

Random permutation of arrays

October 26, 2017

1 Statement of the problem

Our purpose is to

- study an algorithm for randomly permuting an array, and
- compare the run times of implementations in

1. **R**
2. *Rcpp*
3. the built-in `sample()` function in R.

2 The algorithm

```
PERMUTE(A)
-----
n = length(A)
for (i = 1, ..., n) {
  SWAP(A, i, RANDOM(i, n))
}
```

3 Implementation

The following is an R implementation of this algorithm.

```
random <- function(a, b)
{
  a + floor(runif(1) * (b-a+1))
}

permute <- function(x)
{
  n <- length(x)
  for (i in seq_along(x))
```

```

    {
      s <- random(i, n)
      x[c(i, s)] <- x[c(s, i)]
    }
  x
}

```

One example of runtime:

```

> system.time(permute(1:1000000))
   user  system elapsed 
5.420   0.012   5.431 
> system.time(sample(1:1000000))
   user  system elapsed 
0.032   0.008   0.038 

```

Run time as function of sample size:

