

AnimalTracker

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AnimalTracker
by Rainer Blessing

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This is version 0.05 of the documentation for AnimalTracker. A software to map the position of animals and record their behaviour.

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Chapter 1. Preface

The software was written to aid in a thesis about howler monkeys. It can save the researcher a significant amount of time, especially if AnimalTracker is used on a tablet PC or a Laptop. It transforms graphical positions into numerical vales which can be used in all kinds of calculations. The software was originally written for the MS Windows operating system. But one of the development aims was to get this software running on Unix-like operating systems. The software runs on Windows OSs and on Linux variants. The used GUI Toolkit wxWidgets is available for several other operating systems. AnimalTracker has not been tested with these. If AnimalTracker should be working under one of those OSs I would be interested in getting notified of it.

Features

- It transforms graphical positions into numerical data.
- The positions can be entered and modified either graphically on a map or numerically in a table.
- The behaviour for each scan can be recorded.
- The application can calculate the distance between every animal per scan and the mean distance (arithmetic and median) per day.
- Areas can be defined which constrain the distance-calculation to only certain areas of the map.
- The distribution of the animals across the map can be calculated.
- All the data can be exported as screenshots or tabular data to be used in other applications, for example spreadsheets.
- The files are saved as XML files. They can be modified with a text editor or a separate program.

Chapter 2. Technical Things

Requirements

AnimalTracker has rather low hardware requirements. It should be running fine on any computer with at least the following properties:

- A CPU with the equivalent processor power of a Intel Pentium CPU with 100 MHz
- 32 MB RAM
- A PCI Graphics Card with built-in 2D acceleration.
- 2 MB of storage space for the application and data
- Windows 95 or XFree86 with a light Window Manager like Fluxbox

It is assumed that the PC also has at least a keyboard, a pointing device and a visual interface.

Installation

MS Windows

The windows version has a setup program. Just start the application and click on all the buttons. It installs itself in "c:\Program files\AnimalTracker". The exact path depends on your windows version. In your Start menu there will be a new program group called AnimalTracker.

Other Operating Systems

Up to now there are no precompiled binaries, so you have to compile AnimalTracker yourself. AnimalTracker needs wxWidgets and the Xerces-C library from Apache , so you need to have the libraries and the corresponding headers installed. To compile and install use *./configure* and *make*.

Running the application

MS Windows

Click on AnimalTracker in the Start menu.

You can assign the AnimalTracker data files to the AnimalTracker application. If you did this you can open the data file together with AnimalTracker by clicking on the data file.

Other Operating Systems

You can either copy the AnimalTracker binary to a file which is in your Path variable or start AnimalTracker by entering the full path name.

Deinstallation

MS Windows

Use the deinstallationfunction in the AnimalTracker menu group or in the Software dialog in the Control Panel.

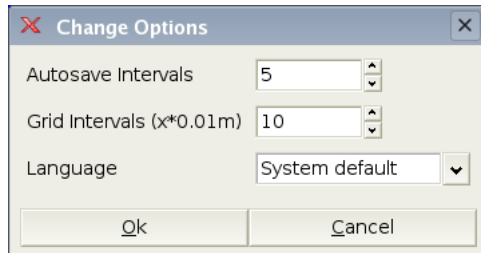
Other Operating Systems

Delete the AnimalTracker binary and the file ".AnimalTracker" in the directory you installed it in, or use *make uninstall*.

Chapter 3. What you can do with it

The Beginning

Figure 3-1. General Options



If you have started AnimalTracker you will usually see an empty window. Before you start you might want to change some general options. Select "File/Gen. Options" from the menu. There you can change three settings:

- *Autosave Intervals* The application can automatically save your work. You can specify the interval in minutes. A value of "0" disables the automatic save function.
- *Grid Intervals* This interval is used for the "Snap to grid" function in the editor view.
- *Language* You can choose the language of the text. There are two choices: English and German.

