Ditigal Transmitters and Recievers

February 6, 2018

Contents

1 Lecture 1 - History of Communication

This is mt, I have not a copy of these notes. Mainly discussed how in the last 120 years we/society has gone from using semophores to using modern fast as light coms.

2 Lecture 2 - A cont. of lecture 1

More info I don't have a copy of. . . .

3 Lecture 3

4 Lecture ?

:DATE: *<2018-02-05 Mon>*

4.1 Transmitter

two bits per symbol - four possible wave forms

symbol	bits	four possible waveforms
0	00	0^0
1	01	90^0
2	10	180^0
3	11	270^0

4.2 Reciever

Use correlators to match input to possible transmitted waveforms

4.3 TODO Graham-Schmidt: check matrix algebra book on this topic.

- Signals $S_1(t), \ldots, S_m(t)$
- basis functions $\phi_n(t), \ldots, \phi_n(t)$, $N \neq M$
- $S_i(t) = \sum n = 1 N S_{in} \phi_n(t)$
- $\mathbf{S_i} = [S_{i1}\ S_{i2}\ \ldots\ S_{in}]$

4.3.1 1st signal

$E_{s1} = ||S_1||^2$
$\$\phi_1 = \frac{S_1(t)}{\sqrt{E_{s1}}}$
$S_{11} = \sqrt{E_{s1}}$

4.3.2 2nd – Nth signal

Creating a new basis function
$S_{21} = <S_2(t), \phi_1(t)>$
$r_2(t) = S_2(t) - S_{21}\ \phi_1(t)$ <– orthogonal to $\phi_1(t)$
`If remainted r_i(t) = 0 skip the steps below`

- The part of signal 2 that can't be represented by ϕ_1(t).

  E_{r2} = $||r_2(t)||^2$

  ϕ_2(t) = $\frac{r_2(t)}{\sqrt{E_{r2}}}$

  S_{22} = $\sqrt{E_{r2}}$

- others

  S_{ni} = <S_n(t) , ϕ_i(t)> for ϕ_i(t) which are defined.

  r_i(t) = S_i(t) - $\sum${S_{in}} ϕ_n(t)

4.4 Fourier Transfrom

- **F** {g(t)} = G(f) = $\int_{-\inf}^{\inf} g(t)e^{-j2\pi ft}$

- **F** $^{-1}$ {G(f)} = g(t) = $\int_{-\inf}^{\inf} G(f)e^{j2\pi ft}$

4.4.1 TODO Properties: verify that 4.4.1 is correct

- Linearity
  - **F** $a_1x_1(t) + a_2x_2(t)$ = a_1 **F** $x_1(t)$ + a_2 **F** $x_2(t)$
- Time Shift
  - **F** $x(t - T_0)$ = $\int_{-\inf}^{\inf} x(t - t_0)e^{-j2\pi ft}$

    λ = t-t_0

    = $e^{-j2\pi f}$ $\int_{-\inf}^{\inf} x(\lambda + t_0)$

    = e^{-j2_0} $\int_{-\inf}^{inf} x(\lambda)e^{-2\pi f\lambda}d\lambda$ (EQ1)

    = e^{-2j_0} X(f)
- Frequency Property
  - **F** $^{-1}X(f - f_0) = e^{j2\pi f_0 t} \int_{-\inf}^{\inf} x(t)$

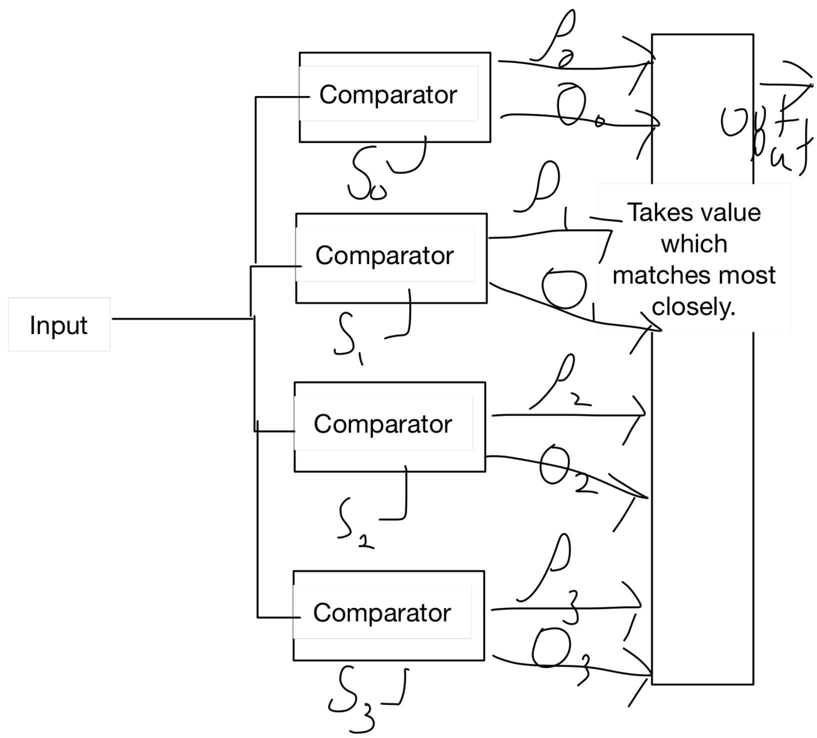

Figure 1: internals of Ditigal reciever with two-bit decode