User Guide of Tracer 1.6.0

Walter Xie
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The new function of tracer allows analyzing values in 3 different trace types:

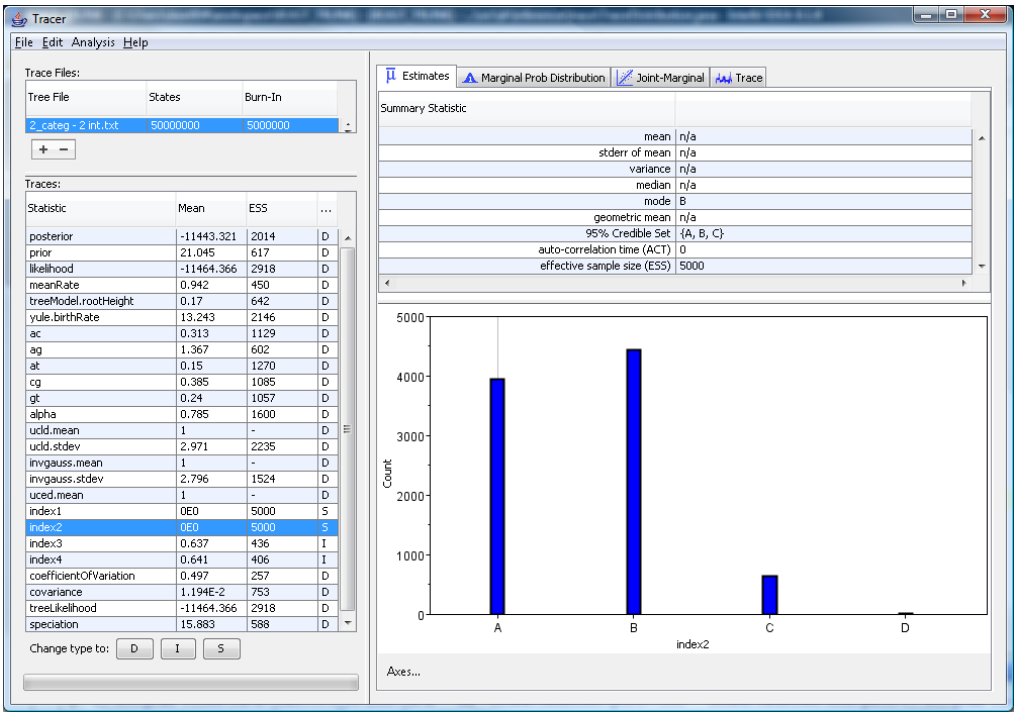
- Double (D),
- Integer (I),
- String (S).

1. Define Trace Type in Log File

The real (D) type is default. For other two types, the user needs to define in the top comment section of given log files. The format starts at keyword, *integer* or *string*, and follows by the set of trace names to be defined as this type, which are delimited by tab. For example:

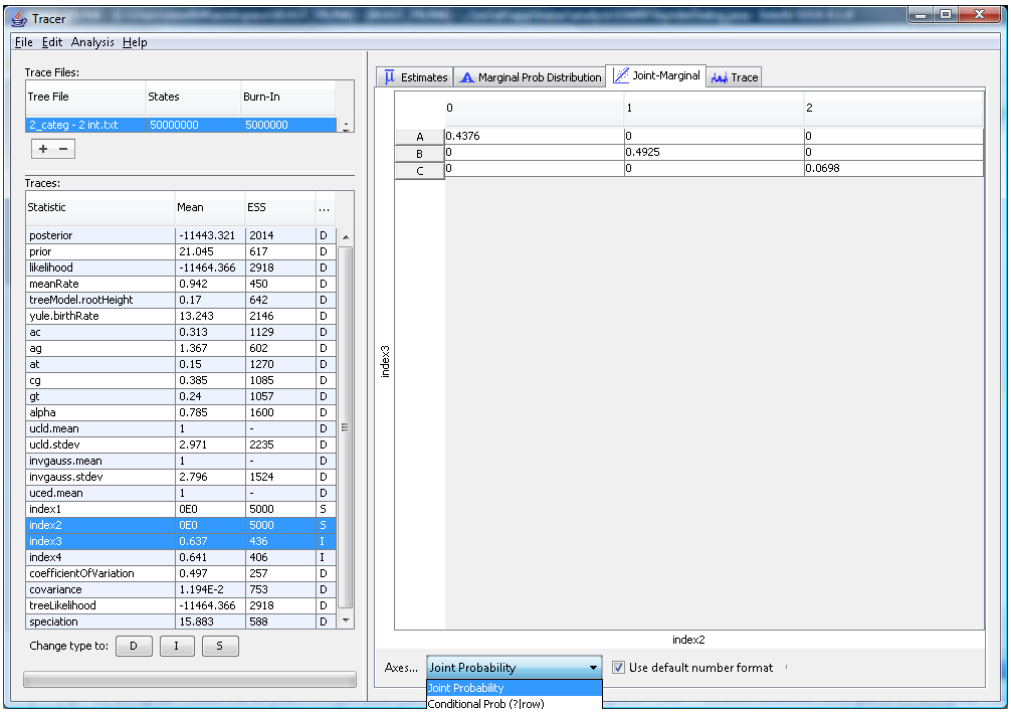
```
# … …
# string    index1      index2
# integer   index3      index4
state posterior         …     index1      index2      index3      index4
0     -18107.89569      …     A           B           0           0
5000  -11757.36321      …     C           C           2           2
10000 -11682.44755      …     C           A           2           2
15000 -11652.15645      …     C           A           2           1
… …
```

