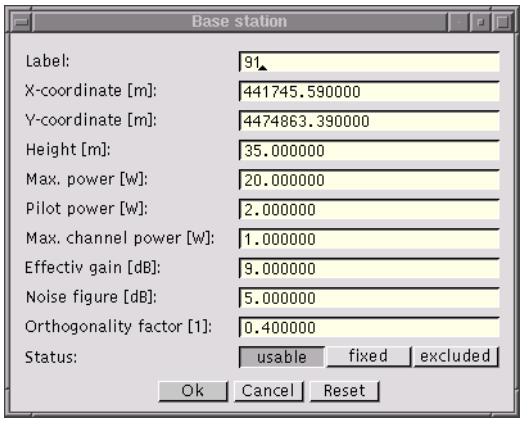
  Sets the number of validation tries which should be performed during the best-set search algorithm. The value must be greater than zero.

- **Validation requirement [%]:**

  Sets the percentage of the validation tries that must be matched in order to consider the best-set being valid. The value must be greater than 0 and less than or equal to 1.

3.2.6 Base station

Allows to change properties of a base station. A base station must be selected with a left mouse click. The action is aborted with a right mouse click.



- **Label:**

  Sets the label of the base station. The value can be any sequence of printable characters.

- **X-coordinate [m]:**

  Sets the x-coordinate of the base station antenna. The value is entered in [m].

- **Y-coordinate [m]:**

  Sets the y-coordinate of the base station antenna. The value is entered in [m].

- **Height [m]:**

  Sets the height of the base station antenna. If the value is equal to zero, the values for the height over ground and over building of the heights settings (Section 3.2.1) are used in a simulation. The value is entered in [m] and must be positive.

- **Max. power [W]:**

  Sets the maximum radiation power of the base station antenna. The value is entered in [W].

- **Pilot power [W]:**

  Sets the pilot power of the base station antenna. The value is entered in [W].

- **Max. channel power [W]:**

  Sets the maximum radiation power per channel of the base station antenna. The value is entered in [W].

- **Effective gain [dB]:**

  Sets the effective gain of the base station antenna. The value is entered in [dB].

- **Noise figure [dB]:**

  Sets the noise figure of the base station antenna. The value is entered in [dB].

- **Orthogonality factor [1]:**

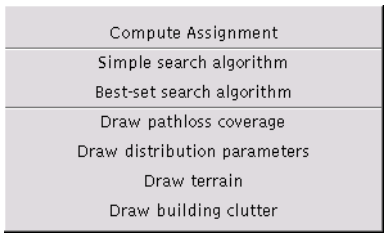
  Sets the orthogonality factor of the base station antenna. The value must be between 0.0 and 1.0.

- **Status:**

  Selects whether the base station is usable, fixed, or excluded in the simulation. Usable base stations are drawn in green color. Fixed base stations are drawn in violet color. Excluded base stations are drawn in orange color; base stations that are not placed within the terrain — in case a terrain has been loaded — are automatically excluded.

3.3 Run

The run menu is used to perform optimization runs and to visualize data.



3.3.1 Compute Assignment

Tries to compute a valid assignment according to the current parameter settings.

3.3.2 Simple search algorithm

Starts either the heuristic branch-and-bound algorithm or the genetic algorithm, depending on the selection in the search parameter dialog (Section 3.2.4) where the guiding parameters can be set as well. Each of the algorithms finds a good subset of the base stations which is sufficient to satisfy the UMTS requirements (Section 3.2.2) for all mobile users. The heuristic branch-and-bound algorithm is able to find the optimum subset, but this may lead to huge run times.

At least a mobile user distribution and a base station distribution must be available. See Load mobile users (Section 3.1.4) and Load base stations (Section 3.1.3) how to load such distributions or Random mobile users (Section 3.1.10) and Random base stations (Section 3.1.9) how to generate such distributions automatically.
If *no* terrain data have been loaded, the simple free space propagation model with the two parameters *Far distance pathloss constant* and *Far distance pathloss factor* is applied.
See Load Terrain (Section 3.1.2) how to load terrain data.

