Marking Trees

Lab Report: Marking Trees

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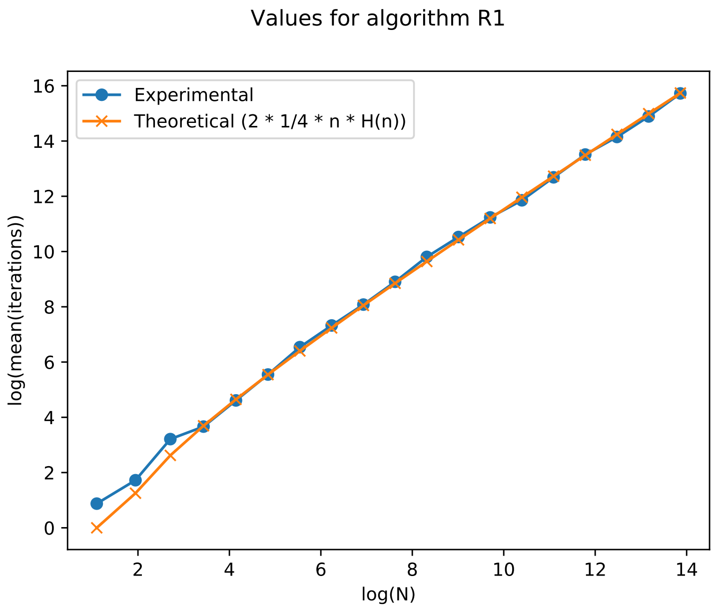
Results

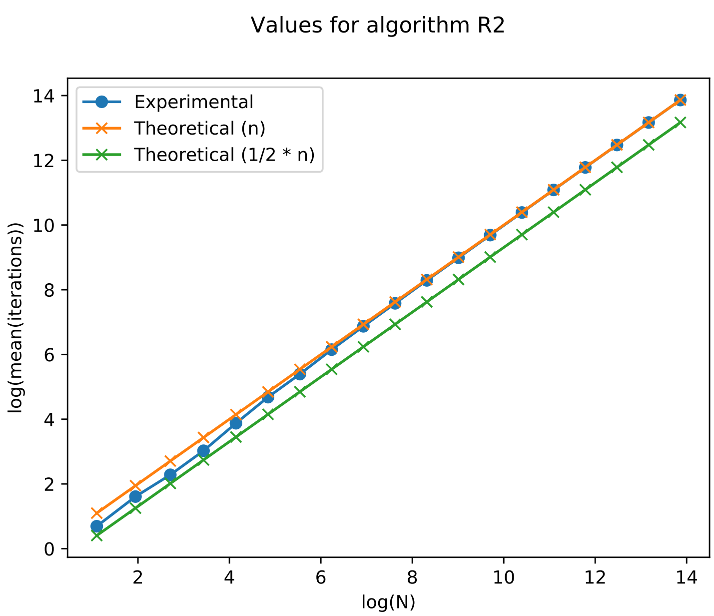
For $i \in \{1, 2, 3\}$, the number of rounds R_i spent until the tree is completely marked in process i is given in the following table. The table shows the result of 24 repeated trails.

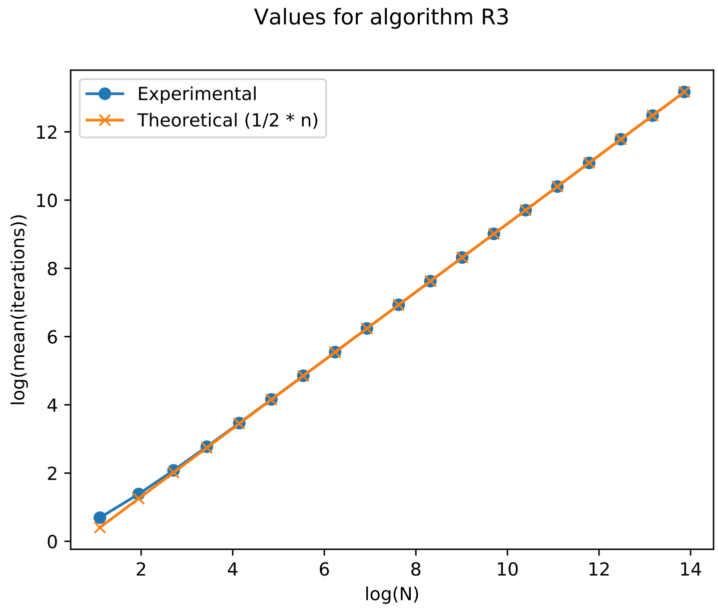
In the last column, report the expected value of R_1 for each N, using the formula derived from your theoretical analysis in the following section

