Bus schedule

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Suppose that a bus is scheduled to arrive at the stop on the hour, at 15 minutes past the hour, at 30 minutes past the hour, and at 45 minutes past the hour. However, due to random fluctuations, it arrives anywhere between 1 minute early and 2 minutes late with uniform distribution ($\mathcal{U}(-1, 2)$). Assume that the arrivals of different buses are independent and identically distributed (IID).

Parameters

```
t_int = 15;   % time interval between stops
dlo = -1;     % low end of delay
dhi = 2;      % high end of delay
rep = 1e6;    % number of repetitions
```

Simulation

The Monte-Carlo simulation will assume people arrive at the bus stop randomly, one person every time a bus arrives ($\mathcal{U}(0, 15)$). Passengers will enter the first bus that arrives. There is no problem of space inside the bus. Furthermore, we will use the inherent symmetry of the problem to rule out one of the posibilities: the passenger arrives after the first bus has already passed. Time is centered on the passenger.

```
span_d = dhi - dlo;
unif = rand(rep, 3);
y = unif(:, 1) * t_int;
x_2 = unif(:, 2) * span_d + t_int + dlo - dhi;
x_3 = unif(:, 3) * span_d + 2*t_int + dlo - dhi;

tic;
waitt = (x_2 - y).*(x_2 >= y) + (x_3 - y).*(x_2 < y);
toc;

muhat = mean(waitt);
```

```
Elapsed time is 0.008925 seconds.
```

Output results

```
disp(['The average waiting time obtained is ' num2str(muhat)])
```

```
The average waiting time obtained is 7.545
```

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