decrease_key.R

Preston

2020-05-23

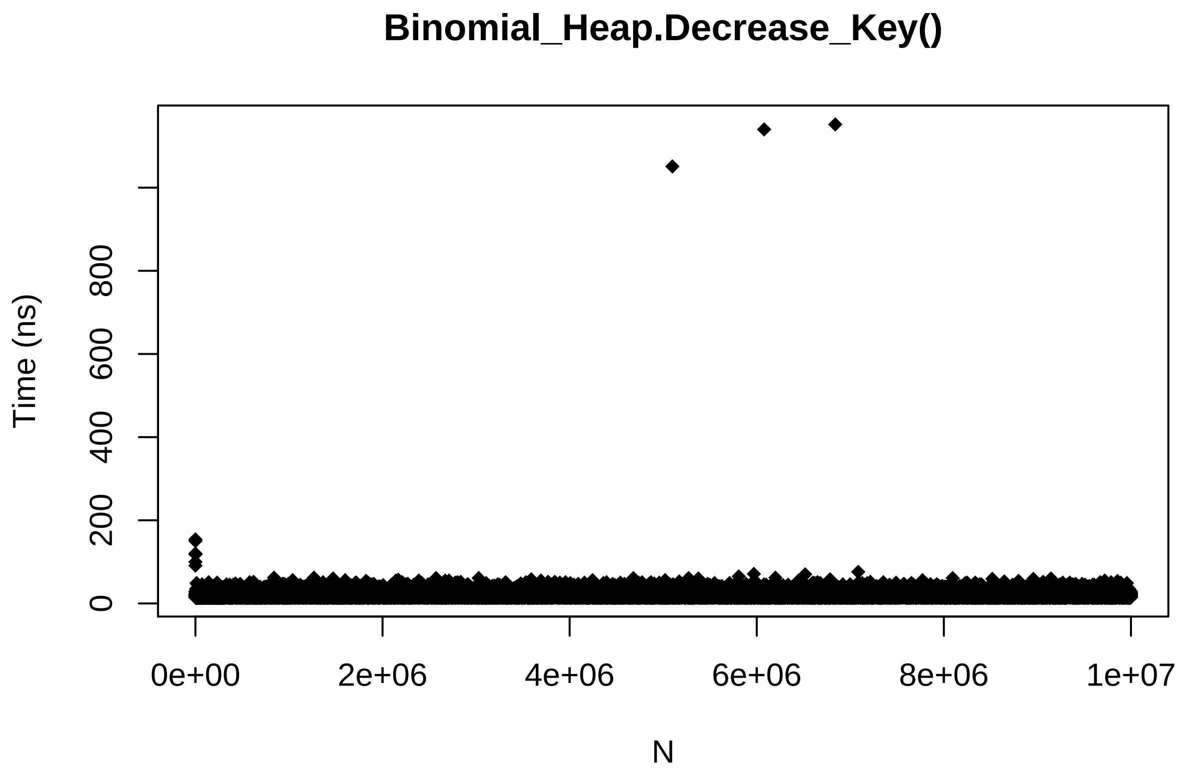
```r
# Preston Dunton
# CS320 Honors Option
# May 23, 2020
# pdunton@rams.colostate.edu

# Minimum() in a binomial heap should be O(logn)

decrease_key_binomial = read.csv("./decrease_key_binomial.csv")
attach(decrease_key_binomial)
```

```
## The following object is masked from package:base:
##
##     T
```