Alternatively, the trace type can be changed by clicking buttons: D, I, S on the bottom of **Statistic** table on the left side.



2. New Plot and Table on Joint-Marginal Panel

Go to **Joint-Marginal** panel and choose two traces in **Statistic** table on the left side, if their trace types are both discrete (*integer* or *string*), then a probability table will replace the plot. It also provides calculations for the marginal, joint, conditional probability and frequency count.

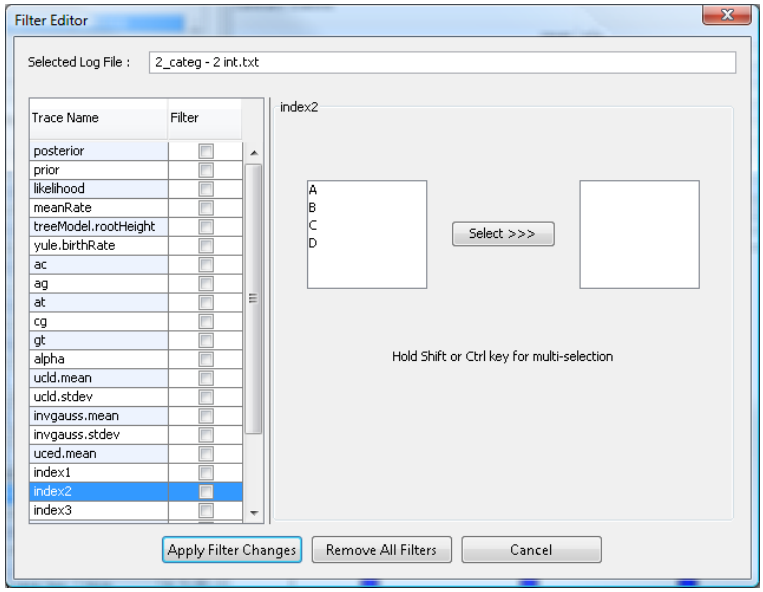


3. Filter To Find Conditional Posterior Distribution

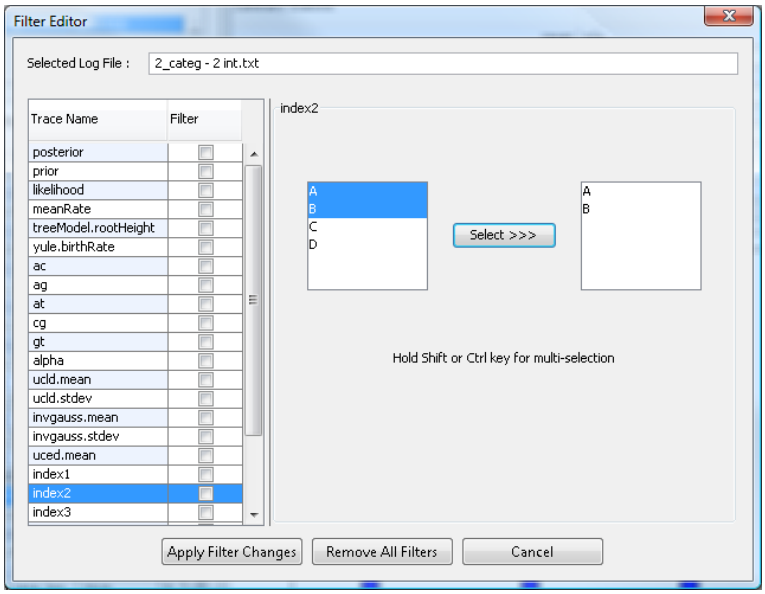
The purpose of filtering in Tracer is to provide:

1) Fairly general solution to looking at conditional posterior distributions;
2) Specifically, support for BSSVS forms of model averaging, in which some parameters are only in the likelihood when their submodel is "indicated" by some indicator function that is usually a discrete, integer or boolean variable. In that case the posterior of the parameter should not include the states when it was sampled only in the prior because the submodel it belonged to was "turned off". This is relevant for EBSP, Random Local Clocks model, microsatellite model averaging and relaxed clock model averaging methods all from my group in last couple of years. Also relevant for BSSVS in phylogeography as well depending on how the state is logged.

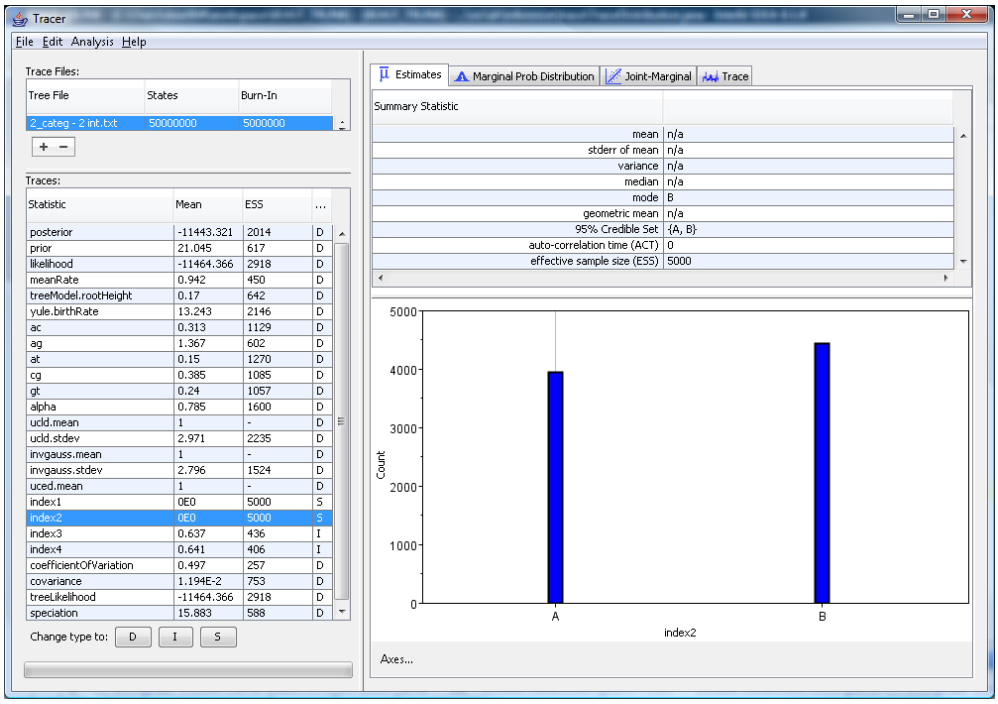
To create or edit filter(s), user needs to select one trace file each time and choose the option **Find Conditional Posterior Distribution …** in **Analysis** menu. And then **Filter Editor** dialog will be popped out.



Hold *Shift* or *Ctrl* key to select both **A** and B, and click **Apply Filter Changes**.



As it can be seen, trace **index2** only shows its value **A** and **B**. In fact, only the state whose trace **index2** contains value **A** or **B** is allowed to participate in the following analysis, and the analysis result is recalculated based on these states whose trace **index2** contains value **C** and **D** are filtered out.


