Analysis of Simple Loops

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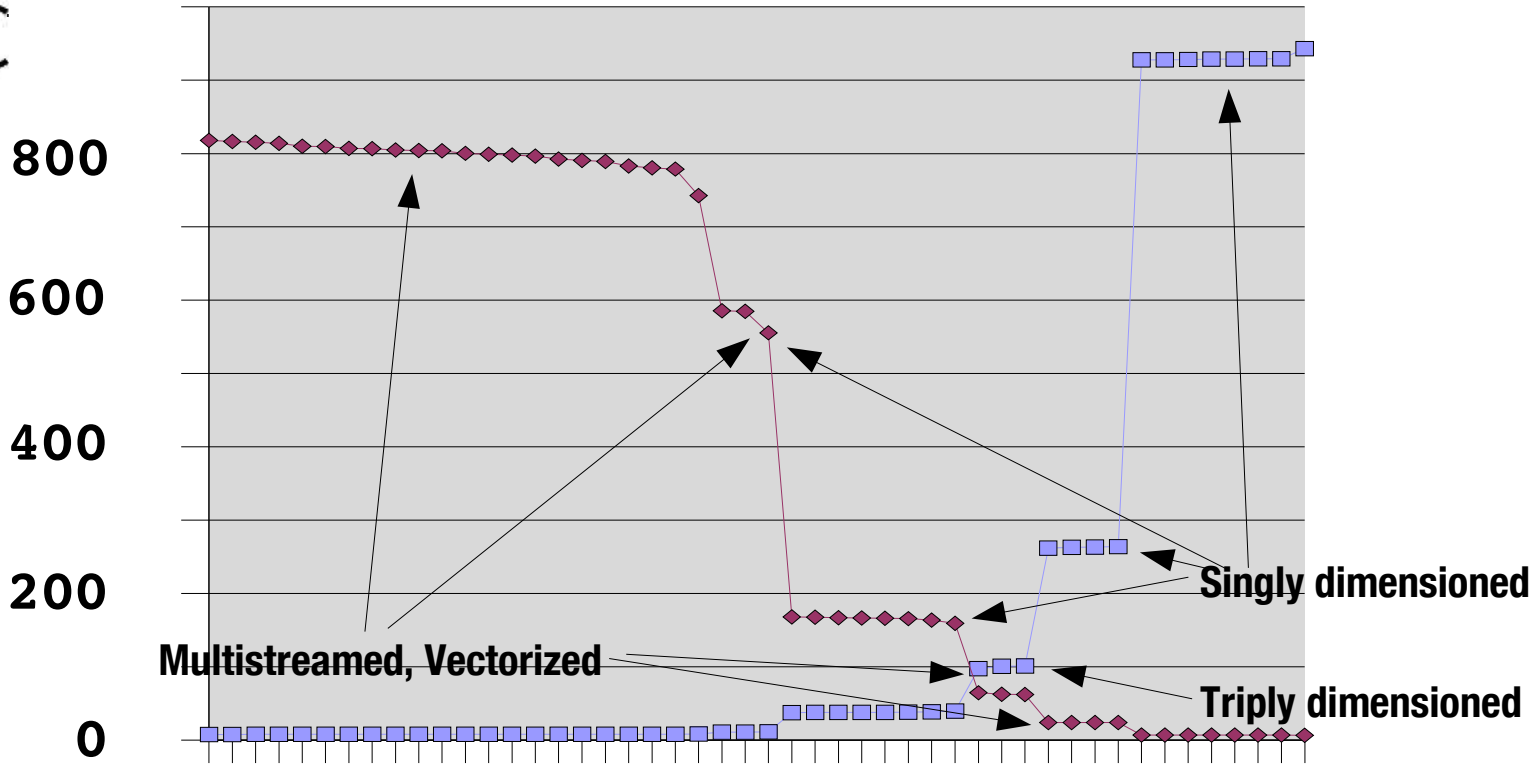
X1 Loop Analysis

Analysis of 2 Simple Loop Nests

```
do i=1, n1
    do j=1, n2
        do k=1, n3
            u3(i,j,k) = x3(i,j,k)/d3(i,j,k)
            v3(i,j,k) = y3(i,j,k)/d3(i,j,k)
            w3(i,j,k) = z3(i,j,k)/d3(i,j,k)
        enddo
    enddo
enddo
```

Second Loop Nest

```
do i=2, n1-1
    do j=2, n2-1
        do k=2, n3-1
            u3(i,j,k) = (v3(i,j,k)*((x3(i+1,j,k) -  x3(i-1,j,k))     &
                        +  (x3(i,j+1,k)-x3(i,j-1,k))                 &
                        + (x3(i,j,k+1)-x3(i,j,k-1)))                 &
                        + w3(i,j,k)**y3(i,j,k) ) * sin(z3(i,j,k))
            z3(i,j,k) = w3(i,j,k)**y3(i,j,k)
            if (i==j .or. j==k) then
                    u3(i,j,k) = 1.0
            endif
        enddo
    enddo
enddo
```



