

test_remark_bijection.r

max

2022-05-24

```
library(PhyloMarkovChains)
library(phangorn)
```

```
## Loading required package: ape
```

```
n <- 7
all.splits <- sapply(allSplits(n + 1), paste, collapse = "")
J <- length(all.splits)

all.trees <- allTrees(n, rooted = TRUE)
K <- length(all.trees)

compute <- FALSE

if(compute){
  comp.time <- system.time(
    SPR.mat <- as.matrix(rspr_matrix(all.trees) > 0) + 0
  )
  save(SPR.mat,
       file = paste0("SPR_matrix_n=", n, ".RData"))
}else{
  load(paste0("SPR_matrix_n=", n, ".RData"))
}

####
# Neighbourhood stuff
incidence.mat <- as.matrix(apply(SPR.mat, 2,
                                function(x) as.numeric(x==1)))

n.sizes.inc <- colSums(incidence.mat)
n.sizes.decomp <- unlist(lapply(all.trees,
                                function(t) neighbourhood_size(t)$n_size))

all.equal(n.sizes.inc, n.sizes.decomp)
```

```
## [1] TRUE
```

```
complete.Splits <- parallel::mclapply(all.trees, get_clades,
                                       mc.cores = 6)
```

```
complete.indexes <- parallel::mclapply(complete.Splits,
                                     function(x) charmatch(x, all.splits),
                                     mc.cores = 6)

complete.clade.matrix <- do.call(rbind, parallel::mclapply(complete.indexes,
                                                           clade_indicators,
                                                           L = J,
                                                           mc.cores = 6))

colnames(complete.clade.matrix) <- all.splits
colMeans(complete.clade.matrix)
```

```
##          1          2          12          3          13          23          123
## 1.00000000 1.00000000 0.09090909 1.00000000 0.09090909 0.09090909 0.03030303
##          4          14          24          124          34          134          234
## 1.00000000 0.09090909 0.09090909 0.03030303 0.09090909 0.03030303 0.03030303
##        1234          5          15          25          125          35          135
## 0.02164502 1.00000000 0.09090909 0.09090909 0.03030303 0.09090909 0.03030303
##        235        1235          45          145          245        1245          345
## 0.03030303 0.02164502 0.09090909 0.03030303 0.03030303 0.02164502 0.03030303
##        1345        2345        12345          6          16          26          126
## 0.02164502 0.02164502 0.03030303 1.00000000 0.09090909 0.09090909 0.03030303
##          36          136          236          1236          46          146          246
## 0.09090909 0.03030303 0.03030303 0.02164502 0.09090909 0.03030303 0.03030303
##        1246          346          1346          2346          12346          56          156
## 0.02164502 0.03030303 0.02164502 0.02164502 0.03030303 0.09090909 0.03030303
##        256        1256          356          1356          2356        12356          456
## 0.03030303 0.02164502 0.03030303 0.02164502 0.02164502 0.03030303 0.03030303
##        1456        2456        12456          3456          13456        23456        123456
## 0.02164502 0.02164502 0.03030303 0.02164502 0.03030303 0.03030303 0.09090909
##          7          17          27          127          37          137          237
## 1.00000000 0.09090909 0.09090909 0.03030303 0.09090909 0.03030303 0.03030303
##        1237          47          147          247          1247          347          1347
## 0.02164502 0.09090909 0.03030303 0.03030303 0.02164502 0.03030303 0.02164502
##        2347        12347          57          157          257        1257          357
## 0.02164502 0.03030303 0.09090909 0.03030303 0.03030303 0.02164502 0.03030303
##        1357        2357        12357          457          1457        2457        12457
## 0.02164502 0.02164502 0.03030303 0.03030303 0.02164502 0.02164502 0.03030303
##        3457        13457        23457        123457          67          167          267
## 0.02164502 0.03030303 0.03030303 0.09090909 0.09090909 0.03030303 0.03030303
##        1267          367          1367          2367          12367          467          1467
## 0.02164502 0.03030303 0.02164502 0.02164502 0.03030303 0.03030303 0.02164502
##        2467        12467          3467          13467          23467        123467          567
## 0.02164502 0.03030303 0.02164502 0.03030303 0.03030303 0.09090909 0.03030303
##        1567        2567        12567          3567          13567        23567        123567
## 0.02164502 0.02164502 0.03030303 0.02164502 0.03030303 0.03030303 0.09090909
##        4567        14567        24567        124567          34567        134567        234567
## 0.02164502 0.03030303 0.03030303 0.09090909 0.03030303 0.09090909 0.09090909
##        1234567
## 1.00000000
```

```
# colSums(complete.clade.matrix)
# cladeCorrelation::pclade(2, n)
```

```

clade <- "14"
clade.ind <- clade_index(x = clade, all.splits = all.splits)

S1.c.pos <- which(complete.clade.matrix[, clade.ind] == 1)

in.neighbourhood.pos <- apply(incidence.mat, 2,
                             function(x) which(x==1))

A1.c.pos <- lapply(in.neighbourhood.pos,
                  function(x) intersect(x, S1.c.pos))

A1.c.sizes <- unlist(lapply(A1.c.pos, length))

sizes.dt <- data.frame(
  tree = paste0("tree_", 1:K),
  neighbourhood_size = n.sizes.inc,
  A1c_size = A1.c.sizes
)

hasclade <- S1.c.pos

clade.nice <- paste0("t", strsplit(clade, "")[[1]])

parts <- lapply(all.trees[hasclade],
               safe_f_c, clade = clade.nice)

Nxprimes <- unlist(lapply(parts,
                         function(x) neighbourhood_size(x$x_prime)$n_size))

Ntauxcs <- unlist(lapply(parts,
                       function(x) neighbourhood_size(x$tau_x_c)$n_size))

cbind(sizes.dt[hasclade, ], Nxprimes + Ntauxcs)

```

##	tree	neighbourhood_size	A1c_size	Nxprimes + Ntauxcs
## 112	tree_112	82	50	50
## 113	tree_113	84	52	52
## 114	tree_114	82	52	52
## 116	tree_116	82	52	52
## 117	tree_117	84	52	52
## 118	tree_118	82	50	50
## 119	tree_119	82	50	50
## 120	tree_120	82	50	50
## 121	tree_121	78	48	48
## 123	tree_123	84	52	52
## 124	tree_124	82	50	50
## 125	tree_125	80	50	50
## 127	tree_127	82	52	52
## 128	tree_128	84	52	52
## 129	tree_129	84	52	52
## 130	tree_130	82	50	50
## 131	tree_131	82	50	50
## 132	tree_132	78	48	48

## 134	tree_134	82	52	52
## 135	tree_135	80	50	50
## 136	tree_136	78	50	50
## 138	tree_138	78	50	50
## 139	tree_139	82	52	52
## 140	tree_140	82	52	52
## 141	tree_141	82	52	52
## 142	tree_142	78	50	50
## 143	tree_143	76	48	48
## 156	tree_156	82	52	52
## 157	tree_157	82	52	52
## 158	tree_158	78	50	50
## 160	tree_160	78	50	50
## 161	tree_161	82	52	52
## 162	tree_162	82	52	52
## 163	tree_163	80	50	50
## 164	tree_164	78	50	50
## 165	tree_165	76	48	48
## 167	tree_167	84	52	52
## 168	tree_168	84	52	52
## 169	tree_169	82	52	52
## 171	tree_171	82	52	52
## 172	tree_172	82	50	50
## 173	tree_173	82	50	50
## 174	tree_174	82	50	50
## 175	tree_175	82	50	50
## 176	tree_176	78	48	48
## 178	tree_178	82	50	50
## 179	tree_179	84	52	52
## 180	tree_180	82	52	52
## 182	tree_182	82	52	52
## 183	tree_183	82	50	50
## 184	tree_184	82	50	50
## 185	tree_185	84	52	52
## 186	tree_186	82	50	50
## 187	tree_187	78	48	48
## 189	tree_189	78	48	48
## 190	tree_190	78	48	48
## 191	tree_191	76	48	48
## 193	tree_193	76	48	48
## 194	tree_194	78	48	48
## 195	tree_195	78	48	48
## 196	tree_196	82	52	52
## 197	tree_197	74	46	46
## 198	tree_198	74	46	46
## 211	tree_211	84	52	52
## 212	tree_212	82	50	50
## 213	tree_213	80	50	50
## 215	tree_215	82	52	52
## 216	tree_216	82	50	50
## 217	tree_217	82	50	50
## 218	tree_218	84	52	52
## 219	tree_219	84	52	52
## 220	tree_220	78	48	48

