Bioinformatics - Tree Comparison Project 3

Peter Gabrielsen 20114179 Christoffer Hansen 20114637

December 8, 2015

1/4 Approximation - Results

hp-string 1

hhppppphhppphp flfrrflffrrflrrlf

hphphhhppphhhhpphh ffffffrrffflrrl

Score: 5

hp-string 3

phpphphhhphhphhhhh ffffffffffffffff

Score: 4

hp-string 4

hphpphhphpphphhpphph fflrrlfffrrfflrrlff

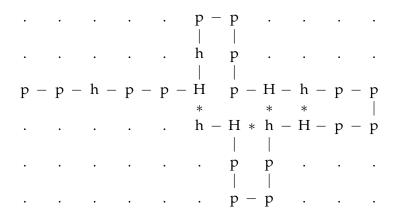
hhhpphphphphphphphphflrrlfffffffff

Score: 3

hp-string 6

hhpphpphpphpphpphpphh lrrllfrrflfrrlfrrfllrrl

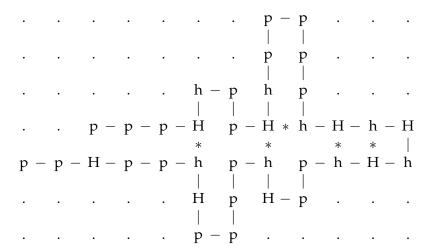
pphpphhpppphhpppphh ffffffrrflffrrfflfrrfl

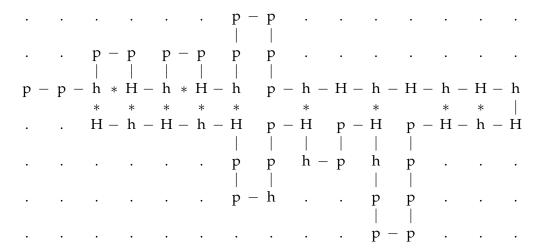


Score: 4

hp-string 8

ppphhpphhpppphhhhhhhhhpphhppphhpphpp ffflrrllffrrfflffrrfflrrllfrrflfff





Score: 11

hp-string 10

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Score: 20

hp-string 12

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Our folding approach

Bruteforce for n < 20

Algorithm 1 Bruteforce

```
    for all possible foldings x do
    if x is valid folding then
    get score of folding
    if score is the best then
    store the path and score
    end if
    end for
```

Sampling for $n \ge 20$

Algorithm 2 SAMPLING WITH DFS

- 1: while long time is not long anymore do
- 2: generate valid random folding using DFS
- 3: get score of folding
- 4: **if** score is the best **then**
- 5: store the path and score
- 6: end if
- 7: end while

hhppppphhppphpphp nwsseeneenwwnnwsw

hphphhhppphhhhpphh nwnwswwssenessenn

Score: 8

hp-string 3

phpphphhhphhphhhhh nwnenenessswwnen

hphpphhphpphphhpphph nwwseswssenenesennw

hhhpphphphphphphphph nwwseseenenwnwnwwse

Score: 10

hp-string 6

hhpphpphpphpphpphpphh ssenenwnwwnwswsessennn

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Score: 7

hp-string 8

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Score: 17

hp-string 10

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  h - H - h * H
- H - h - H * h - p - p
          h - H
                - h * H - h
              h * H
                       p
                           p - h - p
                 - h * H * h
                - H * h - H * h
          p
                   h - H -
                           h
                                    1
                         - H
                       h
                                   p
                       H - h - H - p
```

Results

Approximation

| | score | time | fold |
|----|------------|------|---|
| 1 | -2 | <1ms | flfrrflffrrflrrlf |
| 2 | <i>-</i> 5 | <1ms | fffffffrrfffflrrl |
| 3 | -4 | <1ms | fffffffffffffffffffffffffffffffffffffff |
| 4 | <i>-</i> 5 | <1ms | fflrrlfffrrfflrrlff |
| 5 | -3 | <1ms | flrrlfffffrfffff |
| 6 | -4 | <1ms | lrrllfrrflfrrfllrrl |
| 7 | -4 | <1ms | ffffflfrrflfffrrffl |
| 8 | <i>-</i> 5 | <1ms | ffflrrllffrrfflffrrflffff |
| 9 | -11 | <1ms | fflrrllrrllfrrflfffffrrffllrrllfrrflfff |
| 10 | -12 | <1ms | fffffffffffffffffffffffffffffffffffffff |
| 11 | -20 | <1ms | ffflrrlffffffrrlfffffffffffffffffffffff |
| 12 | -20 | <1ms | fffffffffffffffrrllrrllfrrflfrrfllrrllrrlffffff |
| 13 | -25 | <1ms | ffflfrrflffffffffffffffffffffffffffffff |
| 14 | -25 | <1ms | fffffffffffffffffffffffffffrrfllrrlfflrrlffffrrfflrrlffffff |
| 15 | -24 | <1ms | ffflrrlfflrrlfffflrrlffffffffffffffrrlffffrrlffffrrlffffff |

Bruteforce and Sampling

| | score | time | fold |
|----|-------|-------|---|
| 1 | -4 | 55s | nwsseeneenwwnnwsw |
| 2 | -8 | 1m10s | nwnwswwssenessenn |
| 3 | -9 | 1m16s | nwneneessswwnen |
| 4 | -9 | 6m50s | nwwseswssenenesennw |
| 5 | -10 | 6m55s | nwwseseenenwnwwwse |
| 6 | -9 | 1m53s | ssenenwnwwnwswsesssennn |
| 7 | -7 | 6m34s | enwnenwneessssenneennwsw |
| 8 | -12 | n/a | nwswwseswssenesennwneesseeswwsswnws |
| 9 | -17 | n/a | nesseswseseeneenwwnwswnneneseseneseneseswwwse |
| 10 | -17 | n/a | swnwnnnwsswnnwnennessennesseeessessswwnenwnwnwsse |
| 11 | -28 | n/a | wwnnnwwseswwnwsseeesswnwssseneseeswwseeennnwnwswnnnesee |
| 12 | -28 | n/a | nneeeswwsswwnwwwnwswnwneeeeseenwneeeneseeesseswsesw |
| 13 | -39 | n/a | nwnnwseswseswwnnnwnwswssenesswsssenneeeennnesseswssseenwnennnessseeennwswnnnwswnnw |
| 14 | -30 | n/a | swnneeneseeswwwssswswwwneenwnwwsswnnwneenwneneenwwnwwwwneeeesennwnnnwswnwsseeswwwwwwseswwwseeeeee |
| 15 | -31 | n/a | sseneeeenvnunnneeeswwsesessennennunennnwwseswwwwwssswwwwsswsseneenvneessswwswseesswwwnnunwwsesess |