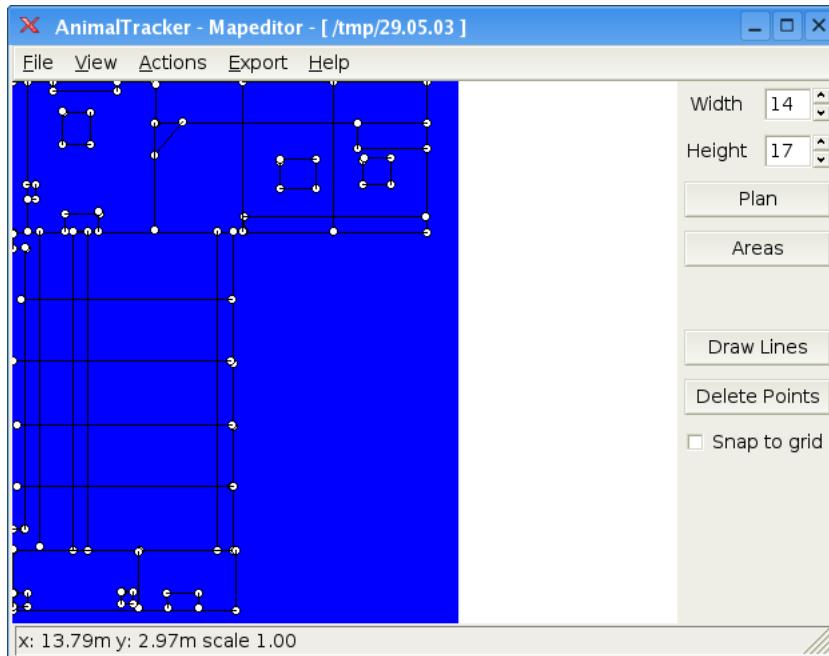
You then can start working. Open the File menu and click on New File or Open File, if you already have a file. If you choose New File a dialog window will open. There you can set several values for your project.

- *Animals* The number of animals you observed.
- *Days* The number of days.
- *Scans* The number of scans per day.
- *Cage Height* The maximum height.
- *Height Intervals* The divider for the cage height.
- *Distancefactor* This is a value which is used if the distance for two animals should be calculated that are not in the same area. If the value is zero, the distance to the animal outside of the area will not be considered in the calculation.

If you are creating a new project the *map editor* view will be shown next. The *position animals* view will be shown if you open an existing file.

The Map Editor

Figure 3-2. The Map Editor



You start your project by drawing the a map of the area the animals are contained in. To make drawing easier you there are two features to help you. They can be used in both modes. To draw a straight line regardless of the exact mouse position hold down the *Shift* key while setting a point. If you check the *Snap to grid* box you can only set points on the crossing lines on a grid. This helps in setting the points more precise. The size of the grid can be changed in the *General Options* dialog in the *File* menu (or by pressing *Ctrl+G*). The grid is invisible. You can change the size of the area by changing the values *Width* and *Height* on the top right of the window. On the bottom of the window in the statusbar you see three values if the mousepointer is in the drawing area. These are the x and y positions of the mousepointer and the scalefactor. If you zoomed in and your map is not completely visible anymore you can move the view of the map by moving the scrollbarhandles or by pressing the cursor keys. You can change this scalefactor to zoom in or out of the map. This can be done with the *Page Up* and *Page Down* keys or additionally with the mousewheel if you use the MS Windows version. To increase the zoomfactor more rapidly press the *Shift* key while changing the scalefactor.

There are two drawing options:

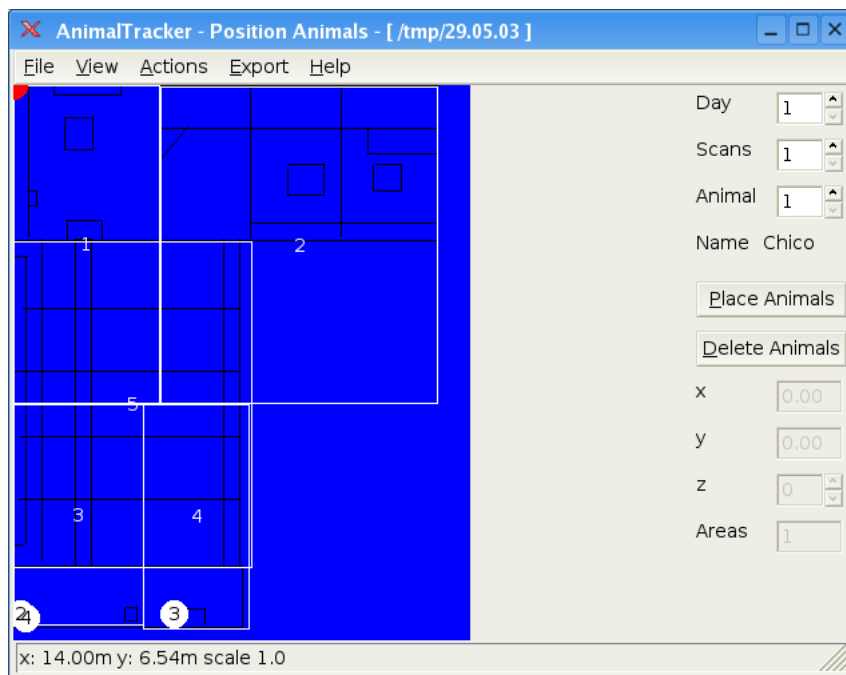
- *Plan* Here you can draw a map of the observed area. To draw a line click on the *Draw Lines* button and click on the drawing area to set a point. You will see a line following the mouse pointer. Click another time to fixate the point an to draw a line. If you are finished with one object (an object with consecutive lines) click on the right mouse button and the line following the mouse pointer disappears. The *Draw Lines* button is now released and the *Delete Points* button is pushed. To start drawing another object click on the right mouse button again and the *Draw Lines* button is pushed and you can set another starting point.

You can delete points if the *Delete Points* button is pushed. You can either push it directly or switch the modes with the right mouse button. Click on a point and the point should be deleted together with any lines leading to the point.

- *Areas* The distance to other animals is only calculated if the animals are in the same area. The drawing of an area works like drawing the map. The only difference is that an area is always a closed polygon and every area has a number. The number is needed in the distance calculation. You also can see right away if certain animals are in the same area.

The Place Animals View

Figure 3-3. Place Animals



This is the view where you position the animals. You get there by selecting *Enter Animal Positions* from the *Actions* menu. This view will be shown automatically if you open an existing file. You can move through the scans by selecting the values in the fields *Day*, and *Scan*. You also can switch to the next or previous scan by pushing the + and - keys on your numberblock on your keyboard. You can select a certain animal with the animal field. A selected animal is shown in red. The name of the animal is shown in next to *Name* beneath the *Animal* row. The exact position of the selected animal is also shown in the x,y,z fields on the lower right side of the window.

To place an animal push the *Place Animals* button and make a left click on the map to position it. The animal which you position is the selected animal. The colour of the animal (circle) will turn grey if you clicked. You now can select the height interval. You can see the interval in the z value field on the right of

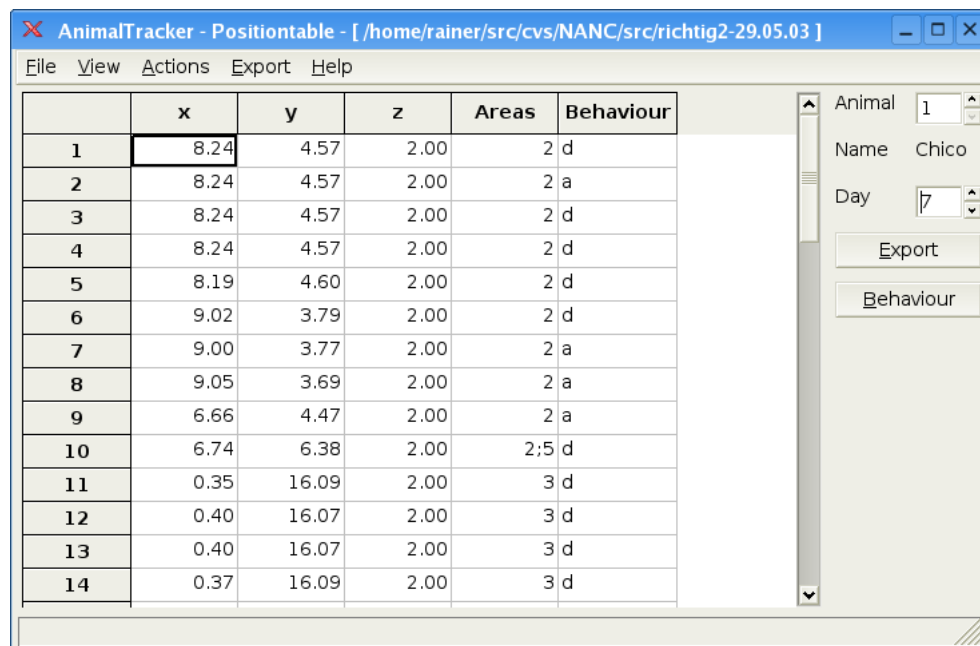
the window. Select the appropriate interval by moving your mousewheel if you use the MS Windows version or use the *Page Up/Down* keys (this works in all versions) and then click once with the left mousebutton. Once you placed an animal you automatically can place the next animal. If you placed all animals in a scan you can move to the next scan by pressing the + key.