## 222	tree_222	82	50	50
## 223	tree_223	76	44	44
## 224	tree_224	74	44	44
## 226	tree_226	78	48	48
## 227	tree_227	78	46	46
## 228	tree_228	76	44	44
## 229	tree_229	76	44	44
## 230	tree_230	76	44	44
## 231	tree_231	74	44	44
## 233	tree_233	80	50	50
## 234	tree_234	74	44	44
## 235	tree_235	72	44	44
## 237	tree_237	74	46	46
## 238	tree_238	74	44	44
## 239	tree_239	74	44	44
## 240	tree_240	78	48	48
## 241	tree_241	72	44	44
## 242	tree_242	72	44	44
## 255	tree_255	82	52	52
## 256	tree_256	78	48	48
## 257	tree_257	74	46	46
## 259	tree_259	76	48	48
## 260	tree_260	78	48	48
## 261	tree_261	78	48	48
## 262	tree_262	78	48	48
## 263	tree_263	76	48	48
## 264	tree_264	74	46	46
## 266	tree_266	82	50	50
## 267	tree_267	78	46	46
## 268	tree_268	74	44	44
## 270	tree_270	78	48	48
## 271	tree_271	76	44	44
## 272	tree_272	76	44	44
## 273	tree_273	76	44	44
## 274	tree_274	76	44	44
## 275	tree_275	74	44	44
## 277	tree_277	82	50	50
## 278	tree_278	76	44	44
## 279	tree_279	74	44	44
## 281	tree_281	78	48	48
## 282	tree_282	76	44	44
## 283	tree_283	76	44	44
## 284	tree_284	78	46	46
## 285	tree_285	76	44	44
## 286	tree_286	74	44	44
## 288	tree_288	78	48	48
## 289	tree_289	74	44	44
## 290	tree_290	72	44	44
## 292	tree_292	74	46	46
## 293	tree_293	74	44	44
## 294	tree_294	74	44	44
## 295	tree_295	80	50	50
## 296	tree_296	72	44	44
## 297	tree_297	72	44	44

## 310	tree_310	82	52	52
## 311	tree_311	80	50	50
## 312	tree_312	78	50	50
## 314	tree_314	78	50	50
## 315	tree_315	82	52	52
## 316	tree_316	78	50	50
## 317	tree_317	82	52	52
## 318	tree_318	82	52	52
## 319	tree_319	76	48	48
## 321	tree_321	80	50	50
## 322	tree_322	74	44	44
## 323	tree_323	72	44	44
## 325	tree_325	74	46	46
## 326	tree_326	78	48	48
## 327	tree_327	72	44	44
## 328	tree_328	74	44	44
## 329	tree_329	74	44	44
## 330	tree_330	72	44	44
## 332	tree_332	78	50	50
## 333	tree_333	72	44	44
## 334	tree_334	70	44	44
## 336	tree_336	70	44	44
## 337	tree_337	76	48	48
## 338	tree_338	70	44	44
## 339	tree_339	74	46	46
## 340	tree_340	70	44	44
## 341	tree_341	70	44	44
## 354	tree_354	78	50	50
## 355	tree_355	74	46	46
## 356	tree_356	70	44	44
## 358	tree_358	70	44	44
## 359	tree_359	76	48	48
## 360	tree_360	70	44	44
## 361	tree_361	72	44	44
## 362	tree_362	70	44	44
## 363	tree_363	70	44	44
## 365	tree_365	82	52	52
## 366	tree_366	78	48	48
## 367	tree_367	76	48	48
## 369	tree_369	76	48	48
## 370	tree_370	78	48	48
## 371	tree_371	74	46	46
## 372	tree_372	78	48	48
## 373	tree_373	78	48	48
## 374	tree_374	74	46	46
## 376	tree_376	78	50	50
## 377	tree_377	72	44	44
## 378	tree_378	70	44	44
## 380	tree_380	70	44	44
## 381	tree_381	74	46	46
## 382	tree_382	70	44	44
## 383	tree_383	76	48	48
## 384	tree_384	70	44	44
## 385	tree_385	70	44	44