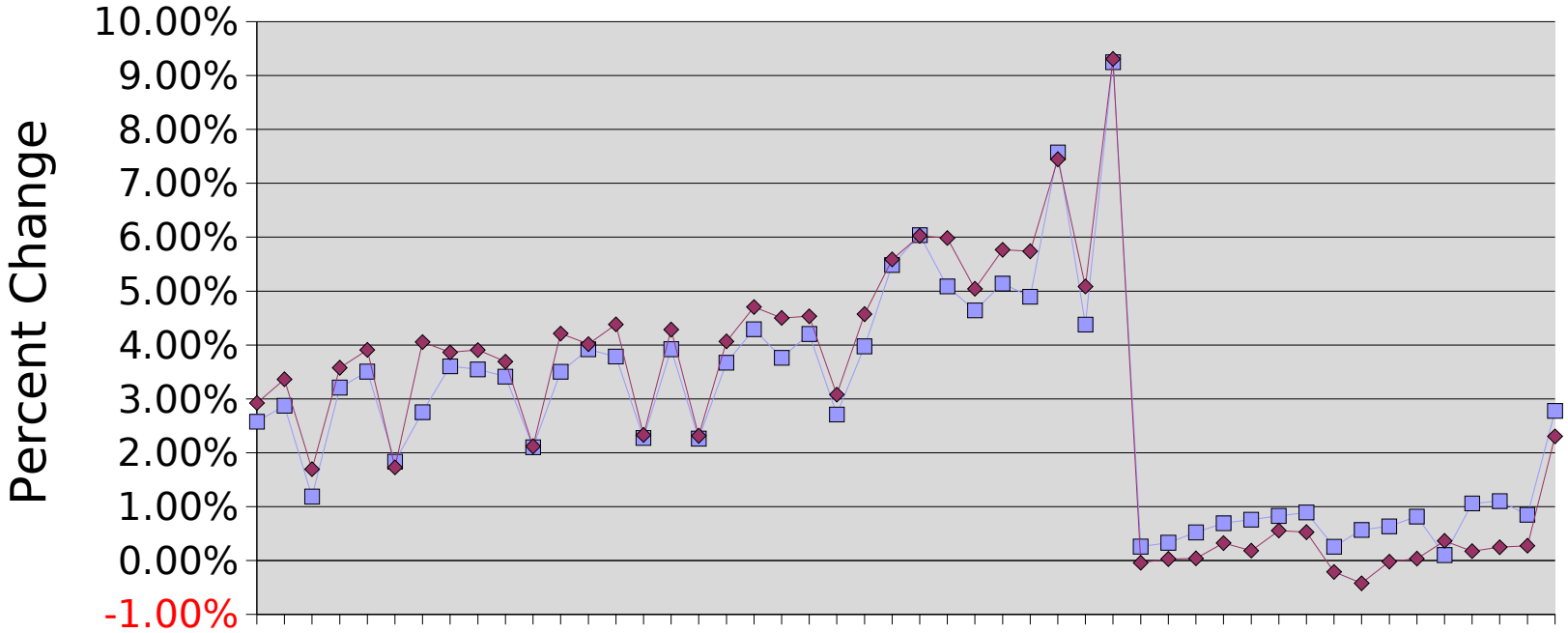
Fortran Performance, Default Optimization, 100% Vectorization

Forty-eight codings of 1st problem on (128, 128, 128).

Red is MFLOPS, blue is ms execution time. Best/worst = 123.

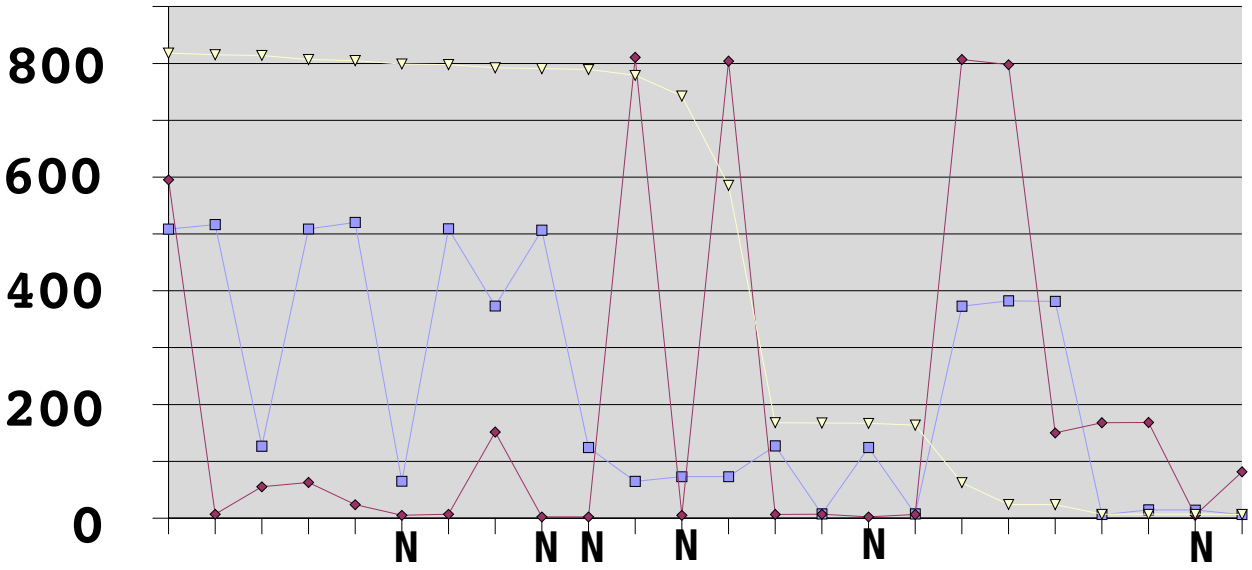
-03 averaged 1% faster (03/default range: 7% slower to 13% faster).