3.3.3 Best-set search algorithm

Starts the best-set search algorithms which is based either on the heuristic branch-and-bound algorithm or on the genetic algorithm, depending on the selection in the search parameter dialog (Section 3.2.4) where their guiding parameters can be set as well.
The parameters for the best-set search are set in the best-set parameter settings (Section 3.2.5).
At least a mobile user distribution and a base station distribution must be available. See Load mobile users (Section 3.1.4) and Load base stations (Section 3.1.3) how to load such distributions or Random mobile users (Section 3.1.10) and Random base stations (Section 3.1.9) how to generate such distributions automatically.
If *no* terrain data have been loaded, the simple free space propagation model with the two parameters *Far distance pathloss constant* and *Far distance pathloss factor* is applied.
See Load terrain (Section 3.1.2) how to load terrain data.

3.3.4 Draw pathloss coverage

Visualizes in a new window the pathloss coverage map around a base station that has to be selected with a left mouse click. A right mouse click aborts the operation. An additional dialog ask whether the coverage should be calculated for points inside building blocks as well.
Previously, terrain data (Section 3.1.2) must have been loaded.
The radius to be used for the calculation of the pathloss coverage map is set in the heights settings (Section 3.2.1).

3.3.5 Draw distribution parameters

Visualizes in a new window the mobile user distribution parameters.
Previously, the mobile user distribution parameters (Section 3.1.5) must have been loaded.

3.3.6 Draw terrain

Visualizes in a new window the terrain data around a base station that has to be selected with a left mouse click. A right mouse click aborts the operation.
Previously, terrain data (Section 3.1.2) must have been loaded.
The radius to be used for the visualization of the terrain data is set in the heights settings (Section 3.2.1).

3.3.7 Draw building clutter

Visualizes in a new window the building clutter data around a base station that has to be selected with a left mouse click. A right mouse click aborts the operation.
Previously, terrain data (Section 3.1.2) must have been loaded.
The radius to be used for the visualization of the building clutter data is set in the heights settings (Section 3.2.1).

3.4 About

Displays Copyright Information (Section 8) in an acknowledge dialog box.

3.5 Exit

Exits **optimUMTS** immediately.

3.6 Help

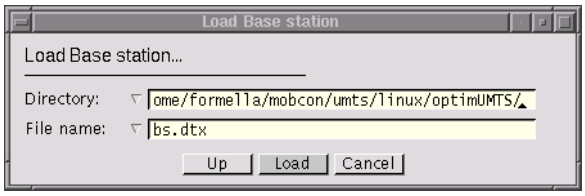
Shows where to find information about **optimUMTS**.

4 Common dialog boxes

The common dialog boxes are presented to the user in various occasions. Besides small variations, they always appear much the same to the ones described in this section, which is the file select dialog (Section 4.1).

4.1 File select dialog

To select a file—either for reading or for writing—**optimUMTS** uses, e.g., the following dialog box (under Windows there is also an input line to select the drive):