## 387	tree_387	76	48	48
## 388	tree_388	72	44	44
## 389	tree_389	70	44	44
## 391	tree_391	70	44	44
## 392	tree_392	74	46	46
## 393	tree_393	70	44	44
## 394	tree_394	78	50	50
## 395	tree_395	70	44	44
## 396	tree_396	70	44	44
## 508	tree_508	82	52	52
## 509	tree_509	82	52	52
## 510	tree_510	78	50	50
## 512	tree_512	78	50	50
## 513	tree_513	80	50	50
## 514	tree_514	78	50	50
## 515	tree_515	82	52	52
## 516	tree_516	82	52	52
## 517	tree_517	76	48	48
## 519	tree_519	82	52	52
## 520	tree_520	78	48	48
## 521	tree_521	74	46	46
## 523	tree_523	76	48	48
## 524	tree_524	78	48	48
## 525	tree_525	76	48	48
## 526	tree_526	78	48	48
## 527	tree_527	78	48	48
## 528	tree_528	74	46	46
## 530	tree_530	78	50	50
## 531	tree_531	74	46	46
## 532	tree_532	70	44	44
## 534	tree_534	70	44	44
## 535	tree_535	72	44	44
## 536	tree_536	70	44	44
## 537	tree_537	76	48	48
## 538	tree_538	70	44	44
## 539	tree_539	70	44	44
## 552	tree_552	78	50	50
## 553	tree_553	76	48	48
## 554	tree_554	70	44	44
## 556	tree_556	70	44	44
## 557	tree_557	74	46	46
## 558	tree_558	70	44	44
## 559	tree_559	72	44	44
## 560	tree_560	70	44	44
## 561	tree_561	70	44	44
## 563	tree_563	80	50	50
## 564	tree_564	78	48	48
## 565	tree_565	72	44	44
## 567	tree_567	74	46	46
## 568	tree_568	74	44	44
## 569	tree_569	72	44	44
## 570	tree_570	74	44	44
## 571	tree_571	74	44	44
## 572	tree_572	72	44	44

## 574	tree_574	78	50	50
## 575	tree_575	76	48	48
## 576	tree_576	70	44	44
## 578	tree_578	70	44	44
## 579	tree_579	72	44	44
## 580	tree_580	70	44	44
## 581	tree_581	74	46	46
## 582	tree_582	70	44	44
## 583	tree_583	70	44	44
## 585	tree_585	76	48	48
## 586	tree_586	74	46	46
## 587	tree_587	70	44	44
## 589	tree_589	70	44	44
## 590	tree_590	72	44	44
## 591	tree_591	70	44	44
## 592	tree_592	78	50	50
## 593	tree_593	70	44	44
## 594	tree_594	70	44	44
## 607	tree_607	78	48	48
## 608	tree_608	78	48	48
## 609	tree_609	76	48	48
## 611	tree_611	76	48	48
## 612	tree_612	82	52	52
## 613	tree_613	74	46	46
## 614	tree_614	78	48	48
## 615	tree_615	78	48	48
## 616	tree_616	74	46	46
## 618	tree_618	78	48	48
## 619	tree_619	74	44	44
## 620	tree_620	72	44	44
## 622	tree_622	74	46	46
## 623	tree_623	80	50	50
## 624	tree_624	72	44	44
## 625	tree_625	74	44	44
## 626	tree_626	74	44	44
## 627	tree_627	72	44	44
## 629	tree_629	76	48	48
## 630	tree_630	72	44	44
## 631	tree_631	70	44	44
## 633	tree_633	70	44	44
## 634	tree_634	78	50	50
## 635	tree_635	70	44	44
## 636	tree_636	74	46	46
## 637	tree_637	70	44	44
## 638	tree_638	70	44	44
## 651	tree_651	76	48	48
## 652	tree_652	74	46	46
## 653	tree_653	70	44	44
## 655	tree_655	70	44	44
## 656	tree_656	78	50	50
## 657	tree_657	70	44	44
## 658	tree_658	72	44	44
## 659	tree_659	70	44	44
## 660	tree_660	70	44	44

