Calculating the 3- and 4-tangles

This text documents using R to compute the explicit polynomial form of the "3-tangle" and "4-tangle" discussed in http://arxiv.org/abs/1211.3461. The main purpose of this code is to verify that the 3-tangle has 1,152 monomial terms while the 4-tangle has 431,424. The calculation of the 3-tangle takes seconds, while the calculation for the 4-tangle will take between 4-7 hours.

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Depends: Windows operating system.
                R package: "fastmatch" (http://cran.r-project.org/).

Due to memory constraints on a standard machine, the calculation proceeds in 24 batches from Windows cmd line.

The 4-tangle is a degree 8 polynomial in 64 variables. The variables are given as an array X_{ijk} where i,j,k range from 1 to 4. In the code we represent ijk as a unique 2-digit integer in the range 10 to 73 and express the degree 8 monomials as the integer obtained, after ordering, by concatenation.

i.e., $X_{111} \rightarrow 10$, $X_{112} \rightarrow 11$, $X_{113} \rightarrow 12$, ... , $X_{443} \rightarrow 72$, $X_{444} \rightarrow 73$

$$X_{111}(X_{112})^2 X_{113} X_{443} (X_{444})^3 \quad \rightarrow \quad 1011111272737373$$

The representation of the 3-tangle is analogous.

Files

reduceFunction.r	Single function "reduce()" that reduces polynomials (i.e. adds like terms). Depends on "fastmatch" package (otherwise is extremely slow).

3-tangle

3tangleCODE.r	The R code that computes the 3-tangle (depends on "reduce" function, see above).
3tangle.r	The final form of the 3-tangle.

4-tangle

R.bat	*.bat* file that points to the R executables. This file may need modification depending upon R installation file.
winCMD.r	Contains the 24 (identical) lines to paste to the Windows command line.
singlebatchCMD.r	The R code that controls each batch.

i1batch.r	Text file containing a single integer that tracks the batches. Must be initialized to 0.
tangleBatch.r	The R code that, for each batched part, computes the 4-tangle.
monos1.r, monos2.r	The monomial terms for each batched part of the 4-tangle.
cofs1.r, cofs2.r ...	The coefficients for *monos1.r*, *monos2.r etc.*
finalReduce.r	The R code that reads in each batched part and computes the final form of the 4-tangle.
4tangle.r	The final form of the 4-tangle.