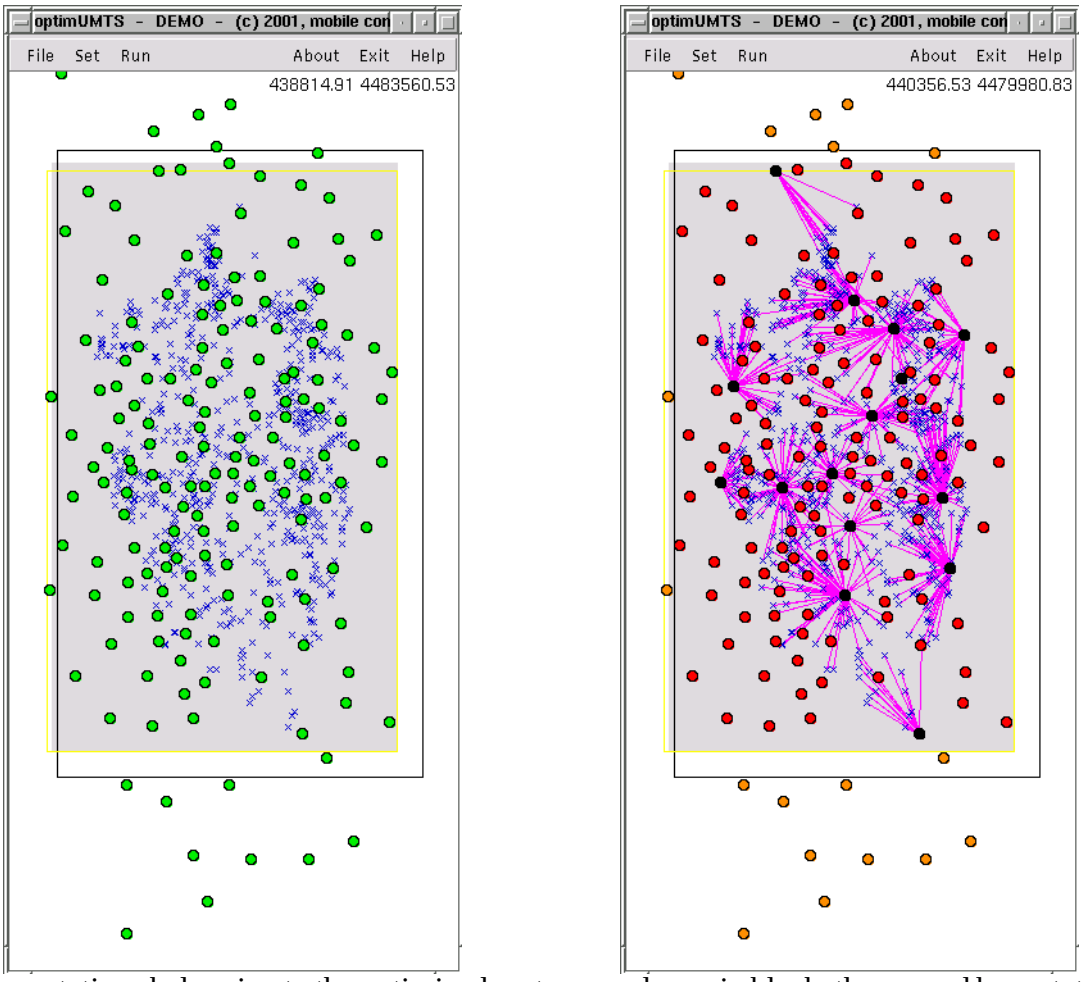
Clicking on the small triangle beside the drive, directory, or file entry visualizes a list (possibly with a scroll bar on the right side) from which an entry may be selected. The button **[up]** ascends the directory entry one level. If the entry contains a relative path name, the name is converted into an absolute path name.
The drive list contains all available one character drive identifiers; the drive `A:` is always present. A drive must be specified with the terminating colon.
The directory list contains all directories down the path to the displayed directory and all directories within the displayed directory. The file list always contains all files in the displayed directory matching the required file type.
However, an arbitrary directory name or file name may be entered in the editable lines. **optimUMTS** accepts only file names built with the following character set: alpha numeric characters `0..9`, `a..z`, `A..Z`, the eight characters `$ % @ . # _ / \` and the blank.
Note, that a directory name must be terminated by the delimiter / (slash) in Unix or \ (backslash) in Windows, in which case the file list will be updated. If the entered directory is not available, the file list will be empty.
After closing the dialog, the selected file name is the concatenation of the directory entry and the file entry with one exception: if the file name is entered as an absolute name, i.e., starting with a slash or backslash or with a drive specification under Windows, the directory name is not prepended.
Usually, the file name which was selected last remains memorized for the next selection.

5 Output data visualization

optimUMTS visualizes the current base station and mobile user distributions, the terrain are, the available area of the building clutter, and the are of the distribution parameters for mobile user generation in the main window. Various sets of output data are presented in different subwindows.
This section shows some output examples which have been obtained with the files of the demonstration version of **optimUMTS**. The terrain data defines an area of approximately 12 km height and 7 km width which have been sampled with 16 m spacing.