To place the animals more precisely you can either zoom like explained in the map view or you can zoom a certain area. If you press one of the number keys on your keyboard (1-9) the according area it zoomed so that the area is completely visible with the maximum scalefactor. You can go back to scalefactor 1 by pressing the key 0.

Misplaced animals can be deleted by changing into the delete mode by clicking on the *Delete Animals* button.

The Position Tables

Figure 3-4. Position Table



The screenshot shows a window titled "AnimalTracker - Positiontable - [/home/rainer/src/cvs/NANC/src/richtig2-29.05.03]". The window contains a table with columns for scan number, x, y, z, Areas, and Behaviour. The table has 14 rows of data. To the right of the table is a control panel with a dropdown menu for "Animal" (set to 1), a text field for "Name" (Chico), a dropdown menu for "Day" (set to 7), and two buttons: "Export" and "Behaviour".

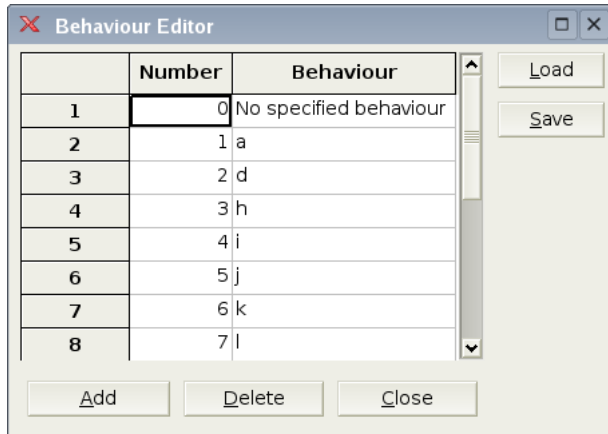
	x	y	z	Areas	Behaviour
1	8.24	4.57	2.00	2	d
2	8.24	4.57	2.00	2	a
3	8.24	4.57	2.00	2	d
4	8.24	4.57	2.00	2	d
5	8.19	4.60	2.00	2	d
6	9.02	3.79	2.00	2	d
7	9.00	3.77	2.00	2	a
8	9.05	3.69	2.00	2	a
9	6.66	4.47	2.00	2	a
10	6.74	6.38	2.00	2;5	d
11	0.35	16.09	2.00	3	d
12	0.40	16.07	2.00	3	d
13	0.40	16.07	2.00	3	d
14	0.37	16.09	2.00	3	d

Here you can see all the animals positions in a table. You get there by selecting *Table* in the *View* menu. Each table represents a day. The rows are the scans on that day. The Area column contains the area the animal is in. The viewed animal can be changed by clicking on the animal field on the right side of the window. The days can be changed, too. If you click on the *Export* button you can export the displayed table as a file which you can for example import in a spreadsheet application. If you select *Positiontables* in the *Export* menu you can export all the data. A file will be created for every animal which contains all the positions.