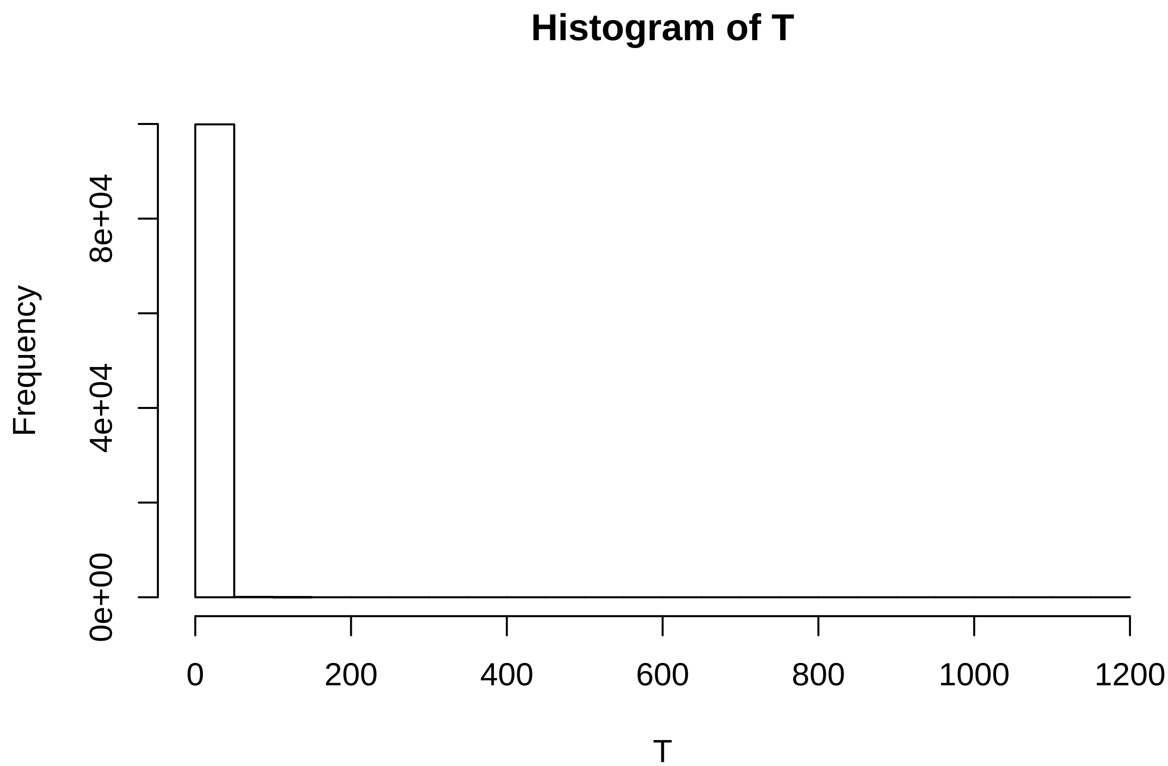
```r
summary(T)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   14.00   15.00   19.00   19.75   21.00 1152.00
```

```r
# min 14
# q1 15
# median 19
# mean 19.75
# q3 21
# max 1152
plot(N,T,pch=18,xlab="N",ylab="Time (ns)",main="Binomial_Heap.Decrease_Key()")
```




```
hist(T,breaks=30)
```




```r
# Let's see if we can remove some outliers

quantile(T,seq(0,1,0.1))
```

```
##   0%  10%  20%  30%  40%  50%  60%  70%  80%  90% 100%
##   14   15   15   16   16   19   20   21   24   26 1152
```

```r
quantile(T,seq(0.9,1,0.01))
```

```
##  90%  91%  92%  93%  94%  95%  96%  97%  98%  99% 100%
##   26   27   28   29   30   30   31   32   35   37 1152
```

```r
quantile(T,seq(0.99,1,0.001))
```

```
##   99% 99.1% 99.2% 99.3% 99.4% 99.5% 99.6% 99.7% 99.8% 99.9%  100%
##    37    38    39    40    40    41    41    43    46    50  1152
```

```r
quantile(T,seq(0.999,1,0.0001))
```

```
##     99.9%    99.91%    99.92%    99.93%    99.94%    99.95%    99.96%    99.97%
##   50.0000   50.0000   50.0000   51.0000   51.0000   53.0000   55.0000   56.0006
##    99.98%    99.99%      100%
##   61.0000   76.0030 1152.0000
```

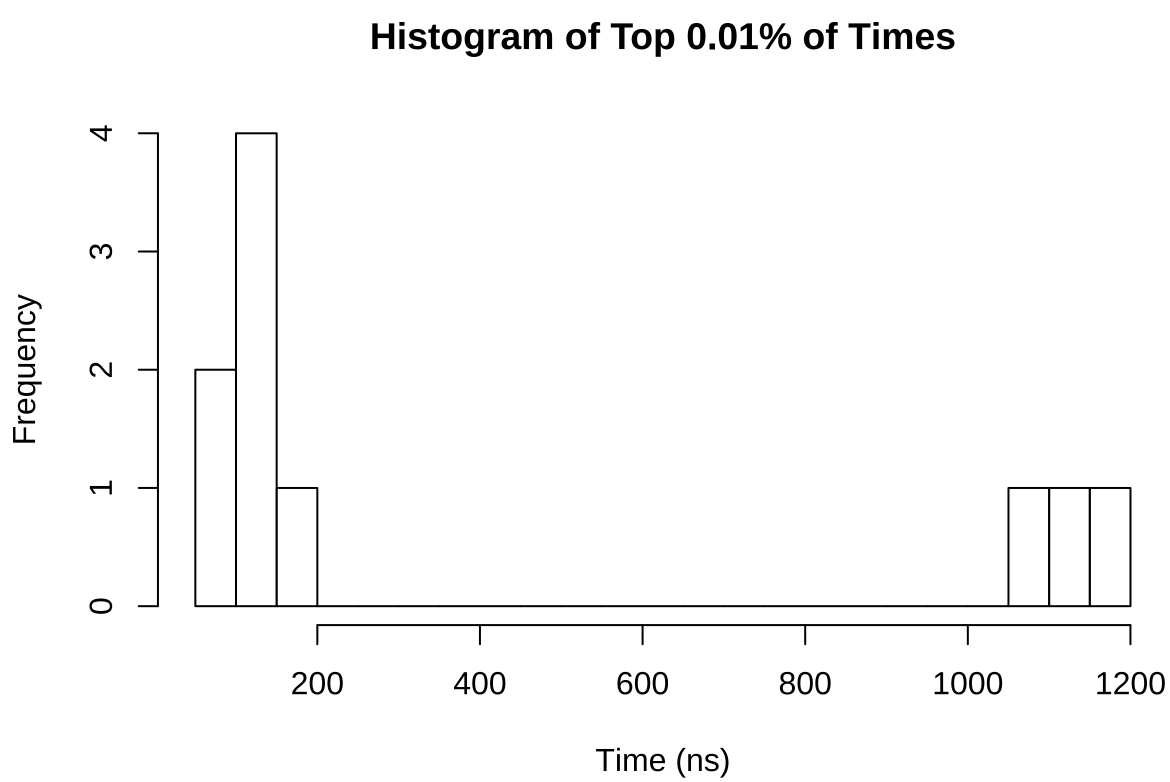
```r
# Let's separate the top 0.01% and analyze

# Top 0.01%
sum(T>76) # There are 10 outliers
```

```
## [1] 10
```

```r
summary(T[which(T>76)])
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    91.0   118.2   135.0   419.5   826.8  1152.0
```