5.1 Optimization results

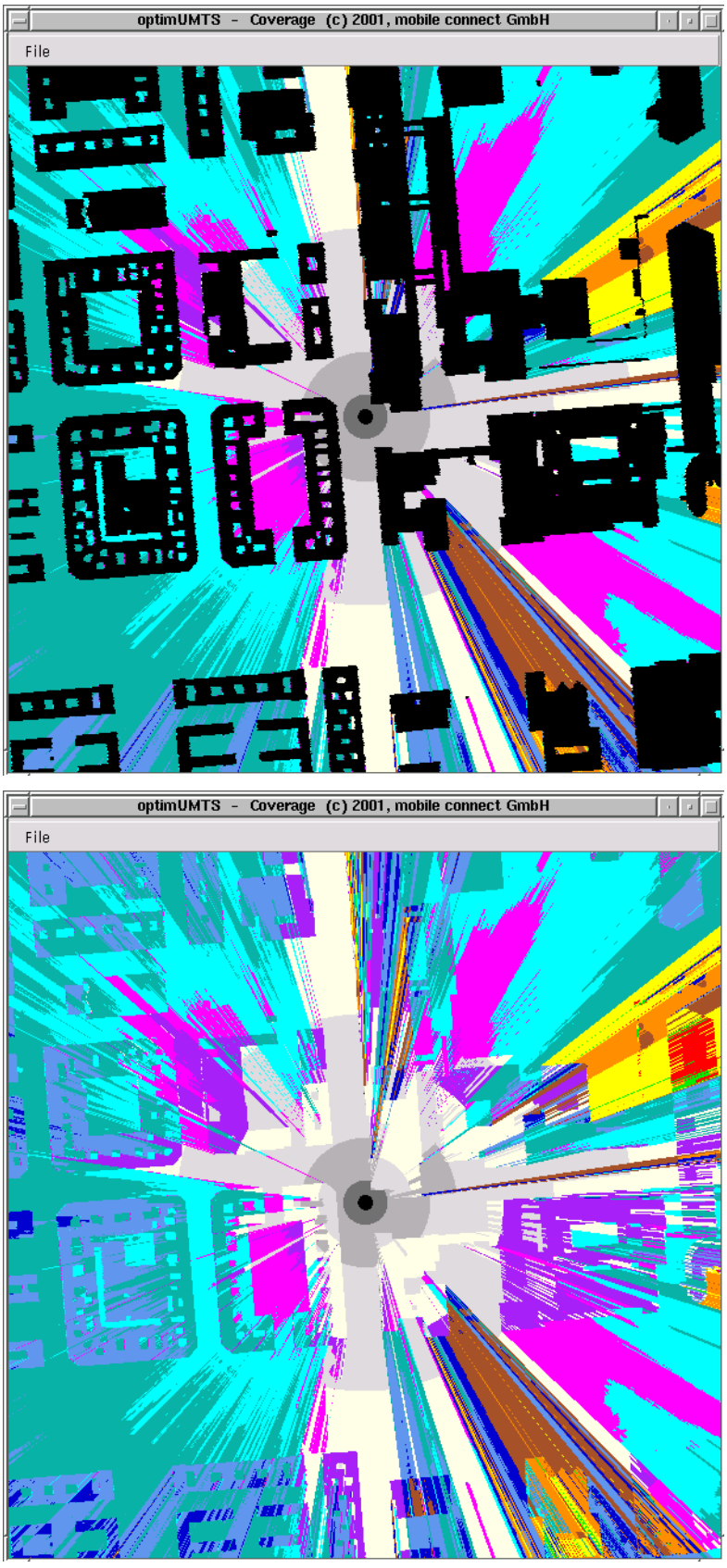
Before starting the simple search algorithm (Section 3.3.2), the main window looks like the figure on the left hand side. The figure on the right hand side shows the result of the optimization run.



The base stations belonging to the optimized system are drawn in black, the unused base stations are drawn in red. The connection established between a mobile user and a base station is drawn with a pink line.

