Contents


```
%-------------------------------------------------------------------------%
%%-------------- Lab Mid-Term 2 Digital Communication ------------------%%
 %--------------- Supervisor: Dr.Shirvani Moghaddam ---------------%
  %------- Source by Mohammad Reza Farhadi Nia ----- Date:Nov 2020 --%
%-------------------------------------------------------------------------%
```

MUX

Inputs : 8 bit frames

```
Tail0 = 0*(1:64) + 1;
cha1in  = randi([0 1],1,64);
cha2in  = randi([0 1],1,64);
cha3in  = randi([0 1],1,64);
cha4in  = randi([0 1],1,64);
cha5in  = randi([0 1],1,64);
cha6in  = randi([0 1],1,64);

Parity = xor(xor(xor(xor(xor(cha1in,cha2in),cha3in),cha4in),cha5in),cha6in);

Parallel_input = [Tail0; cha1in; cha2in; cha3in; cha4in; cha5in; cha6in; Parity];

Sereies = Par2SerOpt(Parallel_input, 8, 64)
```

DMUX

Output

```
Prallel_output = Ser2ParOpt(Sereies, 8)

cha1out  = Prallel_output(2,:);
cha2out  = Prallel_output(3,:);
cha3out  = Prallel_output(4,:);
cha4out  = Prallel_output(5,:);
cha5out  = Prallel_output(6,:);
cha6out  = Prallel_output(7,:);
cha7out  = Prallel_output(8,:);

erorr = Parallel_input - Prallel_output;
erorr1 = cha1out - cha1in;

figure
```

```
subplot(8,1,1);stairs([-length(cha1in)/2+1/2:length(cha1in)/2-1/2],cha1in);
axis([-length(cha1in)/2 length(cha1in)/2 -2 2]);title('Channe 1 Input = Channe 1 Output');gri
d on;

subplot(8,1,2);stairs([-length(cha2out)/2+1/2:length(cha2out)/2-1/2],cha2out);
axis([-length(cha2out)/2 length(cha2out)/2 -2 2]);title('Channe 2 Input = Channe 2 Output');g
rid on;

subplot(8,1,3);stairs([-length(cha3in)/2+1/2:length(cha3in)/2-1/2],cha3in);
axis([-length(cha3in)/2 length(cha3in)/2 -2 2]);title('Channe 3 Input = Channe 3 Output');gri
d on;

subplot(8,1,4);stairs([-length(cha4out)/2+1/2:length(cha4out)/2-1/2],cha4out);
axis([-length(cha4out)/2 length(cha4out)/2 -2 2]);title('Channe 4 Input = Channe 4 Output');g
rid on;

subplot(8,1,5);stairs([-length(cha5out)/2+1/2:length(cha5out)/2-1/2],cha5out);
axis([-length(cha5out)/2 length(Parity)/2 -2 2]);title('ParityChanne 5 Input = Channe 5 Outpu
t');grid on;

subplot(8,1,6);stairs([-length(cha6out)/2+1/2:length(cha6out)/2-1/2],cha6out);
axis([-length(cha6out)/2 length(cha6out)/2 -2 2]);title('Channe 6 Input = Channe 6 Output');g
rid on;

subplot(8,1,7);stairs([-length(cha7out)/2+1/2:length(cha7out)/2-1/2],cha7out);
axis([-length(cha7out)/2 length(cha7out)/2 -2 2]);title('Parity');grid on;

subplot(8,1,8);stairs([-length(Sereies)/2+1/2:length(Sereies)/2-1/2],Sereies);
axis([-length(Sereies)/2 length(Sereies)/2 -2 2]);title('Sereies Carrier');grid on;
```