Tracer
File Edit Analysis Help
Trace Files:
Tree File
States
Burn-In
2_categ - 2 int.txt
50000000
5000000
Traces:
Statistic
Mean
ESS
posterior -11443.321 2014 D
prior 21.045 617 D
likelihood -11464.366 2918 D
meanRate 0.942 450 D
treeModel.rootHeight 0.17 642 D
yule.birthRate 13.243 2146 D
ac 0.313 1129 D
ag 1.367 602 D
at 0.15 1270 D
cg 0.385 1085 D
gt 0.24 1057 D
alpha 0.785 1600 D
ucld.mean 1 - D
ucld.stdev 2.971 2235 D
invgauss.mean 1 - D
invgauss.stdev 2.796 1524 D
uced.mean 1 - D
index1 0E0 5000 S
index2 0E0 5000 S
index3 0.637 436 I
index4 0.641 406 I
coefficientOfVariation 0.497 257 D
covariance 1.194E-2 753 D
treeLikelihood -11464.366 2918 D
speciation 15.883 588 D
Change type to: D I S
Estimates
Marginal Prob Distribution
Joint-Marginal
Trace
Summary Statistic
mean n/a
stderr of mean n/a
variance n/a
median n/a
mode B
geometric mean n/a
95% Credible Set {A, B}
auto-correlation time (ACT) 0
effective sample size (ESS) 5000
5000
4000
3000
2000
1000
0
Count
A
B
index2
Axes...

Developer Note of Tracer 1.6.0

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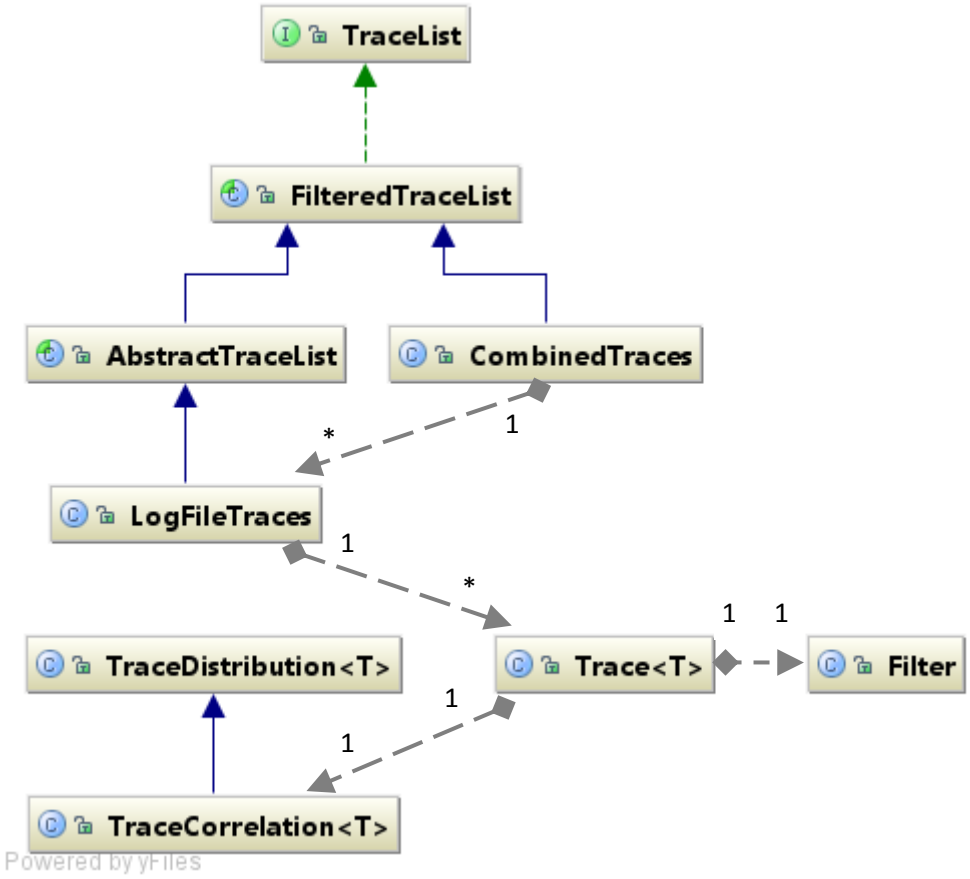
Class Diagram