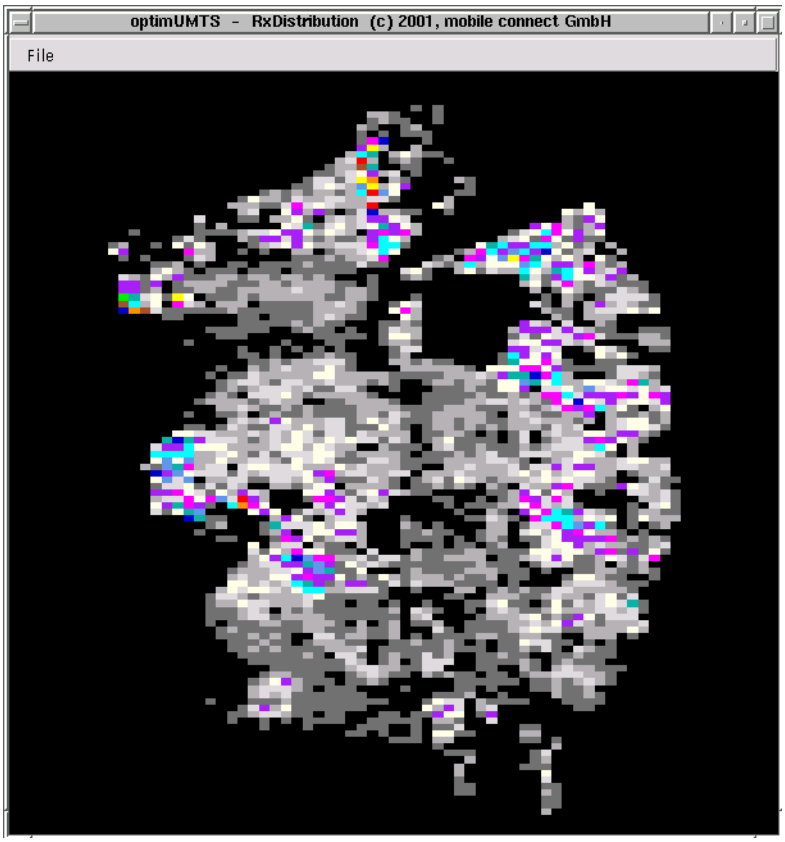
5.2 Pathloss coverage map

The pathloss coverage map shows the pathloss at the mobile user locations respective to a base station location applying the simplified Xia-Bertoni propagation model. The following figures show examples of pathloss coverage maps:



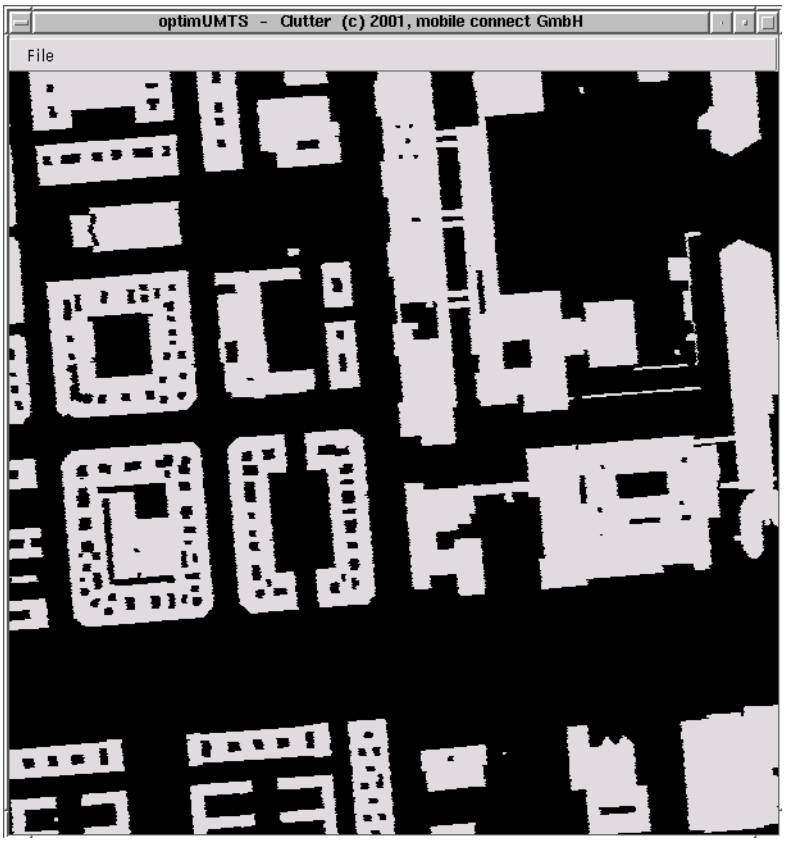
5.3 Mobile user distribution parameter map

The mobile user distribution parameter map shows the number of mobile users being present in a certain region. The following figure shows the example mobile user distribution parameter map:



5.4 Terrain map and building clutter

The terrain map (on the left hand side) shows the terrain heights according to the underlying grid. The corresponding building clutter is shown below.