## 662	tree_662	82	52	52
## 663	tree_663	80	50	50
## 664	tree_664	78	50	50
## 666	tree_666	78	50	50
## 667	tree_667	82	52	52
## 668	tree_668	78	50	50
## 669	tree_669	82	52	52
## 670	tree_670	82	52	52
## 671	tree_671	76	48	48
## 673	tree_673	74	46	46
## 674	tree_674	72	44	44
## 675	tree_675	70	44	44
## 677	tree_677	70	44	44
## 678	tree_678	78	50	50
## 679	tree_679	70	44	44
## 680	tree_680	76	48	48
## 681	tree_681	70	44	44
## 682	tree_682	70	44	44
## 684	tree_684	74	46	46
## 685	tree_685	72	44	44
## 686	tree_686	70	44	44
## 688	tree_688	70	44	44
## 689	tree_689	76	48	48
## 690	tree_690	70	44	44
## 691	tree_691	78	50	50
## 692	tree_692	70	44	44
## 693	tree_693	70	44	44
## 3577	tree_3577	78	44	44
## 3578	tree_3578	82	48	48
## 3579	tree_3579	78	44	44
## 3581	tree_3581	82	50	50
## 3582	tree_3582	80	46	46
## 3583	tree_3583	78	44	44
## 3584	tree_3584	78	44	44
## 3585	tree_3585	78	44	44
## 3586	tree_3586	76	44	44
## 3588	tree_3588	82	48	48
## 3589	tree_3589	82	48	48
## 3590	tree_3590	80	46	46
## 3592	tree_3592	84	52	52
## 3593	tree_3593	82	48	48
## 3594	tree_3594	82	48	48
## 3595	tree_3595	82	48	48
## 3596	tree_3596	82	48	48
## 3597	tree_3597	78	46	46
## 3599	tree_3599	78	44	44
## 3600	tree_3600	80	46	46
## 3601	tree_3601	78	44	44
## 3603	tree_3603	82	50	50
## 3604	tree_3604	78	44	44
## 3605	tree_3605	78	44	44
## 3606	tree_3606	82	48	48
## 3607	tree_3607	78	44	44
## 3608	tree_3608	76	44	44

## 3621 tree_3621	82	50	50
## 3622 tree_3622	84	52	52
## 3623 tree_3623	82	50	50
## 3625 tree_3625	82	52	52
## 3626 tree_3626	82	50	50
## 3627 tree_3627	82	50	50
## 3628 tree_3628	84	52	52
## 3629 tree_3629	82	52	52
## 3630 tree_3630	78	48	48
## 3632 tree_3632	80	46	46
## 3633 tree_3633	82	48	48
## 3634 tree_3634	78	44	44
## 3636 tree_3636	82	50	50
## 3637 tree_3637	78	44	44
## 3638 tree_3638	78	44	44
## 3639 tree_3639	78	44	44
## 3640 tree_3640	78	44	44
## 3641 tree_3641	76	44	44
## 3643 tree_3643	78	44	44
## 3644 tree_3644	82	48	48
## 3645 tree_3645	78	44	44
## 3647 tree_3647	82	50	50
## 3648 tree_3648	78	44	44
## 3649 tree_3649	78	44	44
## 3650 tree_3650	80	46	46
## 3651 tree_3651	78	44	44
## 3652 tree_3652	76	44	44
## 3654 tree_3654	76	44	44
## 3655 tree_3655	78	46	46
## 3656 tree_3656	76	44	44
## 3658 tree_3658	78	48	48
## 3659 tree_3659	76	44	44
## 3660 tree_3660	76	44	44
## 3661 tree_3661	82	50	50
## 3662 tree_3662	74	44	44
## 3663 tree_3663	74	44	44
## 3676 tree_3676	82	48	48
## 3677 tree_3677	82	48	48
## 3678 tree_3678	80	46	46
## 3680 tree_3680	84	52	52
## 3681 tree_3681	82	48	48
## 3682 tree_3682	82	48	48
## 3683 tree_3683	82	48	48
## 3684 tree_3684	82	48	48
## 3685 tree_3685	78	46	46
## 3687 tree_3687	82	48	48
## 3688 tree_3688	78	44	44
## 3689 tree_3689	78	44	44
## 3691 tree_3691	82	50	50
## 3692 tree_3692	80	46	46
## 3693 tree_3693	78	44	44
## 3694 tree_3694	78	44	44
## 3695 tree_3695	78	44	44
## 3696 tree_3696	76	44	44

