DIGITAL SIGNAL PROCESSING

PROJECT-2

FINDING DIT-FFT USING BUTTERFLY ALGORITHM

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M - FILE

```
clc;

clear;

close all;


%%input sequence

xn=input('enter the input sequence: ');

N=input('enter the number of points: ');

x = bitrevorder(xn);


% first stage butterflies

[a1,b1] = butterfly(x(1),x(2),0);

[a2,b2] = butterfly(x(3),x(4),0);

[a3,b3] = butterfly(x(5),x(6),0);

[a4,b4] = butterfly(x(7),x(8),0);


% second stage butterflies

[p1,q1] = butterfly(a1,a2,0);
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```
[p2,q2] = butterfly(b1,b2,2);
[p3,q3] = butterfly(a3,a4,0);
[p4,q4] = butterfly(b3,b4,2);

% third stage butterflies
[X0,X4] = butterfly(p1,p3,0);
[X1,X5] = butterfly(p2,p4,1);
[X2,X6] = butterfly(q1,q3,2);
[X3,X7] = butterfly(q2,q4,3);

y = [X0,X1,X2,X3,X4,X5,X6,X7];
disp(y)
function [z,y] = butterfly(u,v,n)
z = u + (exp(-1i*2*pi*n/8)*v);
y = u - (exp(-1i*2*pi*n/8)*v);
end
```

OUTPUT SNAPSHOTS

```
enter the input sequence: [1 2 3 4 4 3 2 1]

enter the number of points: 8

  Columns 1 through 6


  20.0000 + 0.0000i  -5.8284 - 2.4142i   0.0000 + 0.0000i  -0.1716 - 0.4142i   0.0000 + 0.0000i  -
0.1716 + 0.4142i


  Columns 7 through 8


   0.0000 + 0.0000i  -5.8284 + 2.4142i
```

CONCLUSION: In the context of fast Fourier transform algorithms, a butterfly is a portion of the computation that combines the results of smaller discrete Fourier tranforms (DFTs) into larger DFT, or vice versa. The name butterfly comes from the shape of the data- flow diagram in the radix-2 case.