Contents

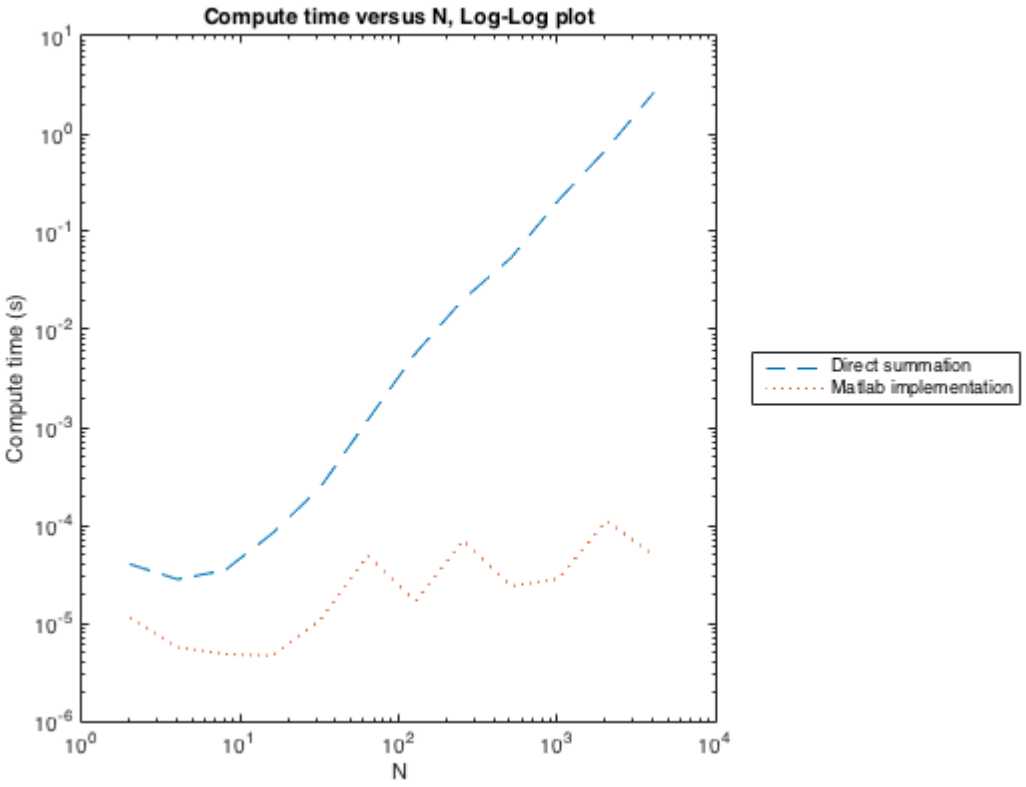

```
% Shannon Moran
% Math 671, HW 2, problem 2

function[]=Math671_HW2_p2()

% We are going to run at 12 different values of N

% Givens: Values of N to test
q = transpose(linspace(1,12,12));
N = 2.^q;
tests = length(N);
blank = zeros(tests,1);
[t_man,t_auto,check] = deal(blank,blank,blank);

for i=1:tests
    [t_man(i),t_auto(i),check(i)] = DFTtimer(N(i));
end

% Display results of checking equality of the two DFT implementations
disp('In below table, check=1 if (direct sum DFT)==(Matlab implementation DFT)');
disp('(Used 5 sig figs of abs of both values to check equality)')
table(N,check)

% Plot results
figure
loglog(N,t_man,'--',N,t_auto,':')
title('Compute time versus N, Log-Log plot')
legend('Direct summation','Matlab implementation','Location','eastoutside')
xlabel('N')
ylabel('Compute time (s)')

end
```

DFT by direct summation for given N

```
function[t_manual,t_automatic,match_check]=DFTtimer(N)
v = zeros(N,1);
for i=1:N
    v(i) = 1/i;
end

% To be consisted with Matlab's fft, 1/sqrt(N) prefactor not included
F_manual = zeros(N,N);
tic
for n=1:N
    for j=1:N
        F_manual(n,j) = v(j)*exp(-2*pi*1i*(n-1)*(j-1)/N);
    end
end
F_manual = sum(F_manual,2);
t_manual = toc;

% Time Matlab's fft
tic
```

```
F_automatic = fft(v);
t_automatic = toc;

% Check direct summation against Matlab fft
match_check=isequal(round(abs(F_manual),5,'significant'),round(abs(F_automatic),5,'significant'));
end
```

```
In below table, check=1 if (direct sum DFT)==(Matlab implementation DFT)
(Used 5 sig figs of abs of both values to check equality)
ans =
     N      check
    ____    _____
      2     1
      4     1
      8     1
     16     1
     32     1
     64     1
    128     1
    256     1
    512     1
   1024     1
   2048     1
   4096     1
```



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