CS 6220 Assignment 2

September 22, 2011

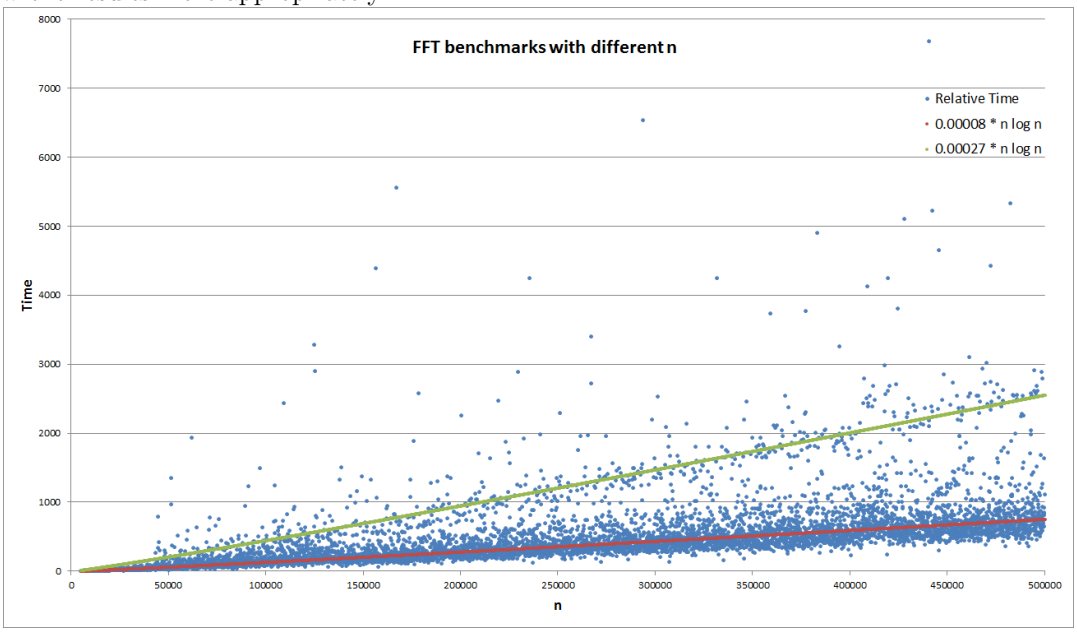
Benchmarking MATLAB's ftt Function

To benchmark the `fft` function, I implemented a `MATLAB` script that would run `fft` on n sized vectors where n would vary between 5000 and 500000 with intervals of 73. These numbers where chosen because choosing too big of a number would make the script run for too long ($> 30min$) and choosing a small interval would cause the resulting graph to be too cluttered. This is the test script I used:

```
function FFTBenchmark
%FFTBENCHMARK Writes the relative times of computing fft to a csv file and
%also outputs a graph showing the pattern
    start = 5000;
    finish = 500000;
    diff = 73;

    %choose a start such that 8192 is in there
    for i = start:start+diff+1
        if (~isempty(find((i:diff:finish)==8192,1,'first')))
           start = i;
           break;
        end
    end

    index = find((start:diff:finish)==8192,1,'first');

    times = zeros(floor((finish-start)/diff)+1,1);
    %make the random largest vector necessary and then only take subparts
    %of it. Saves time and memory
    A = randn(finish,1);
    nRepeat = 1;
    j = 1;
    for i = start:diff:finish
        % Depending on the size of the matrix multiple runs may be
        % necessary
        if (i < 3000)
            nRepeat = 500;
        elseif (i < 4000)
            nRepeat = 400;
        elseif (i < 5000)
            nRepeat = 300;
        elseif (i < 6000)
            nRepeat = 100;
        elseif (i < 8000)
            nRepeat = 50;
        elseif (i<10000)
```

```
            nRepeat = 10;
        elseif (i<12000)
            nRepeat = 3;
        else
            nRepeat = 1;
        end

        B = A(1:i);
        tic
        for (k = 1:nRepeat)
            fft(B);
        end
        times(j,1) = toc/nRepeat;
        j = j+1;
    end
    %get relative times
    times(:,1)= times(:,1)/times(index,1);
    csvwrite('benchfft.csv',[(start:diff:finish)' times]);
    n = (start:diff:finish)';
    pat1 = 0.00006 * n .* log2(n);
    pat2 = 0.00016 * n .* log2(n);
    plot(n , [times pat1 pat2])
end
```

I used the data from the .csv file and used Microsoft Excel to generate a scatter graph to show the results more appropriately:



We can see from the graph that it appears that the runtime of `fft` follows mostly two different $n \log n$ curves (with different constant multipliers). It is clear from these two curves that some n are much nicer than others.

The data had too data points to include in this .pdf, but if needed you can send me an e-mail.