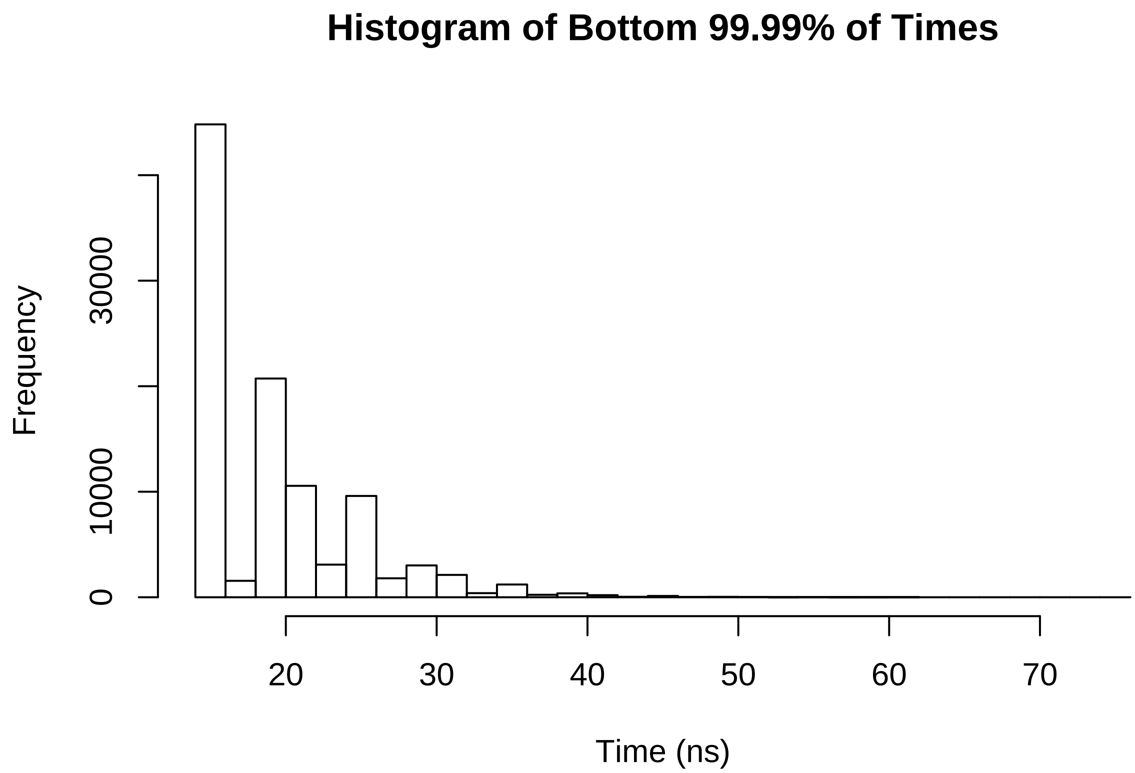
```r
# min 91
# q1 118.2
# median 135
# mean 419.5
# q3 826.8
# max 1152
hist(T[which(T>76)],main="Histogram of Top 0.01% of Times",xlab="Time (ns)",breaks=30)
```




```r
# Bottom 99.99%
summary(T[which(T<=76)])
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   14.00   15.00   19.00   19.71   21.00   76.00
```

```r
# min 14
# q1 15
# median 19
# mean 19.71
# q3 21
# max 76
hist(T[which(T<=76)],main="Histogram of Bottom 99.99% of Times",xlab="Time (ns)",breaks=30)
```




```r
# 99.99% of deletions take less than 76 ns
# There also appears to be no large corelation between N and insertion time
# The implementation must be correct for an O(logn) time

detach(decrease_key_binomial)
```