optimUMTS - Clutter (c) 2001, mobile connect GmbH
File

6 optimUMTS files

optimUMTS reads and/or writes the following proprietary file formats:

extension	description	format	(Section)
`.drx`	mobile user	ASCII	6.1
`.drd`	distribution	ASCII	6.2
`.dtx`	base station	ASCII	6.3
`.map`	terrain	binary	6.4
`.urb`	clutter	binary	6.5

6.1 Format of mobile user data files

The mobile user data file is an ASCII file with lines of the following structure (the entries are separated by white-space-characters):

```
number xcoord ycoord
```

`name` an arbitrary number as identification of the mobile user, the value is ignored in the demonstration version, instead, the mobile users are numbers as they appear in the file,

`xccord` the x-coordinate of the base station as floating point value,

`yccord` the y-coordinate of the base station as floating point value.

6.2 Format of distribution parameter files

The distribution parameter file is an ASCII file with the following entries separated by white-space-characters:

```
ncols nrows xll yll size [ values ]
```

`ncols` the number of columns of the matrix, the integer value must be positive and at least 2,

`nrows` the number of columns of the matrix, the integer value must be positive and at least 2,

`xll` the x-coordinate of the center of the cell at the lower left corner of the matrix,

`yll` the y-coordinate of the center of the cell at the lower left corner of the matrix,

`size` the size of a cell of the matrix in meters, the integer value must be positive and greater than 0,

`[values]` the matrix defining the distribution parameters, there must be number of columns times number of rows many integer values present which must not be greater than 65535.

6.3 Format of base station data files

The base station data file is an ASCII file with lines of the following structure (the entries are separated by white-space-characters):

```
name xcoord ycoord
```

`name` an arbitrary string as name of the base station, the string must not contain white-space-characters,

`xccord` the x-coordinate of the base station as floating point value,

`yccord` the y-coordinate of the base station as floating point value.

6.4 Format of terrain data files

The format of the terrain data file is not included in the documentation of the demonstration version.

6.5 Format of building clutter data files

The format of the terrain data file is not included in the documentation of the demonstration version.

7 Hardware and software requirements

optimUMTS is developed to run on any Unix or Windows platform. To install and run **optimUMTS** you need

- at least 8 MBytes of free memory for simple examples; depending on your simulation needs certainly more memory is needed
- approximately 25 MBytes of free disk space for installation, documentation, and simple examples; depending on your simulation needs certaily more disk space is needed.

The software and hardware requirements are:

- Linux-operating system
  - Linux kernel 2.2.x or higher
  - X-windows environment with window manager
  - Intel pentium processor or higher
  - at least 16 color graphics with resolution of 800x600;
- Windows-operating systems
  - Windows95, Windows98, WindowsNT, Windows2000
  - Intel pentium processor
  - at least 16 color graphics with resolution of 800x600;

8 Copyright information

mobile **connect** retains all Intellectual Property Rights in the **optimUMTS** Software and Documentation.

8.1 License agreement

optimUMTS may be used only in accordance with the written licence agreement which is delivered together with the program (see file `copyright.txt`) and the menu entry About (Section 3.1.1):

```
This is the demonstration version of optimUMTS - a valuable
planning tool for UMTS mobile networks.  There is no
warranty whatsoever, neither for the functionallity of the
program nor for the correctness of the output results.
All rights reserved, (c) 2001-2002 mobile connect GmbH.
optimUMTS is developed in collaboration with the Universidad
de Vigo (E.T.S.I. TSC) and the Universidad Politecnica de
Madrid (E.T.S.I. SSR).
The software can be freely copied and distributed.  It is
forbidden to manipulate the software.  The simulations can
be performed only with the accompanying data files.
If you like to obtain more information or a more functional
version, feel free to contact mobile connect GmbH
(phone:  +49 (0) 681 831 8858, email:  info@mobile-connect.de)
```

Any further usage is forbidden.
optimUMTS is not fault-tolerant and is not designed, manufactured or intended for use in on-line control equipment, in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of **optimUMTS** could lead directly to death, personal injury, or severe physical or environmental damage ("High Risk Activities"). ***mobile*** **connect** specifically disclaims any express or implied warranty of fitness for High Risk Activities.

8.2 Copyright of incorporated software

optimUMTS contains part of the genetic algorithm software GAlib, which underlies the following licence and copyright agreement:

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Copyright (c) 1996-2000 Matthew Wall (the Author) All rights reserved.
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8.3 Trademarks