## 3698 tree_3698	80	46	46
## 3699 tree_3699	78	44	44
## 3700 tree_3700	78	44	44
## 3702 tree_3702	82	50	50
## 3703 tree_3703	78	44	44
## 3704 tree_3704	78	44	44
## 3705 tree_3705	82	48	48
## 3706 tree_3706	78	44	44
## 3707 tree_3707	76	44	44
## 3720 tree_3720	84	52	52
## 3721 tree_3721	82	50	50
## 3722 tree_3722	82	50	50
## 3724 tree_3724	82	52	52
## 3725 tree_3725	82	50	50
## 3726 tree_3726	82	50	50
## 3727 tree_3727	84	52	52
## 3728 tree_3728	82	52	52
## 3729 tree_3729	78	48	48
## 3731 tree_3731	82	48	48
## 3732 tree_3732	80	46	46
## 3733 tree_3733	78	44	44
## 3735 tree_3735	82	50	50
## 3736 tree_3736	78	44	44
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## 3738 tree_3738	78	44	44
## 3739 tree_3739	78	44	44
## 3740 tree_3740	76	44	44
## 3742 tree_3742	82	48	48
## 3743 tree_3743	78	44	44
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## 3746 tree_3746	82	50	50
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## 3748 tree_3748	78	44	44
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## 3751 tree_3751	76	44	44
## 3753 tree_3753	78	46	46
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## 3758 tree_3758	76	44	44
## 3759 tree_3759	76	44	44
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## 3762 tree_3762	74	44	44
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## 3781 tree_3781	78	44	44
## 3782 tree_3782	78	44	44
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## 3784 tree_3784	76	44	44

## 3786 tree_3786	80	46	46
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## 3788 tree_3788	78	44	44
## 3790 tree_3790	82	50	50
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## 3795 tree_3795	76	44	44
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## 3805 tree_3805	78	44	44
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## 3859 tree_3859	82	50	50
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## 4045 tree_4045	78	50	50
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## 4054 tree_4054	76	48	48
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## 4076 tree_4076	78	48	48
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## 4085 tree_4085	76	44	44
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## 4125 tree_4125	74	46	46
## 4127 tree_4127	82	50	50
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## 4132 tree_4132	84	52	52
## 4133 tree_4133	80	50	50
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## 4153 tree_4153	74	46	46
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## 7095 tree_7095	74	46	46

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## 7106 tree_7106	74	44	44
## 7108 tree_7108	76	44	44
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## 7115 tree_7115	78	46	46
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## 7126 tree_7126	80	50	50
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## 7128 tree_7128	72	44	44
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## 7147 tree_7147	84	52	52
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## 7158 tree_7158	82	50	50
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## 7169 tree_7169	82	52	52
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## 7191 tree_7191	82	52	52
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## 7198 tree_7198	82	52	52
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## 7219 tree_7219	78	48	48
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## 7621 tree_7621	78	50	50
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