You can not only view the positions and export them, you can also enter or change the position values in the tables. You only cannot change the values of the *Area* column because these values are calculated

automatically. You can select a region on the table and use the entries in the context menu (click the right mouse button) to move, copy or delete a region. To enter the behaviour click on the *Behaviour* button and enter the possible behaviours. You can save and load that list if you want to reuse the behaviours in another observation. You can then select one of the defined behaviours in the the behaviour column of each scan.

Figure 3-5. The Behaviour Editor



The Distance Calculation

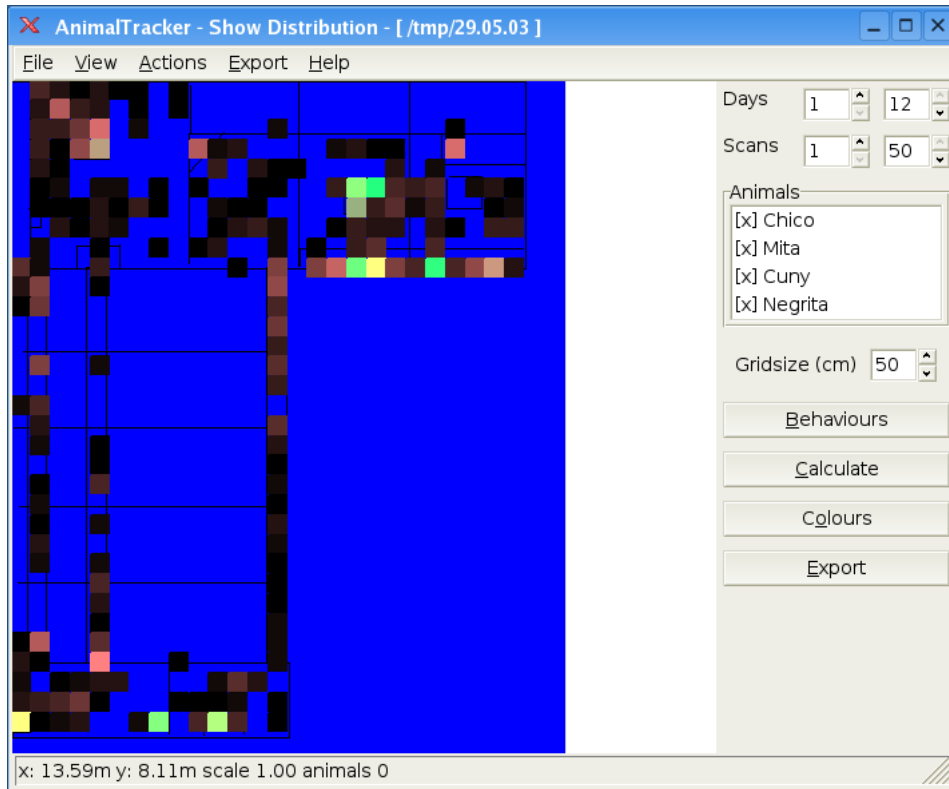
Figure 3-6. Distance Calculation

	Chico	Mita	Cuny	Negrita
1	0.00	-1.00	-1.00	-1.00
2	0.00	-1.00	-1.00	-1.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00

Click on *Calculate Distance* in the *Actions* menu to view the calculated distances between the animals. Only the distance to animals which are in the same area is calculated, the distancefactor from the *General Options* dialog is used otherwise. The average distance across a day is shown on the bottom of the table. The left value is the arithmetic mean, the right value is the median. The median value is useful if you want to know the difference to the animal in the same area. The animal and day can be selected by changing the values on the right panel. The export functions work like in the positionable view. You can export the current table by clicking on the *Export* button. If you want to export all tables click on *Distancetables* in the *Export* menu.