Parallel to Series Optimum O(n)

```
function Output = Par2SerOpt(Input, row_len, column_len)
    for column = 1:column_len
        Output(1, (column-1)*row_len+1:column*row_len) = Input(1:row_len, column);
    end
end
```

```
Sereies =

  Columns 1 through 13

     1     1     0     0     1     1     1     0     1     1     0     1     1

  Columns 14 through 26

     0     1     0     1     0     1     0     0     0     0     1     1     1

  Columns 27 through 39

     1     0     1     1     0     0     1     0     0     0     1     0     1

  Columns 40 through 52
```

```
   0     1     0     1     1     1     1     1     1     1     0     0     0

Columns 53 through 65

   1     1     0     0     1     1     1     1     0     1     1     1     1

Columns 66 through 78

   1     1     0     1     1     1     1     1     0     1     0     0     0

Columns 79 through 91

   0     1     1     0     0     0     1     0     1     0     1     1     1

Columns 92 through 104

   1     1     0     0     0     1     0     0     1     1     0     0     0

Columns 105 through 117

   1     1     0     0     1     1     1     0     1     1     1     1     1

Columns 118 through 130

   1     1     0     1     0     1     1     1     0     0     1     1     0

Columns 131 through 143

   0     1     0     0     1     0     1     1     1     1     0     1     0

Columns 144 through 156

   0     1     1     1     1     0     0     0     1     1     1     0     0

Columns 157 through 169

   0     0     0     1     1     0     1     0     0     1     0     0     1

Columns 170 through 182

   1     0     0     0     0     0     1     1     0     0     0     0     1

Columns 183 through 195

   0     1     1     1     0     1     1     0     0     1     1     1     1

Columns 196 through 208

   0     1     0     0     1     1     0     0     0     0     1     0     1

Columns 209 through 221

   1     0     0     0     0     1     1     0     1     1     1     1     1

Columns 222 through 234

   1     0     1     1     0     0     0     0     1     1     0     1     0
```

Columns 235 through 247

```
   1     0     0     0     0     1     1     1     1     1     1     0     0
```

Columns 248 through 260

```
   0     1     0     1     1     1     1     0     0     1     1     1     0
```

Columns 261 through 273

```
   0     0     0     0     1     1     0     0     1     1     1     0     1
```

Columns 274 through 286

```
   1     0     0     1     1     0     1     1     1     1     1     0     0
```

Columns 287 through 299

```
   1     0     1     1     1     0     0     1     1     0     1     0     0
```

Columns 300 through 312

```
   1     1     0     1     1     1     1     1     0     0     1     1     0
```

Columns 313 through 325

```
   1     0     1     1     0     1     1     0     1     1     1     1     0
```

Columns 326 through 338

```
   0     1     0     1     1     1     0     1     1     1     1     1     1
```

Columns 339 through 351

```
   1     1     1     1     1     0     1     0     1     0     0     0     0
```

Columns 352 through 364

```
   1     1     0     0     1     0     1     0     0     1     1     0     1
```

Columns 365 through 377

```
   1     1     1     1     1     1     1     0     0     1     1     0     1
```

Columns 378 through 390

```
   1     0     0     1     1     0     1     1     1     1     1     0     0
```

Columns 391 through 403

```
   1     0     1     0     0     1     0     0     0     1     1     0     1
```

Columns 404 through 416

```
   0     0     1     0     0     1     0     0     0     0     0     0     0
```

```
  Columns 417 through 429

     1     0     0     1     0     1     0     0     1     0     1     0     0

  Columns 430 through 442

     1     0     0     1     0     0     1     1     1     0     1     1     1

  Columns 443 through 455

     1     1     0     0     0     1     1     0     1     0     1     0     1

  Columns 456 through 468

     1     1     0     0     1     1     1     1     0     1     0     0     1

  Columns 469 through 481

     1     0     1     1     1     0     1     1     1     1     0     0     1

  Columns 482 through 494

     0     0     0     0     0     0     0     1     1     0     0     0     1

  Columns 495 through 507

     1     1     1     0     0     1     1     0     1     1     1     0     0

  Columns 508 through 512

     1     1     1     1     0
```

Series to Parallel Optimum O(n)

```
function Output = Ser2ParOpt(Input, out_len)
    for row = 1:ceil(length(Input)/out_len)
        Output(1:out_len, row) = Input(1, (row-1)*out_len+1:row*out_len);
    end
end
```

```
Prallel_output =

  Columns 1 through 13

     1     1     1     1     1     1     1     1     1     1     1     1     1
     1     1     0     1     0     0     0     1     1     0     0     1     0
     0     0     1     1     0     1     0     1     1     1     0     1     0
     0     1     0     0     0     1     0     1     0     0     0     1     1
     1     1     0     1     1     1     1     0     1     0     1     1     1
     1     0     0     1     0     1     1     1     1     0     0     0     0
     1     1     0     0     1     1     0     1     1     0     1     0     0
     0     0     1     0     0     1     0     1     1     1     0     0     0
```

Columns 14 through 26

1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	0	0	1	1	1	0	1	0	1	1	0
0	1	1	0	1	1	0	1	0	0	0	1	0
0	1	1	1	1	1	0	0	0	0	1	0	0
1	1	1	0	0	0	0	0	0	0	1	1	0
1	1	0	0	1	0	0	1	0	1	0	0	1
1	1	0	1	0	0	0	0	0	0	0	0	0
0	0	1	0	0	1	1	0	1	1	1	1	1