N	R_1	R_2	R_3	$\mathbf{E}[R_1]$
3	2.40e+00 ± 8.00e-01	2.00e+00	2.00e+00	0.00e+00
7	5.60e+00 ± 1.85e+00	5.00e+00 ± 8.94e-01	4.00e+00	3.50e+00
15	2.48e+01 ± 1.00e+01	9.80e+00 ± 1.17e+00	8.00e+00	1.38e+01
31	3.90e+01 ± 9.94e+00	2.06e+01 ± 1.36e+00	1.60e+01	4.02e+01
63	1.01e+02 ± 2.01e+01	4.82e+01 ± 7.47e+00	3.20e+01	1.05e+02
127	2.57e+02 ± 2.69e+01	1.08e+02 ± 4.82e+00	6.40e+01	2.56e+02
255	6.92e+02 ± 2.43e+02	2.20e+02 ± 1.08e+01	1.28e+02	6.03e+02
511	1.52e+03 ± 2.37e+02	4.69e+02 ± 5.61e+00	2.56e+02	1.39e+03
1023	3.23e+03 ± 4.80e+02	9.63e+02 ± 4.91e+01	5.12e+02	3.13e+03
2047	7.36e+03 ± 1.68e+03	1.96e+03 ± 5.15e+01	1.02e+03	6.97e+03
4095	1.82e+04 ± 3.27e+03	3.98e+03 ± 3.25e+01	2.05e+03	1.54e+04
8191	3.73e+04 ± 3.78e+03	8.00e+03 ± 1.01e+02	4.10e+03	3.36e+04
16383	7.58e+04 ± 4.11e+03	1.61e+04 ± 1.98e+02	8.19e+03	7.29e+04
32767	1.41e+05 ± 1.31e+04	3.24e+04 ± 2.19e+02	1.64e+04	1.57e+05
65535	3.23e+05 ± 2.61e+04	6.51e+04 ± 1.66e+02	3.28e+04	3.37e+05
131071	7.38e+05 ± 8.30e+04	1.31e+05 ± 2.71e+02	6.55e+04	7.19e+05
262143	1.39e+06 ± 1.12e+05	2.61e+05 ± 4.98e+02	1.31e+05	1.53e+06
524287	2.93e+06 ± 1.59e+05	5.23e+05 ± 4.30e+02	2.62e+05	3.24e+06
1048575	6.74e+06 ± 5.83e+05	1.05e+06 ± 4.51e+02	5.24e+05	6.84e+06

Analysis


Values for algorithm R1
Experimental
Theoretical (2 * 1/4 * n * H(n))
log(mean(iterations))
log(N)


Values for algorithm R2
Experimental
Theoretical (n)
Theoretical (1/2 * n)
log(mean(iterations))
log(N)



Our experimental data indicates that $\mathbf{E}[R_1] = 2\frac{1}{4} \cdot nH_n = \frac{n}{2}H_n$ $\mathbf{E}[R_2]$ is bounded by: $\frac{n}{2} \leq \mathbf{E}[R_2] \leq n$, and $\mathbf{E}[R_3] = \frac{n}{2}$.

Theoretically, the behaviour of R_1 can be explained as follows: $\cdots$