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}\(-2, 1\)\). 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.

```
schedule = (1:rep)' * t_int;
span_d = dhi - dlo;
delay = rand(rep, 1) * span_d + dlo;
stops = schedule + delay;
arrivals = rand(rep, 1) * t_int + schedule - t_int;
waitt = (1:rep)';

% scales exponentially
% tic;
% for i = 1:rep
%     for j = 1:rep
%         if arrivals(i) < stops(j)
%             waitt(i) = stops(j) - arrivals(i);
%             break
%         end
%     end
% end
% toc;

% scales linearly
tic;
for i = 1:rep
    if i == 1
        dif = stops(i:i+1) - arrivals(i);
```

```
    elseif i == rep
        dif = stops(i-1:i) - arrivals(i);
    else
        dif = stops(i-1:i+1) - arrivals(i);
    end
    pos = dif(dif > 0);
    waitt(i) = min(pos);
end
toc;
```

```
Elapsed time is 1.648796 seconds.
```

Output results

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

```
The average waiting time obtained is 7.5449
```

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