Columns 27 through 39

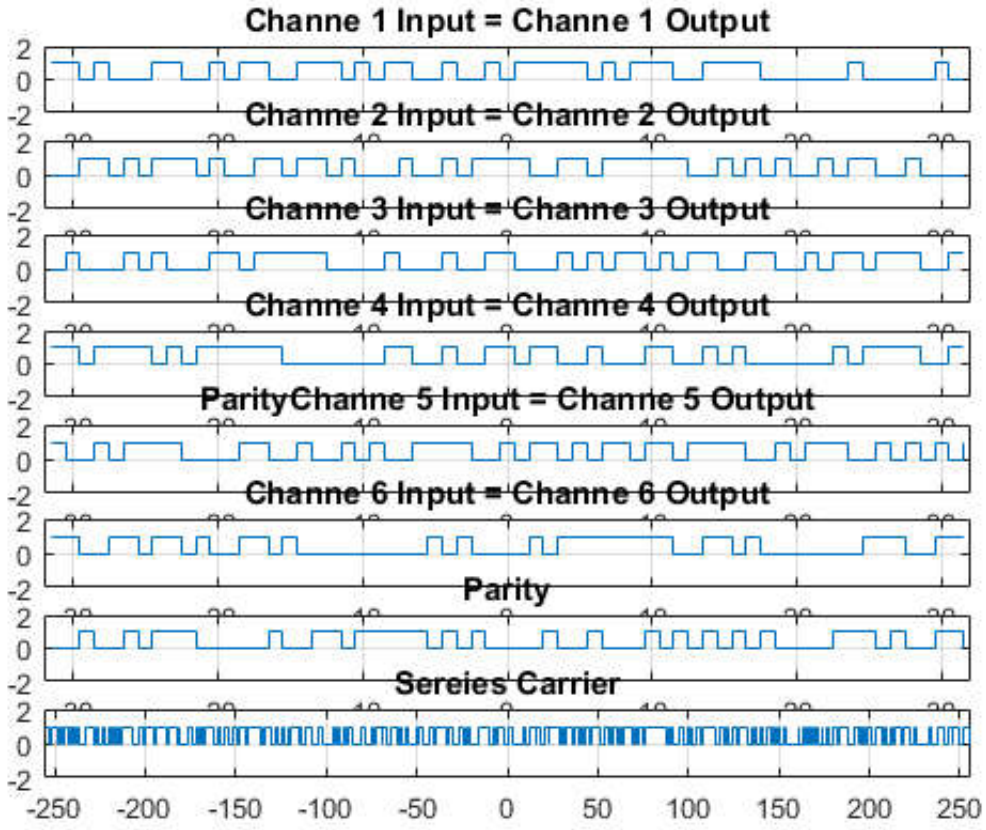
1	1	1	1	1	1	1	1	1	1	1	1	1
0	1	0	0	1	0	1	1	1	1	1	0	1
0	1	0	1	1	1	1	0	0	1	1	0	1
0	1	0	0	1	1	0	0	0	1	0	1	0
0	1	0	0	1	1	0	1	1	0	0	1	0
1	1	1	0	0	1	0	1	1	0	1	0	1
1	0	1	0	0	0	0	1	0	1	1	1	1
0	1	0	1	0	0	0	0	1	0	0	1	0

Columns 40 through 52

1	1	1	1	1	1	1	1	1	1	1	1	1
0	1	1	1	0	0	1	1	1	1	0	0	0
1	1	1	1	1	0	0	1	0	1	0	1	0
1	1	0	1	0	1	1	0	0	1	1	0	0
0	0	1	1	0	0	1	0	1	0	0	0	0
1	0	1	1	0	1	1	1	1	0	0	1	0
1	1	1	1	0	0	1	1	0	1	0	0	0
0	0	1	0	1	0	1	0	1	0	1	0	0

Columns 53 through 64

1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	1	0	0	0	0	0	1	0	0
0	1	0	1	1	0	0	1	0	0	0	0
1	0	1	1	0	1	1	1	0	0	1	1
0	0	1	0	1	1	1	1	0	0	1	1
1	1	1	0	0	1	0	1	0	1	0	1
0	0	0	0	1	1	1	0	0	1	1	1
0	0	1	1	1	0	1	0	0	1	1	0