Compiler Improvements



Loop (fastest to slowest)

Red: 5.4/5.2 **Lilac**: 5.3/5.2



Yellow, triangles: Original

Red, diamonds: Same, C

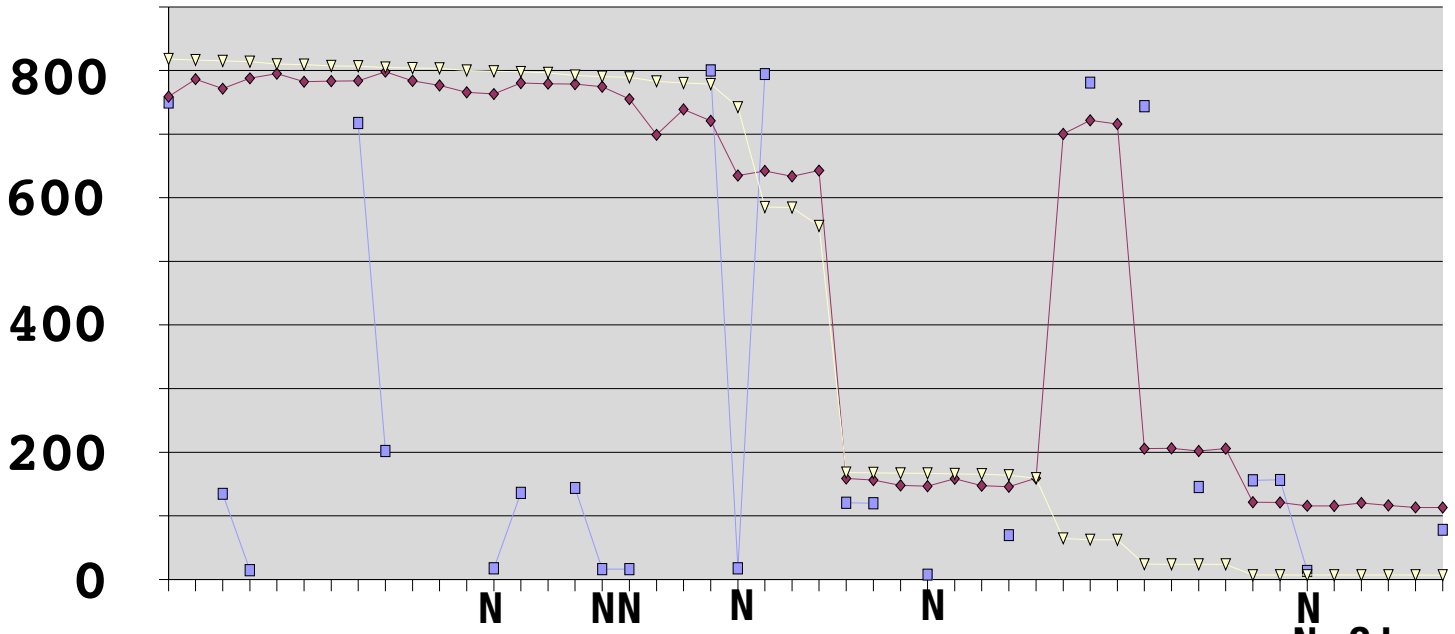
Blue, squares: 2nd Loops

N: C loops did not vectorize

Fortran and C Performance, Default Optimization

Twenty-four codings of 2 problems on (128, 128, 128)

Blue line with squares is the second loop nest.



X1 MFLOPS Performance, Default Optimization

Red, Diamonds: Original loop nest, Fortran Compiler, on (129, 129, 129)

Blue Squares: Original loop nest, C compiler, on (129, 129, 129).

Yellow triangles: Results on (128, 128, 128) cube for reference.