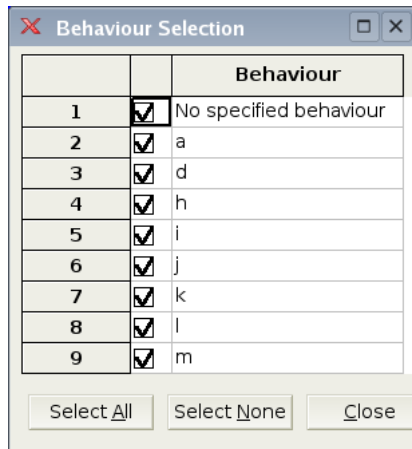
The Distribution View

Figure 3-7. The Distribution View



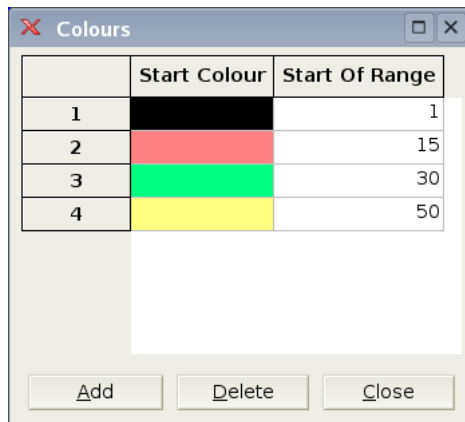
Here you can view the distribution of the animals across the map. Select the desired range (days and scans), select the animals in the listbox, adjust the *Gridsize*, select the wanted behaviours, open the behaviour selection window by clicking on *Behaviours* and click on *Calculate*.

Figure 3-8. The Behaviour Selection



To get the exact number of animals move the mousepointer to the square you want to know the value of. The value will be shown in the statusbar of the window next to *animal*. You can also export the numerical values in a table with a click on the *Export* button to save a table with these values. You can use that table in a spreadsheet or statistics application to create more meaningful diagrams. A screenshot of the graphic can be saved as a bitmap by clicking on *Bitmap* in the *Export* menu.

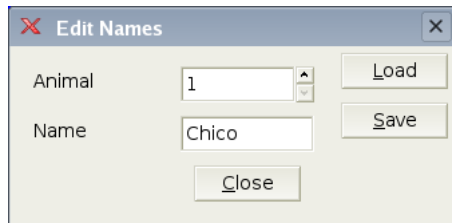
Figure 3-9. The Colour Dialog



If you click on the *colour* button in the distribution view a window opens where you can select the colours which will be used in the view. Click on *Calculate* to update the view if you changed the colours or values.

The Names

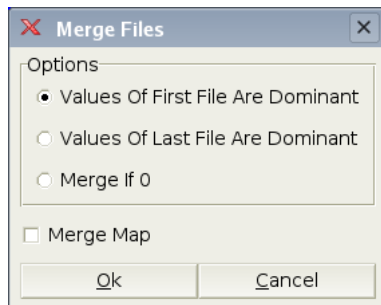
Figure 3-10. Edit Names



Click on *Enter Names* in the *Actions* menu to open the dialog to change or enter the names of you animals. Click on *Close* if you finished your modifications. You can save the names to a separate file and load them if you use the *Save* and *Load* buttons.

Merging two project files

Figure 3-11. Merge Dialog



You can merge the data of two AnimalTracker files. With that feature it is possible that several people can enter their data independently. All user need to have the same data file, though. Create a project first with a map and all needed values and give that file to all users. It is of course not possible to merge files with different values. The map, the size of the map, the scans, the days and so forth have to be the same. Only the position values can differ. The purpose of this function is to merge these position values.

You have three merge options:

- *Values Of First File Are Dominant* The values of the currently open file will be used if there are values in both files for a certain scan.
- *Values Of Last File Are Dominant* The values of the loaded file will be used if there are values in both files for a certain scan.
- *Merge If 0* The value from the loaded file will only be used if the already open file has no values for that scan.

You also can use the map of the file you want to merge. Click on *Merge Map* for that. The dimensions of the map have to be the same nevertheless. It is only useful for aesthetic reasons. If for example the other map looks better or is more complete.

Loading And Saving Of Maps

You can load and save maps independently from your project if you want to use the maps for several projects. Use the options *Load Map* and *Save Map* in the *File* menu for that.

Check Placed Animals

You can use the function *Check Placed Animals* in the *Actions* menu to check if you entered a position for all scans of a day. Select the day and click on the *List* button. Every empty scan of that day will be listed.