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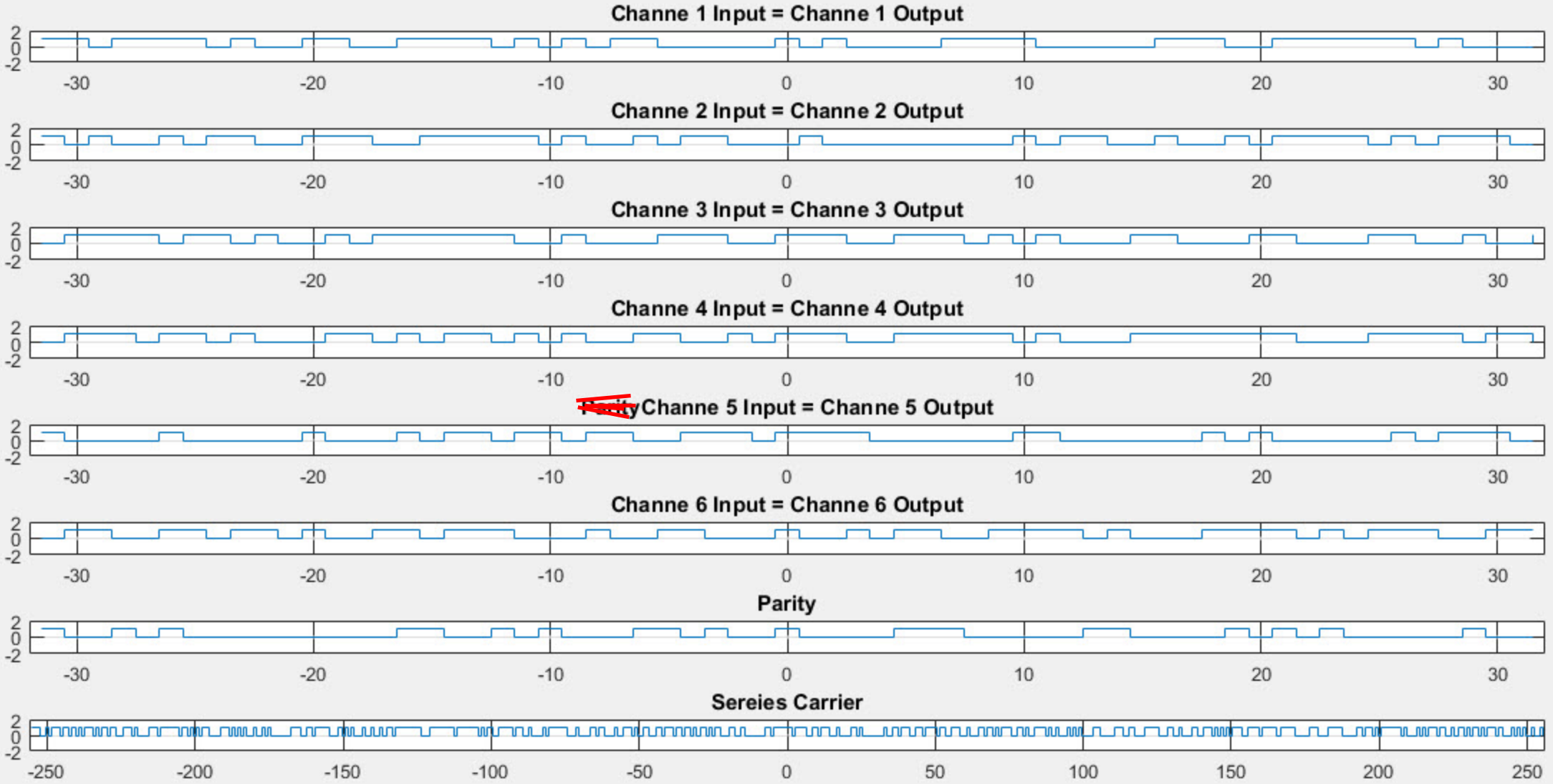
Channe 1 Input = Channe 1 Output
Channe 2 Input = Channe 2 Output
Channe 3 Input = Channe 3 Output
Channe 4 Input = Channe 4 Output
ParityChanne 5 Input = Channe 5 Output
Channe 6 Input = Channe 6 Output
Parity
Sereies Carrier
2
0
-2
-30
-20
-10
0
10
20
30
-250
-200
-150
-100
-50
0
50
100
150
200
250

Workspace

Value	Name
1x64 double	cha1in
1x64 double	cha1out
1x64 double	cha2in
1x64 double	cha2out
1x64 double	cha3in
1x64 double	cha3out
1x64 double	cha4in
1x64 double	cha4out
1x64 double	cha5in
1x64 double	cha5out
1x64 double	cha6in
1x64 double	cha6out
1x64 double	cha7out
8x64 double	erorr
1x64 double	erorr1
8x64 double	Parallel_input
1x64 logical	Parity
8x64 double	Prallel_output
1x512 double	Sereies
1x64 double	Tail0