Matt Elgart- Boggle Analysis

Runtimes for different lexicon implementations:

SimpleLexicon

LexiconFirstAutoPlayer

4x4

100 boards: 5.371000 sec
1,000 boards: 52.485000 sec
10,000 boards: 524.326000 sec
100,000 boards (prediction): ~5,200 sec
1,000,000 boards (prediction): ~52,000 sec

5x5

100 boards: 6.025000 sec
1,000 boards: 60.195000 sec
10,000 boards: 608.952000 sec
100,000 boards (prediction): ~6,000 sec
1,000,000 boards (prediction): ~60,000 sec

BoardFirstAutoPlayer

4x4

100 boards: 1.038000 sec
1,000 boards: 7.750000 sec
10,000 boards: 76.202000 sec
100,000 boards (prediction): ~760 sec
1,000,000 boards (prediction): ~7,600 sec

5x5

100 boards: 2.390000 sec
1,000 boards: 21.908000 sec
10,000 boards: 217.233000 sec
100,000 boards (prediction): ~2,200 sec
1,000,000 boards (prediction): ~22,000 sec

TrieLexicon

LexiconFirstAutoPlayer

4x4

100 boards: 8.747000 sec
1,000 boards: 84.284000 sec
10,000 boards: 836.601000 sec
100,000 boards (prediction): ~8,300 sec
1,000,000 boards (prediction): ~83,000 sec

5x5

100 boards: 9.568000 sec
1,000 boards: 92.041000 sec

10,000 boards: 923.769000 sec
100,000 boards (prediction): ~9,200 sec
1,000,000 boards (prediction): ~92,000 sec

BoardFirstAutoPlayer

4x4

100 boards: 0.552000 sec
1,000 boards: 3.722000 sec
10,000 boards: 35.082000 sec
100,000 boards (prediction): ~350 sec
1,000,000 boards (prediction): ~3,500 sec

5x5

100 boards: 1.167000 sec
1,000 boards: 9.907000 sec
10,000 boards: 98.183000 sec
100,000 boards (prediction): ~980 sec
1,000,000 boards (prediction): ~9,800 sec

BinarySearchLexicon

LexiconFirstAutoPlayer

4x4

100 boards: 5.146000 sec
1,000 boards: 51.500000 sec
10,000 boards: 518.765000 sec
100,000 boards (prediction): ~5,200 sec
1,000,000 boards (prediction): ~52,000 sec

5x5

100 boards: 5.910000 sec
1,000 boards: 59.699000 sec
10,000 boards: 597.455000 sec
100,000 boards (prediction): ~6,000 sec
1,000,000 boards (prediction): ~60,000 sec

BoardFirstAutoPlayer

4x4

100 boards: 0.714000 sec
1,000 boards: 5.329000
10,000 boards: 50.697000 sec
100,000 boards (prediction): ~500 sec
1,000,000 boards (prediction): ~5,000 sec

5x5

100 boards: 1.596000 sec

1,000 boards: 14.219000 sec
10,000 boards: 143.228000 sec
100,000 boards (prediction): ~1,400 sec
1,000,000 boards (prediction): ~14,000 sec

Extra Credit: CompressedTrieLexicon

LexiconFirstAutoPlayer

4x4

100 boards: 6.523000 sec
1,000 boards: 63.714000 sec
10,000 boards: 627.838000 sec
100,000 boards (prediction): ~6,300 sec
1,000,000 boards (prediction): ~63,000 sec

5x5

100 boards: 7.165000 sec
1,000 boards: 70.392000 sec
10,000 boards: 698.038000 sec
100,000 boards (prediction): ~7,000 sec
1,000,000 boards (prediction): ~70,000 sec

BoardFirstAutoPlayer

4x4

100 boards: 0.540000 sec
1,000 boards: 3.127000 sec
10,000 boards: 29.044000 sec
100,000 boards (prediction): ~300 sec
1,000,000 boards (prediction): ~3,000 sec

5x5

100 boards: 1.171000 sec
1,000 boards: 8.388000 sec
10,000 boards: 103.237000 sec
100,000 boards (prediction): ~1,000 sec
1,000,000 boards (prediction): ~10,000 sec

Based on these times from BoggleStats, the TrieLexicon has the shortest runtime, followed by the CompressedTrieLexicon, the BinarySearchLexicon, and then the SimpleLexicon. Therefore, the TrieLexicon implementation seems to be the fastest.

Furthermore, we can use these runtimes to make predictions on how fast the implementations will be able to solve 100,000 or 1,000,000 Boggle boards. These predictions are shown above.

Based on 50,000 solved boards, the following were found to be the boards with the highest possible scores (most possible words):

4x4 (score 1011):

```
c  l  i  t
s  m  e  r
b  d  a  s
c  l  e  h
```

5x5 (score 2120):

```
p  a  c  o  d
o  x  s  e  r
a  t  n  t  r
n  i  e  a  s
d  r  n  c  e
```