

Re: tossing coins

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On Sat, 21 Aug 2004 18:04:52 +0200, Andersen <alibandali@hotmail.com> wrote:

>I have a question regarding the distribution of a coin tossing
>experiment. Somebody actually simulated the following experiment and
>claims it is exponentially distributed. I would like to know if this is
>common knowledge, or if it is false. So I describe the experiment:
>
>I continously toss a coin with the outcome H or T. Assume also I have a
>subset of the integers $I = \{1, \dots, N\}$ for some large integer constant N.
>I also have a set $K = \{N+1, \dots, 2*N\}$.
>
>Each time I toss my coin repeatedly with T seconds inter-arrival time I
>do the following:
>- If I get a H I randomly (with uniform distribution) remove one element
>in K and add it to I.
>- If I get a T, I do the reverse, ie. I remove an element randomly (with
>uniform distribution} from I and add it to K.
>
>I do this for sufficiently long time (infinitely). If we count the
>number of seconds each integer was inside K before being removed, and
>plot a frequency diagram over the "lifetime" of each integer in K, will
>it be exponentially distributed? If so why?

Okay, I've simply recreated the simulation (see Matlab code below).
The result is not an exponential distribution.

Hope this helps (I also hope I did it correctly ;)).

---begin code---

```
close all;
clear all;

N = 1000;
pH = 0.5; % probability heads
T = 500;
```

$p_T = 1 - p_H$; % probability tails.

```
for x = 1:(2*N)
```

```
    A(x) = 1/x;
```

```
    P(1,x) = p_H*A(x);
```

```
end
```

```
for t = 1:T
```

```
    for x = 1:(2*N)
```

```
        if x == 1
```

```
            P(t+1,x) = p_T*P(t, x+1);
```

```
        elseif x == (2*N)
```

```
            P(t+1,x) = p_H*(1-A(x))*P(t,x-1) + (p_T*P(t, x));
```

```
        else
```

```
            P(t+1,x) = (p_H*(1-A(x))*P(t,x-1)) +
```