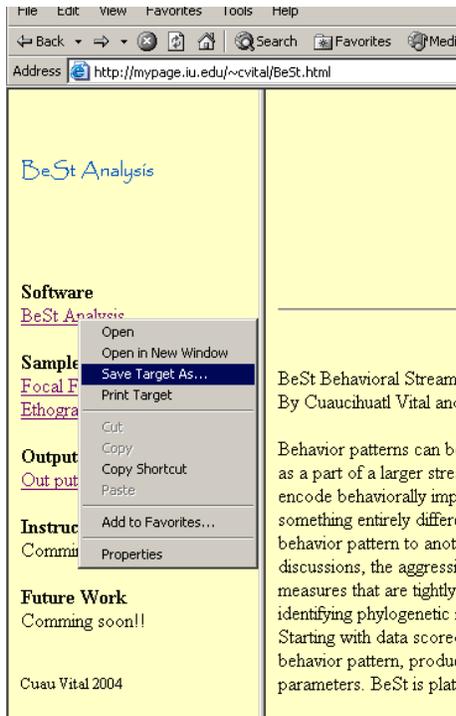


BeSt 1.0 Tutorial

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Before you start



Download version j2sdk1.4.2 of java or later

<http://java.sun.com/j2se/1.4.2/download.html> Follow the instructions for a straight-forward installation.

Download BeSt

The program will not run properly if you run it from the Web, so you have to install it on your computer. Go to <http://mypage.iu.edu/~cvital/BeSt.html>, look at the left frame for the BeSt Analysis link, right click and select the folder where you want to store it.

Ready to start

Behavioral Stream Analysis is designed to analyze the temporal arrangement of behavior contained in a focal sample. Each behavior is analyzed as a unit in a complex sequence. All you need to do is to input two separate files (see below) and you'll get some statistical results, probability matrices that will tell you the probability of observing a particular behavior followed by another one (lags one, two and three) and some Information theory results. Nevertheless, because some sequences of behavior are "natural sequences" for certain organisms it's recommended that you use your own criteria to determine which sequences are significant.

Following are some instructions for the program. As is true for most instructions, if you read them only, it will be hard to figure out what we are talking about. I recommend that you download the sample files and look at them while reading the instructions. Then it will be easier to follow.

INPUT FILES

You will need to input two separate files. Both files should be saved as ASCII files (e.g., Focal.txt). One of the input files is the ethogram file, the second input file is the focal sample file. These files must be saved in the same folder where BeSt is saved.

Focal file

The focal file contains the data collected. It consists of the behavior patterns observed and the start time when they were observed.

Format:

There are two different formats allowed in this part

1. Start time (hrs:min:sec) (space) AM/PM (tab) Behavior code (should be the same as in the ethogram file)

Example:

```
8:35:09 AM t-w
8:40:05 AM h-t
8:41:00 AM end
```

2. Behavior code (tab) time in seconds

```
t-w 30909.0
h-t 31203.0
end 31258.0
```

Always!!! finish the focal file with an “end” code, so that the program will run correctly

Note that in this file we are not separating with commas (as in the ethogram file, below), but instead with spaces or tabs. Be very careful with this spaces and tabs. You can have problems if you have extra spaces or extra lines.

Ethogram file

This file contains a description of each behavior pattern, including other information that will be used later on the analysis. This file should include all the behavioral codes that appear in the Focal file.

Format:

Code, description , has duration (yes or no), Category

Note. Every new line would denote a different behavior. Commas should separate every section in a single line

Code→ I recommend that you use one or two letters to code a behavior name, this should help in displaying the statistics. No spaces are allowed in this part

Example: b (one letter)

S-w (two words joined by a hyphen, note there are no spaces between them)

Description → Brief description of the behavior. No punctuation is allowed in this section (i.e. commas, double quotes or points)

Example: bury self under sand

Incorrect examples:

move laterally, usually with stiff legs for only a short distance

Corrected version (no punctuation):

move laterally usually with stiff legs for only a short distance

Has duration → Describes whether the behavior has duration or not. This should be a Yes or No input only.

Behavior patterns which continue until the next scored behavior (e.g., running, eating, walking) should be described as having durations. Behavioral acts (e.g., head turn or tongue flick) which occur instantaneously should be given a “No”.

Category → Larger group to which the behavior belongs. These groups can be based on any criterion such as behavior function, social context, or the sex of the focal animal. For example, they could include some of the following (not limited, you might make your own)

Chemical

Visual

Action

Miscellaneous

Motion

Ethogram file example:

bury, bury self under sand, No, misc

side-walk, move laterally usually with stiff legs for only a short distance, No, visual
end, end of focal sample, No, other

Always!!! include “end” in the ethogram to ensure the proper functioning of the program.

Comments

You can comment either file (focal or ethogram) by starting a line with two stars **. Any line that you start with ** will be ignored in the analysis

OUTPUT FILE

This file will be generated by the program in the same folder where BeSt program is stored. You might get a conversion window pop-up when opening the output file in a Word processor.

The file is *.doc formatted but java usually saves files in the .txt form. So to open the file in a Word processor, just click “yes” to the conversion.

The very first few lines of the output file contain information about your input files, including the comments from both files. Thus any line that started with *(two stars) in any of the input files will appear here. Names of the input files will also be included in this part.

Frequencies

This section is divided into frequencies of timed events and frequencies of all events. Frequencies are calculated separately for events scored as having durations in the ethogram file. If you get negative numbers in the “Frequencies of timed events” this might be because your observation times are not in consecutive order. I would recommend modifying the times in the input file, so that they are in consecutive order.

Matrices

The matrices represent the transition from one behavior to the next. We have two kinds of matrices: the transition matrices and the probability matrices. Values in the transition matrices are the number of times the behavior patterns listed down the first column were followed by each of the behavior patterns in the top row. Lag-1 matrix elements are the number of times the column behavior immediately followed the row behavior. The Lag-2 matrix describes sequences of 3 behavior patterns, with each entry giving the number of times row and column behavior patterns were separated by one other behavior pattern. The Lag-3 matrix gives the number of times the two behavior patterns were separated by two other behavior patterns (i.e., 4-behavior sequences).

Information Theory Statistics

H→ Diversity Shannon-Wiener index.: large when behavior patterns occur with equal probabilities (H1) and are not sequentially linked (H2)

D→ Redundancy: relative measure of diversity in comparison to maximum possible given number and representation of behavioral categories (large H1 and H2 yield small D1 and D2)

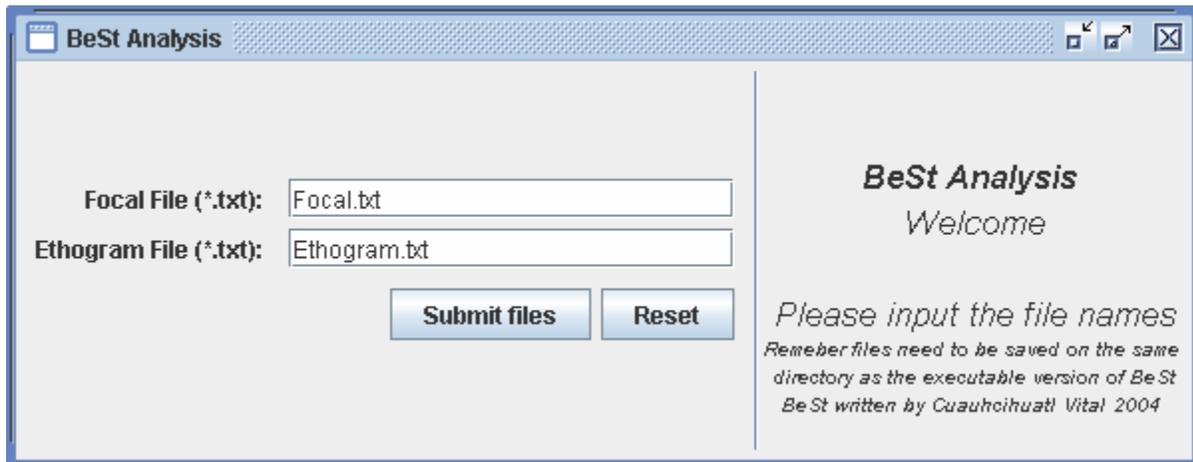
S→Stereotypy: predictability of behavior given sequence

T→ Overlap of information by pair of events. If an event were completely determined by the previous event, H2 would be zero, if an event were completely independent of the previous event, H2 will equal H1.

FINAL RECOMMENDATIONS

- Rename the out.txt file as soon as you get it, to avoid over-writing it with the next set of results. I suggest you rename it with the date and the name of the file you are working with. If possible, move the file to another folder where you can have safer access to it.
- Copy and paste the lag one probabilities into a spreadsheet (e.g., Microsoft Excel) file for better reading. The numbers are tab separated, and so should easily be transferred by the spreadsheet software into separate columns.

- Try to keep the folder where BeSt is stored as empty of other files as possible. This is not a requirement -- just a suggestion.
- Try the sample files first.
Download the sample files and save them in the same folder where BeSt is stored.
Run BeSt (just double click on it).
Enter the name of the files in the text fields and click on “Submit files”.



- Open the out.doc file in a Word processor (say “yes” to the conversion window pop-up), and take a look at the statistics
- If you have troubles getting the output, here are some things to try:
 - Input files: Check your input files against the sample files. Look for spaces, tabs or event extra lines. These can be causing the problem.
 - Computer: Sometimes, computers take a little time to assimilate completely the program. Thus, if you have just installed BeSt on your computer, you might wait for a few minutes and/or reboot before trying to run it. This usually happens with PCs.
 - None of the above: If BeSt was previously working fine and you were getting results, then you may have found a bug. If this happens, email me at cvital@indiana.edu with all the details of the problem and your input data files (focal and ethogram) so that I can try to help.